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THE CHANGING SCENE

Tuberculosis is an age-old disease. While the disease entity has remained, by and large, unchanged through the ages, the scenario of our understanding of the problems of tuberculosis and measures for its control have been continuously changing. The ancient sin/punishment concept of its causation was abandoned long ago. Thereafter, it was considered to be a hereditary disease. A tuberculosis diathesis with adverse environmental and nutritional factors was supposed to influence the development, course and prognosis. The disease which had been a 'captain of the men of the death' all over the world gradually began to decline in the western countries with improvement in socio-economic conditions.

Then came the monumental discovery of Robert Koch. A wave of enthusiasm swept over the entire world and conquest of this scourge was believed to be imminent. Sir Robert Philip, an eminent Physiologist, who qualified soon after the discovery of the bacillus told his teacher that he was thinking of specialising in Tuberculosis. His teacher tried to dissuade him, saying "What is there left in Tuberculosis now (that its cause has been found out)?" Hundred years have passed but the disease is still very much there and far from being vanquished.

The discovery of the bacillus provided an impetus to further research in the field of tuberculosis in two main directions viz. finding an immunising agent and a curative agent. BCG as an immunising agent became available in 1921. Once again there was a sense of euphoria all over the world. An eminent scientist - Schroder - said "a door has finally opened through which tuberculosis can be driven easily and speedily out of existence". The high hope was more of wishful thinking without any scientifically established basis. It is not surprising that it, too remains unfulfilled.

BCG has undoubtedly saved many children from developing the serious early post-primary manifestations of disease but its role in control of disease, in general, is still questionable and it is believed that the decline in the western countries has been more due to the fall in the incidence of infection than BCG even when it was included in the mass tuberculosis control programme.

Sanatorium regime, Robert Philip's tuberculosis dispensary, the forerunner of today's domiciliary treatment, and collapse therapy had also come on the scene and certainly contributed to some extent towards amelioration of the problem. With the advent of chemotherapy, their importance and role in the control of disease has waned tremendously

except in the case of domiciliary treatment, the efficiency of which has been immensely enhanced *by* chemotherapy and it today constitutes the sheet anchor of control of disease.

The story of chemotherapy is no less colourful. Many chemical compounds, the most exotic of which was a gold salt, were deployed for some years. An enthusiast in India advocated intra-pulmonic injections of a weak solution of phenol! Success was claimed for these and many others. But they all proved to be the proverbial nine days' wonders.

With Streptomycin came the breakthrough in the fourth decade of this century. Thereafter, many more potent drugs with specific *in vivo* bactericidal or bacteriostatic action have become available. Once again the hope rose that with these drugs, tuberculosis will be quickly and finally licked. The hope, however, still remains elusive.

Thanks to these drugs, the outlook for the patient is no longer hopeless and the physician today is not so helpless as his predecessors in the pre-chemotherapy era. Potent though these drugs are, none of them qualifies as an ideal drug. Many problems further vitiate the results. These problems are partly biological, like drug resistant and persister bacilli, partly pharmaco-kinetic, but mainly these are operational and organisational like drug distribution system, patient's compliance, supervision of chemotherapy, etc.

It is also being realised that results of chemotherapy do not depend entirely on a simple drug-parasite interaction. It is, in fact, a highly complex relationship involving host factor in addition to the drug and the parasite. If studies in the field of Immunology, initiated by Robert Koch himself, had been pursued with consistency and vigour, the picture may have been different today.

An eminent Immunologist of U K. has gone so far as to claim that Immunology will certainly help to resolve all the remaining unsolved problems of tuberculosis in the near future. He also holds out hopes of a more potent, efficient and specific immunising agent than BCG. Whether these claims are fulfilled or our indomitable and wily foe once again thwarts our efforts, remains to be seen.

Search and endeavour meanwhile must continue diligently and perseveringly. Even if a problem does not have a perfect solution and the solution itself generates more problems, each problem that is solved extends the frontiers of knowledge and is a significant step towards the final goal. It is these advances which make the search fascinating and sustain it.

TUBERCULOSIS CONTROL IN INDIA—CURRENT PROBLEMS AND POSSIBLE SOLUTIONS

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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 1953, 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 anti-tubercular 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 RT22(9), RT 23(10) (1-1) 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(I) to alkali(II) 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 up to 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 3 years(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 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 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*. In spite 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 thePHIs, 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%.

6. 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.

HI. 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 upto 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 where-in 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-suiting 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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SHORT COURSE CHEMOTHERAPY OF PULMONARY TUBERCULOSIS—INTERIM REPORT ON SECOND TUBERCULOSIS ASSOCIATION OF INDIA TRIAL

Research Committee of the Tuberculosis Association of India*

Summary : Two short course regimens were studied. In one, RMP, INH and PZA were given daily for eight weeks. In the other SM was added in the first 8 weeks. Those whose sputum was converted by direct smear at 8 weeks were treated randomly with RMP and INH daily for a further 4 or 18 weeks in both regimens. Patients who continued to have a positive smear at 8 weeks were treated with RMP and INH daily for 18 weeks after the initial intensive phase of 8 weeks. Only 1 patient remained unconverted at the termination of chemotherapy. There was no bacteriological reversion during six months of follow up after termination of chemotherapy if the total duration was 26 weeks. Nearly one-fourth of the patients had bacteriological reversion among those treated for 12 weeks only. Bacilli in most of the relapse cases were sensitive to all drugs at the time of relapse. Streptomycin group had no overall advantage over the others except that sputum conversion at 8 weeks was higher in the former. All patients who harboured initially drug resistant bacilli were converted if their treatment was for 26 weeks.

The first Short-course Chemotherapy (SCC) Trial of the Association was carried out in 1974-78. Two daily regimens were tried, viz. Rifampicin (RMP) plus INH plus Streptomycin (SM) plus Ethambutol (EMB) and Pyrazinamide (PZA) plus INH plus SM plus EMB. The cases in the control regimen were treated with INH and SM for the first 8 weeks followed by INH and Thiacetazone daily in standard doses for 72 weeks (total duration of treatment 80 weeks). Patients on SCC were treated for 20 weeks followed by a placebo for 60 weeks. Although the sputum conversion was nearly 100% in all regimens, cumulative relapse rates at the end of 112 weeks were 16%, 32% and 11% respectively. The difference between RMP and PZA regimens was statistically significant but it was not significant between RMP and control regimen. This trial showed the PZA could not replace RMP and the duration of SCC regimen in this trial viz. 20 weeks was not enough for the type of cases included in the trial. Another important finding of that trial was that the relapses were much more frequent amongst those whose sputum took longer than 8 weeks to convert.

Based on these findings and also the desirability of reducing the cost of drugs as far as possible, the Second Trial was planned. EMB was omitted altogether since studies elsewhere had shown that this drug had practically no role in SCC if at least 3 bactericidal drugs were used.

Method and Material

The two regimens that were tried were as follows:—

Regimen A

RMP + INH + PZA daily for 8 weeks.

Those who were sputum negative by direct smear at 8 weeks were randomly allocated into two sub-groups :

Group A₁ RMP + INH daily for 4 weeks followed by placebo for 14 weeks.

Group A₂ RMP + INH daily for 18 weeks.

Those who were still positive by direct smear at 8 weeks were continued on RMP + INH daily to complete 26 weeks total treatment.

Regimen B

SM was given daily for the first 8 weeks in addition to RMP + INH + PZA. Other particulars of the regimen and the sub-groups were exactly the same as for Regimen A.

Treatment was fully supervised as all patients were hospitalised during the period when anti-microbial drugs were being administered. All drugs were administered daily in the following doses:

RMP 450 mgs if the weight was below 50 kg and 600 mgs for those with weight 50 kg and above.

PZA 1500 and 2000 mgs. respectively.

SM 0.75 gm.
INH 300 mgs.

Patients included in the trial had to fulfil the following criteria:

- (1) They should be between 15 and 45 years of age.

*The Research Committee consisted of Dr. R. Viswanathan, Chairman (deceased 14.7.82), Dr. S.P. Pamra, Dr. H.B. Dingley and Dr. M.M. Singh (members).

- (2) They should be residents of the city and there should be a reasonable chance of their continuing to stay in the city for at least 1-1/2 years.
- (3) They should have had no or less than 10 day's anti-TB treatment previously.
- (4) Their sputum must have been positive at least twice by direct smear.
- (5) Extent of disease should not be more than 3 lung zones.
- (6) They should be willing for injection or any other treatment which is prescribed for them.

Patients falling in the categories mentioned below were ineligible for inclusion in the study:

1. Moribund patients.
2. Patients having pleural effusion obscuring more than 1/3rd of the lung field.
3. Patients suffering from any tuberculous or non-tuberculous complications, e.g. diabetes, extra-pulmonary tuberculosis, etc. likely to interfere with management of the disease.
4. Patients known to be pregnant at the start of the study.
5. Patients whose weight was less than 35 kg.

During the course of treatment, two specimens of sputum were examined at 4, 8, 12, 16, 20 and 26 weeks. All specimens of sputum were put up for culture. Sensitivity tests for the 4 drugs used in the trial were carried out on all positive cultures. Culture and sensitivity testing was carried out centrally in the laboratory of the New Delhi TB Centre for all patients included in the trial. X-ray examination was carried out at 8, 12 and 26 weeks.

During the follow-up period, x-ray chest was to be carried out at 3, 6 and 12 months and sputum examination at 3, 6, 9 and 12 months. These examinations were to be repeated if the patient attended with symptoms at any time in the interval between the routine checks as per schedule.

Patients could be withdrawn from the study only in case of major toxic reaction or intolerance to any drug. However, replacement of

Streptomycin by PAS was permissible in case of SM toxicity.

The study was carried out simultaneously from four institutions in Delhi viz. New Delhi TB Centre, L.R.S. TB Hospital, Mehrauli, R.B. TB Hospital, Kingsway and V.P. Chest Institute. The trial was supervised by the Research Committee and the Director of the New Delhi TB Centre coordinated the trial. Statistical Officer of the New Delhi TB Centre was responsible for collecting and analysing the data. The intake into the trial lasted from January 1980 to January 1982. Results upto 31-7-1982 are presented below.

Results

Table 1 shows that 175 patients in all were inducted into the trial. Thirty three cases have been excluded from the main analysis, mostly because of initial drug resistance or the pre-treatment culture being negative.

TABLE I

Patients excluded from analysis

	A	B	Total	
Total cases inducted	89	86	175	
Exclusions	Initial Culture Negative	8	4	12
	Initial Drug Resistance	4	9	13
	Protocol Infringement	3	—	3
	Initial Defaulters	—	5	5
Total Exclusions	15	18	33	

Two patients in Group B had to be withdrawn from the trial because of major intolerance. One patient developed jaundice within the first 4 weeks and the other severe cutaneous reaction between the 4th and the 8th weeks. There was no death. Thus, 140 patients, 74 in Regimen A and 66 in Regimen B, were left for analysis.

Table 2 shows age and sex distribution and Table 3 the extent of disease and cavitory status of the patients included in the trial. It would be seen that the two groups were,

TABLE 2

Age-sex Distribution of Patients

(Percentages)

	A	B	Total
Males	75	70	73
Females	25	30	27
16-25 years	70	61	66
26-35 years	17	30	23
36-45 years	13	9	11

TABLE 3

Extent of Initial Disease

(Percentages)

	A	B
Extent of Disease	1 Zone	9
	2 Zones	71
	3 Zones	20
Unilateral Disease	54	53
Bilateral Disease	46	47
Extent of Cavitation	Nil	27
	Single	56
	Multiple	17

by and large, comparable in respect of these parameters.

Table 4 shows the results of sputum conversion at 4 and 8 weeks. It would be seen that the difference between regimens A and B was statistically significant in respect of sputum conversion at 4 weeks but at 8 weeks there was

TABLE 4

Sputum Conversion at 4 & 8 weeks

		A		B	
		4 Weeks	8 Weeks	4 Weeks	8 Weeks
Number Assessed		74	73	66	65
Smear	No.	45	65	50	57
Negative	%	61	89	76	88
Culture	No.	56	71	56	63
Negative	%	76	97	85	97

no difference between the two regimens. A good few cases were smear positive but culture negative at 4 and 8 weeks, which is the usual feature of these regimens. This phenomenon persisted upto 12 weeks but thereafter there was hardly any smear positive but culture negative case.

As mentioned earlier, patients who were smear positive at 8 weeks were not randomised into two sub-groups for each regimen but were continued on RMP and INH daily for a further period of 18 weeks. All of them were converted by the 26th week of treatment except one case in Group A (Table 5). Sputum conversion at the end of chemotherapy in all other patients (i.e. sub-groups A₁ A₂, and B₂) was also 100%.

TABU: 5

Bacteriological Status at 26 Weeks of patients who were Smear Positive at 8 Weeks

Group	Total Patients	26 Weeks	
		No. Assessed	Number unconverted
A	8	6	1
B	8	6	0

TABLE 6 Radiological Changes 0-26 Weeks

	Number	Radiological Changes %				Cavity Closure (%)
		Marked Improvement	Slight Improvement	No Change	Worse	
A ₁	29	66	28	3	3	80
A ₂	37	76	16	8	0	63
B ₁	27	74	4	4	18	74
B ₂	33	88	9	0	3	85

Table 6 shows the radiological results at the end of 26 weeks. The two groups again were more or less comparable in respect of the radiological changes. More radiological worsening was noted in groups A₁ and B₁ where the drugs were stopped after 12 weeks. Cavity closure was obtained in 75%.

Since treatment after 12 weeks was different in sub-groups A₁ and B₁ as compared to sub-groups A₂ and B₂, bacteriological reversions between 12 and 26 weeks are shown separately for the 4 sub-groups. It would be seen that there was no reversion in sub-groups A₂ and B₂ who were still taking drugs during this period but in sub-groups A₁ and B₁ where the drugs were stopped at 12 weeks, there were 6.4% and 14.3% reversions (Table 7).

TABLE 7

Bacteriological Reversions 12-26 Weeks

	A ₁	A ₂	B ₁	B ₂
Number Assessed	31	37	28	34
Bacteriological Reversions	No. 2 % 6.4	— 0.0	4 14.3	— 0.0

Table 8 shows the cumulative bacteriological reversions up to the end of 52 weeks i.e. a follow-up period of 26 weeks for sub-groups A₂ and B₂ and 40 weeks for sub-groups A_x and

TABLE 8

Bacteriological Reversions 12-52 Weeks

	A ₁	A ₂	B ₁	B ₂
Number Assessed at 52 Weeks	21	25	23	27
Bacteriological Reversions	No. 6 % 29	— 0	5 22	— 0

TABLE 9

Sensitivity Status: at time of Bacteriological Reversion

	A ₁	B ₁
Sensitive to all drugs	3	3
Resistant to INH	1	1
Sensitivity result not yet available	—	1
Culture Negative	2	—
Total	6	5

TABLE 10

Twenty six Weeks' Treatment Results—Initially Drug Resistant Cases

Initial Drug Resistance Pattern	A		B	
	Number Assessed	Number Converted*	Number Assessed	Number Converted*
I.N.H.	3	2	1	1
I.N.H., SM.	—	—	5	4
I.N.H., PZA.	1	1	—	—
I.N.H., SM., PZA.	—	—	1	—
SM.	—	—	1	1
Total	4	3	8	6

*All unconverted cases were in sub-groups A₂ and B₂.

B₁ Again, there were no bacteriological reversions in sub-groups A₂ and B₂ but a few more cases had reverted in sub-groups A₁ and B₁ and the cumulative bacteriological reversions were 29% and 22% respectively. It is obvious that patients who had chemotherapy only for 12 weeks fared rather badly but those who took drugs for 6 months had no bacteriological reversion during the first six months of follow-up. All patients have not yet completed the stipulated follow-up of one year but there are no relapses in sub-groups A₂ and B₂ so far.

In addition to the bacteriological reversions, there were 5 cases where there was a marked radiological worsening unaccompanied by bacteriological reversion. Of these 5, 2 were in sub-group B, and one each in the other 3 sub-groups.

Table 8 shows the sensitivity pattern at the time of bacteriological reversion of 11 cases whose sensitivity results were available on 31-7-1982. Majority of the specimens were sensitive to all the 4 drugs but 2 cases (one each in sub-groups A₁ and B₁) were resistant to INH.

It was shown in Table 1 that the bacilli in the pretreatment culture were resistant to one or more drugs in 13 cases. Table 10 shows the results of sputum conversion in 12 of these where the results were available, in respect of

the drugs to which the bacilli were resistant. It would be seen that only 3 patients remained unconverted and all of them were from sub-groups A₃ and B₂ where chemotherapy was stopped at the end of 12 weeks.

Conclusions

(1) Treatment with RMP + INK + PZA daily for 8 weeks followed by RMP + INH daily for 18 weeks more appears to be very satisfactory both in respect of sputum conversion and subsequent reversions. Amongst patients in this group there were no bacteriological reversions for 26 weeks after treatment was stopped.

(2) Addition of SM to this regimen during the first 8 weeks does not seem to influence the overall results at all, the only difference being somewhat higher sputum conversion during the first 4 weeks of treatment. The overall sputum conversion and relapses did not seem to be influenced by the addition of SM at all.

(3) Twelve weeks' treatment of even those patients whose sputum was converted at 8 weeks does not seem to be enough. All bacteriological reversions so far have occurred amongst the patients whose chemotherapy was stopped at 12 weeks.

(4) This regimen is equally effective for those

cases where the pre-treatment culture showed bacilli resistant to one or more drugs used in this study. Patients with initial resistance who remained unconverted were again amongst those whose chemotherapy was stopped at 12 weeks

(5) Most of the relapses were caused by sensitive bacilli.

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And also on page 10 Table III last line for 370 read as 496.44 and Table IV first line for 629 read as 659 and in Table V 1st line for S₃Z₂ read as S₂H₂.

RIFAMPICIN—ITS BIOCHEMICAL AND MICROBIOLOGICAL BIOAVAILABILITY IN PULMONARY TUBERCULOSIS PATIENTS

M. KOICHA*, S.C. PARIKH* and A.G. PATEL**

Summary : After determination of the purity of the Rifampicin received from two different pharmaceutical sources, the drug was administered to two groups of patients in double-blind cross over fashion. The serum Rifampicin concentrations were determined biochemically and micro biologically. Twenty-four hour's urinary excretion of Rifampicin was assessed followed by the chromatographic separation of "various Rifampicin metabolites. There was marked difference between the two preparations in respect of all these values. The binding capacities of Rifampicin with various protein fractions were elucidated by carrying out *in vivo* and *in vitro* experiments. The results of these experimental data have been discussed. Initially albumin is the first protein fraction which binds Rifampicin. However alpha-2 protein fraction also plays an important role in binding of Rifampicin, which may be in the labile complex form.

Introduction

With Prof. Peiro Sensi's findings, Rifampicin (RMP) has proved to be the most potent and challenging tuberculocidal drug. However, it has been a practice to administer at least two or three antituberculous agents in the present day conducted therapeutic lines of treatment.⁸ Shri Padmavati Tuberculosis Sanatorium of Baroda has also adopted Streptomycin-Isoniazid-Rifampicin, as current therapeutic regimen.

The price competition amongst the various pharmaceutical concerns led us to evaluate the overall effectiveness of various rifampicin preparations by conducting bioavailability experiments so as to provide medication at the lowest cost without affecting the therapeutic potency. The aim of this study was to ascertain the relative effectiveness of two similar preparations (capsule formulation) obtained from two different pharmaceutical concerns.

The experimental plan for our study was based on;

(1) The determination of the percentage purity of the two preparations available to us by comparing their spectrophotometric absorption with that of pure standard rifampicin.

(2) Bioavailability study which was conducted by biochemical and microbiological assays in double-blind cross-over fashion.

(3) The estimation of the urinary excretion of rifampicin in 24 hours' urine volume.

(4) By culturing the sputa during the course

of treatment every week and checking up the time-lapse of the conversion of positive sputum to negative one.

This study also covered chromatographic separation of various rifampicin derivatives followed by the determination of Rf values of a few of the known metabolites of rifampicin. To enrich the information on the variable binding capacities of both the rifampicin preparations with different fractions of serum proteins, horizontal agarose gel electrophoretic technique was employed.

Material and Methods

The two Rifampicin preparations obtained from two pharmaceutical sources were labelled RMP-A and RMP-B. In the initial phase the percentage purities of RMP-A and RMP-B were quantitatively assessed against reference rifampicin preparation by spectrophotometric and TLC technique employing silica gel G as the supportive medium.

Forty previously untreated patients of sputum positive pulmonary tuberculosis, irrespective of age and sex, were included in the bioavailability study. In the double blind crossover study these forty patients were divided into two groups : i.e. 20 patients in each group.

Group I patients received 450 mg of RMP-A preparation in the fasting state^{1,2} and the blood samples were collected at 2, 4 and 6 hours respectively followed by 24 hours' urine collection. Subsequently, this group of patients continued to receive same RMP-A preparation, 450mg biweekly for a period of 2 weeks. The sputum samples were also received every week and cultured on L.J. medium. After 2 weeks, they

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were switched over to another rifampicin preparation designated as 'B' preparation in the same dosage. Similar protocol was followed with group II patients wherein RMP-B was administered first followed by administration of RMP-A after two weeks' interval.

After the blood samples were collected, unhaemolysed serum samples were processed for determination of the concentrations of rifampicin by biochemical assay and microbiological assay. Biochemical assay was carried out by Sunahara's method using iso-amyl alcohol as rifampicin extractant¹⁶ and microbiological assay by enriched nutrient + agar medium using *Sarcina lutea* as the test organism. The extent of the zone of inhibition produced was compared against that of the known concentration of rifampicin.

After determination of total urinary rifampicin concentrations in 24 hours' urine, a small aliquot of urine was extracted with isoamyl alcohol and the same was charged on silica gel G supported TLC.¹⁶ The Rf values of various rifampicin metabolites were measured.

Ten patients were specially selected for elucidation of relative percentage binding of RMP-A and RMP-B preparations to serum protein fractions. In this case fasting blood sample was collected followed by withdrawal of 4 and 24 hours' blood samples after oral administration of 450 mg of rifampicin. In the first instance RMP-A was administered to this group of patients followed by RMP-B after a lapse of three days. For the *in vitro* study, five mg of RMP-A was added exogenously to the fasting serum sample and incubated at 37°C for 4 and 24 hours respectively. The same procedure was followed for RMP-B. All these exogenously rifampicin treated samples, i.e. 4 and 24 hours serum samples were subjected to agarose gel electrophoresis.¹⁶ Protein fractions which contained rifampicin thus separated by electrophoresis were eluted and relative concentra-

tions of rifampicin were determined biochemically, along with the concentrations of various serum protein fractions.¹⁶ For *in vivo* study, the fasting, 4 and 24 hours serum samples after 450 mg dosing were directly processed for electrophoretic fractionation and the concentration of rifampicin and protein fractions were measured.

Results

The purity of RMP-A and RMP-B as assessed by TLC techniques was 86% and 79% respectively.

The serum concentrations of RMP-A and RMP-B followed by oral administration of a single dose of 450 mg of the antibiotic at 2, 4 and 6 hours' are reported in tables 1 and 2. In accordance with the biochemical assay, the serum RMP-A concentrations at 2, 4 and 6 hours' were : 11.84 ± 1.54 (mean \pm S.E.), 17.72 ± 1.29 and 13.86 ± 21.1 $\mu\text{g/ml}$ respectively and those for RMP-B at the same time intervals were : 13.81 ± 1.26 , 12.31 ± 0.93 and 7.53 ± 0.76 $\mu\text{g/ml}$ respectively (Table 1). The concentrations for RMP-A preparation at 4 and 6 hours' are significantly greater than those after RMP-B preparation at same time intervals ($p < 0.01$ at 4 hours' and < 0.001 at 6 hours). It is interesting to note that peak serum concentrations for RMP-A preparation was attained at 4 hours' while that for RMP-B was attained at 2 hours. The mean apparent biological half-lives of RMP in serum for A and B preparations were 3.52 ± 0.93 and 2.89 ± 0.32 hours' respectively. The relative area under serum RMP concentration-time curve for A and B preparations were : 72.8 ± 5.31 and 59.78 ± 4.13 (mean \pm S.E.) respectively. The differences between these results are not statistically significant. The results of our biochemical assay are in agreement with those of Reiss³ (1968) and those of Acocella et al.⁵

The concentrations of both the RMP

TABLE 1

Serum Rifampicin Concentrations at various intervals for "A" and "B" Preparations by Biochemical Assay

Rifampicin	2 hours $\mu\text{g/ml}$	4 hours $\mu\text{g/ml}$	6 hours $\mu\text{g/ml}$	Area under curve (μg)	Half-life (hours)
"A"	11.84 ± 1.54	17.72 ± 1.29	13.68 ± 1.21	72.81 ± 5.31	3.52 ± 0.93
"B"	13.81 ± 1.26	12.31 ± 0.93	8.53 ± 0.76	59.78 ± 4.13	2.89 ± 0.32

TABLE 2

Serum Rifampicin Concentrations at various intervals for "A" and "B" Preparations by Microbiological Assay

Rifampicin	2 hours $\mu\text{g/ml}$	4 hours $\mu\text{g/ml}$	6 hours $\mu\text{g/ml}$
"A"	11.61 ± 2.36	18.46 ± 1.95	12.12 ± 2.10
"B"	7.95 ± 1.74	15.94 ± 2.04	9.42 ± 2.23

TABLE 3

*Rifampicin Excretion**in Urine during 24 Hours*

Rifampicin	Mean volume (ml)	Mean Excretion (mg)	Mean Weight (kg)
"A"	523 (150-770)	116.53 (88.92-132.04)	49.3 (46-54)
"B"	1422 (600-1120)	99.54 (62.00-132.82)	49.3 (46-54)

preparations in the serum as measured by microbiological growth inhibition method were ; 11.61 ± 2.36 , (mean \pm S.E.) 18.46 ± 1.95 and 12.12 ± 2.1 $\mu\text{g/ml}$ at 2,4 and 6 hours respectively for RMP-A and 7.95 ± 1.74 , 15.94 ± 2.04 and 9.42 ± 2.23 $\mu\text{g/ml}$ at 2, 4 and 6 h. respectively for RMP-B. In this case the difference between the concentrations at similar time intervals are not statistically significant (table 2).

Twenty-four hours' concentrations of rifampicin excreted in urine were found to be 116.53 mg for RMP-A preparation which is approximately 13 % of the total dose administered. The excretion of RMP-B was 99.54 mg and is equivalent to 11.6 % of the total dose administered. The difference between these two values is not significant (table 3).

Chromatographic study of the extracted aliquot of the urine sample with iso-amyl alcohol revealed various metabolites of RMP. The number of bands varied from patient to patient. However, in no case was it less than 10 bands. In a few of the cases there were 13 bands. Six metabolites of RMP were identified on the basis of their available Rf values from the literature.¹ The Rf values of each of these bands are given in Table 4. In general, the major metabolites of RMP excreted in urine seems to be formyl, quinone and desacetyl derivatives.

TABLE 4

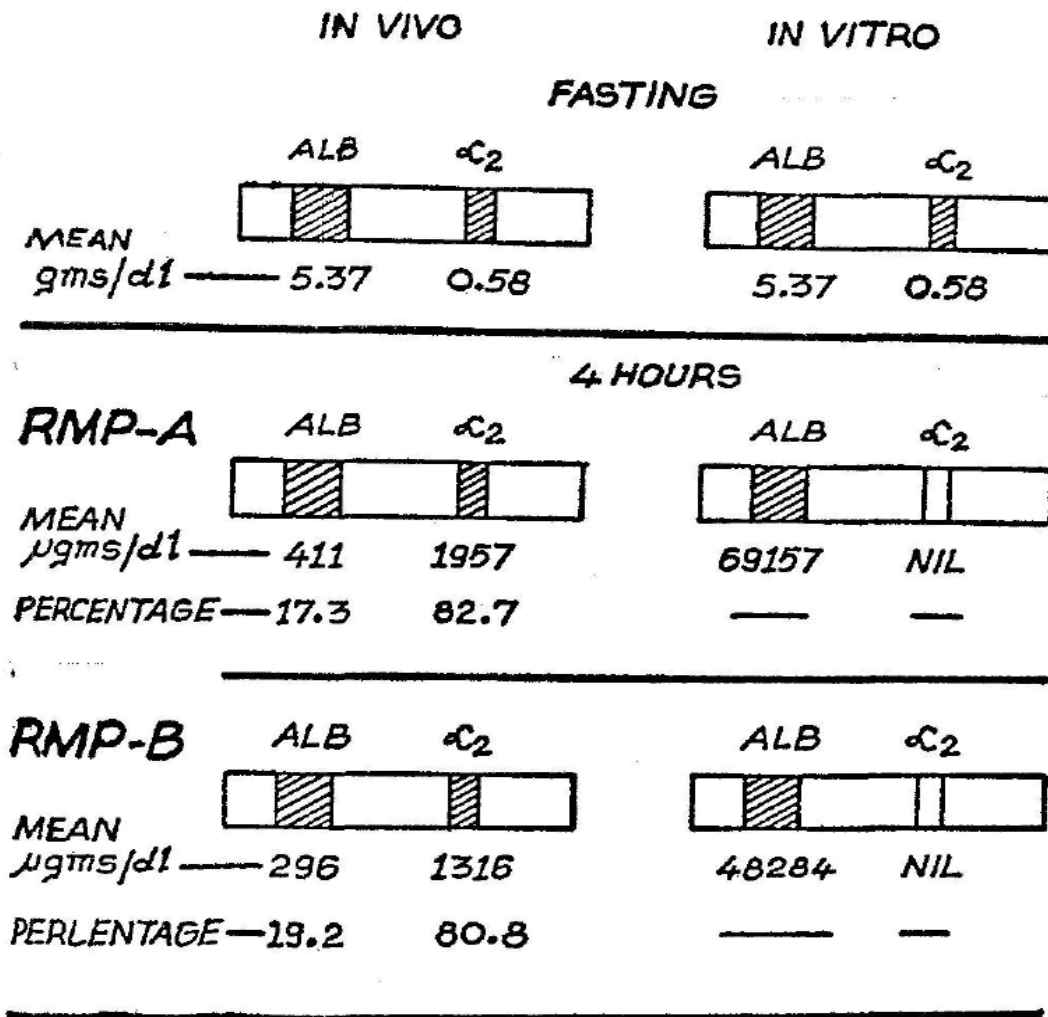
Chromatographic Pattern of Rifampicin Metabolites in Human Urine

Metabolite	Colour	Rf (TIC)
Rifampicinquinone	Violet	0.63
Rifampin	Reddish Orange	0.61
Desacetyl rifampicin Quinone	Violet	0.53
Desacetyl rifampicin	Reddish Orange	0.46
Formyl rifampicin	Red	0.39 0.36
Formyl Desacetyl rifampicin	Reddish	0.27

The present line of therapeutic treatment on these 11140 patients showed negativity of the sputum culture after approximately eight weeks. These results indicate therapeutic effectiveness with the regimen employed as indicated initially.¹²

ELECTROPHORETIC PATTERN OF SERUM-RIFAMPICIN

Fig. 1



A very interesting and controversial parameter viz. the percentage binding of RMP with different serum protein fractions was assessed in this study.^{4,5} Our experimental results show that amongst the five serum protein fractions viz., albumin, alpha-1, alpha-2, beta and gamma, only albumin and alpha-2 fractions were involved in the binding of the antibiotic and that alpha-2 has a greater capacity to bind rifampicin at 4 hours *in vivo*. *In vitro* experiments it binds only with albumin fraction (figure 1). The 24 hours sample did not show binding of RMP to any of the serum protein fractions *in vivo*. However, the concentrations of rifampicin bound to the alpha-2 protein fractions *in vitro* is significantly more than that to albumin (figure 3).

Discussion

The rifamcins, a group of streptomycin mediterranei metabolites, inhibit the growth of Gram positive and acid fast Gram negative bacteria.⁶ Present day chemotherapy contains the hydrazone derivative of rifamycin S.V,⁹ which has marked bactericidal activity.⁹ Thus this preparation is semi-synthetic. The bactericidal effect of this drug is attributed to its inhibitory effect on bacterial DNA-dependent RNA polymerase which also suppresses the initiation of chain formation of bacterial RNA synthesis.⁷ Following the introduction of rifampicin, its incorporation in the routine line of treatment was restricted due to its high cost so that a few years ago only a

few patients could afford it. Due to decline in the price in subsequent years and its high effectivity even in intermittent treatment^{10, 12} it found common use in both, indoor and outdoor patients. Moreover, rifampicin does not cause untoward side effects with great frequency.^{1, 12} One of the authors of this paper has seen only one percent of cases (in 7,500 cases) wherein untoward side effects were observed within the span of more than eight years of implementation of this line of treatment.

The purity of RMP-A was 86% and that of RMP-B in 79 %, indicating that the patients had not actually received the full dose of antibiotic

i.e. 450 mg. Instead, 387 mg of RMP-A and 355 mg of RMP-B preparations were available to the patients. Very recently we have come across one preparation which possessed 45% purity. It is desirable, therefore, that the purity of the drug be assessed before its use in the therapeutic regimen in order to ensure full availability of the drug.

In spite of the cross-over experiment, it was observed that the peak serum RMP concentrations, area under curve, bioavailability and biological half life were observed to be relatively higher for RMP-A than those for RMP-B both by biochemical and by microbiological assays. Both these preparations were given on empty

stomach, in order to rule out the possibility of variation in the absorption mechanism. All these findings are consistent with those of Reiss¹³ (1968) who also found increase in serum rifampicin levels more particularly when the drug was administered on empty stomach.

Fortunately, with the two preparations, the peak serum level was at least 30 times for RMP-A and 27 times for RMP-B on the basis of the MIC value which is considered to be 0.5 Kg/ml.⁸ Thus, though there exists difference in the bioavailability between the two preparations, the effectiveness of the individual rifampicin preparation does not differ significantly.

As far as the binding of rifampicin to serum protein fractions is concerned,^{4,5} the results of this study indicate that initially rifampicin gets bound to the albumin fraction. It is likely that the binding of rifampicin with alpha-2 protein fraction increases with increase in time. However, it is important to note that both these protein fractions seem to form labile complexes with the antibiotic. Hence it is logical to believe that alpha-2 protein fraction be considered to be the more important fraction wherein low concentration of alpha-2 combined with greater concentrations of rifampicin. No doubt, even this protein fraction forms a labile complex with rifampicin, and subsequently it gradually releases rifampicin into circulation to supply the antibiotic to different organs with the result that within the next 24 hours net rifampicin concentration reaches nadir.

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A STUDY OF TUBERCULOSIS SERVICES AS A COMPONENT OF PRIMARY HEALTH CARE

RADHA NARAYAN¹, A. JONES³, S. PRABHAKAR³, and N. SRIKANTARAMU⁴

Summary : Role of multipurpose health workers of a P.H.C. in the delivery of tuberculosis services is analysed vis-a-vis the profile of their entire and diverse health activities at the periphery. Tuberculous services were short of expectations and were given the lowest priority. Findings suggest that integration at the periphery needs more important considerations than functional integration. Task in respect of tuberculous services has to be made more precise and less time-consuming and a rational training programme has to be drawn up.

Introduction

The National Tuberculosis Programme was formulated in 1961 in view of the feasibility of providing diagnosis to symptomatics attending outpatient clinics of general health facilities and of treating ambulatory patients with anti-tuberculosis drugs.

During the last two decades, the health care delivery system of the country has undergone several modifications in terms of structure, personnel and organization. The staffing pattern and job responsibilities of para-medical personnel have specially been through crucial changes, as a result of integration of National Health Programmes and introduction of the Multipurpose Health Workers' Scheme (Min. of Hlth & FP, 1973). The implementation of the concepts of 'Primary Health Care' would again effect far-reaching changes in the health care delivery system (Min. of Hlth & FW, 1981).

Tuberculosis services as offered within the general health services have been found to fall short of expectations. A mere 28 % of the case-finding potential is realised and only about 30% of the patients complete treatment. It is expected that case-finding and case-holding may improve if the multipurpose health workers (MPWs) can collect sputum at the homes of symptomatics and motivate patients to be on treatment. Routine domiciliary visits of these workers might also help reduce default. It is therefore necessary to have a thorough understanding of the multifarious job responsibilities of the MPWs in terms of coverage and output, anti-tuberculosis services being one of them.

The present study was undertaken with the following objectives:

Objectives

1. To obtain a profile of work of the MPWs;

2. To observe the work of the MPWs in villages, on a time and motion analogy;
3. To ascertain output of tuberculosis services by MPWs;
4. To determine the differential output of work of MPWs from the records and reports of Primary Health Centres.

Study Area

Six Primary Health Centres (PHC) in a contiguous area of a district were selected to obtain data on the differential output of work and the profile of MPW. In three of these PHCs the male MPWs were trained in tuberculosis casefinding and caseholding under a separate research protocol of the Institute, viz., 'Feasibility of Involvement of Multipurpose Workers in improving casefinding and caseholding under the District Tuberculosis Programme'. The MPWs were observed at work in villages of one PHC service area.

Study Population

1. MPWs both male and female of the six PHCs.
2. Male MPWs of one PHC.
3. Records and reports of the six PHCs, three of which formed Group I where training in tuberculosis services was given and three in Group II where training was not given.

Method

1. The third month subsequent to the training of the MPWs in tuberculosis casefinding and case holding was selected as the reference month for study of MPWs and also of the records and reports of the PHCs.

1. Sociologist 2 & 3. Social Workers 4. Statistical Asstt., National Tuberculosis Institute, Bangalore-3.

A self-administered questionnaire was framed to cover the activities expected of a MPW and in accordance with the records and reports maintained at the PHC. A randomised day and date

2. A social investigator accompanied the MPW during a day's work in the village and observed the work on the basis of a time and motion study on a observation-cum-interview schedule.
3. The records and registered of the six PHCs were studied in terms of the output of services during the reference period and entered on the record form used for the study.

Coverage

The study was conducted as mentioned in 6 of the 19 PHCs of a district. The population of the PHCs' zone of responsibility ranged from 9,22,79 to 1,62,626 with the average population per MPW varying from 7,330 to 9,228. The number of villages in the PHC areas varied from 31 to 137 and the number of villages per MPW from 1 to 4.

One hundred and sixty (93 %) of the MPWs were covered by the self-administered questionnaire.

Sixteen out of seventeen male MPWs of the one PHC and its sub-health centre were observed on a day's work.

AH pertinent records/registers of the PHCs at an average of 39 records per PHC were available for the study.

FINDINGS

A Profile of the activities of the MPWs

The following table 1 shows the perception of job responsibilities and activities carried out by MPWs on a randomised day.

It is found that 77.5 % did not perform any activity pertaining to anti-tuberculosis work though only 15% claimed that they were not expected to perform any activity regarding tuberculosis. Only the male MPWs in the

TABLE 1

Perception of Sole Responsibility by the MHWS and Performance

Activity	No. of MPWs who did not consider the activity as their responsibility	Range of MHWs who performed any of the 'tasks' of the activity	No. who did not perform any 'task'
Maternal & Child Health	53	4-44	38
Family Welfare	2	1-109	12
Malaria	10	1-55	75
Tuberculosis	24	2-4	124
Immunization	9	1-34	99
Treatment	3	14-103	37
Vital statistics	5	20-54	86
Nutrition	9	13-54	73
Health Education	Nil	1-44	92

PHCs where the training in casefinding and cascholding was conducted had done anti-tuberculosis work, on the randomised day. Four symptomatics were identified, two sputum smears prepared and thirteen patients followed-up. The highest performance was with regard to Family Welfare (68%) and treatment of ailments (64 %).

Table 2 shows the priorities of the different health services in the opinion of the MPWs.

Tuberculosis ranks as 7th, 8th & 9th while MCH and Family Welfare rank as 1st and 2nd, Malaria as 1st and 3rd.

Observation of the MPWs at a day's work in the village

Of the 16 MPWs observed at work in the villages seven, were residents of the sub-health centre villages.

TABLE 2
Multipurpose Health Workers' Opinion on Priorities in Health Activities

Health activity	Priorities									
	1	2	3	4	5	6	7	8	9	Not stated
MCH	43 26.9%	28 17.5%	13	19	8	6	4	11	11	17
FP	44 27.5%	65 40.6%	16	7	3	6	2	1	7	9
Malaria	21 13.1%	18	32 20.0%	14	15	18	10	15	4	13
Tuberculosis	1	2	7	16	22	18	36 22.5%	23 14.4%	23	12
EPI	—	11	44 27.5%	33 20.6%	28	13	8	5	3	15
Nutrition	—	10	15	22	42 26.3%	30 18.7%	16	9	1	15
E.Sanitation	2	7	4	10	15	19	37 23.1%	44 27.5%	7	15
Health Education	39 24.4%	8	13 15.0%	24	12	20	12	15	7	10
School Health	2	1	4	4	2	17	20	23 14.4%	71 44.4%	16

Highlights of Day's work of MPWs

Average distance travelled by MPW to village .. 15.1 km
 Average time spent in travelling to the village & back .. 1 hr 6 mts
 Average time spent in village .. 3 hrs 55 mts
 Average time spent in home visits .. 2 hrs 11 mts

Percentage time spent in different activities during home visits:

Treatment of minor ailments .. 34.4%
 Anti-malaria services .. 26.7%
 Family Welfare .. 12.2%
 Anti-tuberculosis services .. 10.7%
 MCH .. 9.9%
 Health Education, etc. .. 3.8%
 Immunization .. 2.3%
 No. of home visits per worker per day .. 70
 Houses locked .. 25.0%
 Houses with no adult present .. 5.0%

The priorities of health services at the homes are seen to be treatment of illnesses, malaria services and family welfare.

Output of Tuberculosis services at the Primary Health Centres

Of the 39 records/reports available from each PHC for the study, tuberculosis records consisted of treatment cards, sputum register and drug issue register.

Table 3 was compiled from the data available at the PHCs.

The performance of the two groups of HPCs are not comparable in view of the incomplete data which could not be rectified under the survey design.

Anti-malaria services and treatment of minor ailments were reported by all the six PHCs.

TABLE 3

Anti-Tuberculosis Work Done at the six PHCS during the Reference Month

Task	Group I	Group II
Symptomatics identified	*60	—
Sputa Collected	*45	*17
Smears made	61	*20
Sputum positives	**13	—
X-ray positives	**2	-
On treatment	30	*102
Default	*7	**34

*Report not available from one PHC

**Report not available from two PHCs

Though target oriented, the records do not indicate a high performance of family welfare activities. During the reference month contact with eligible couples was of the order of 34 % and registration 35%.

Activity in respect of malaria was a little over 70% of the expected work. Four per cent of the population was treated for minor ailments. Registration of vital events, immunization and other services showed a low performance.

Discussion

Primary Health Centres form an important category of peripheral health institutions through which the District Tuberculosis Programme is implemented, supervised and given managerial support (Nagpaul, 1967). Primary Health Centre services embody the basic concepts of primary health care (ICSSR & ICMR 1980) Integration of anti-tuberculosis services with the primary health centre services confers the beneficial aspects of primary health care both to the tuberculosis programme and tuberculosis patients.

The three-pronged approach of the study reported herein describes the delivery of tuberculosis services in the sum total of activities of PHCs within their zone of responsibility during a reference period and in the context of the

profile of work of the MPW and his diverse health activities among rural population.

It is a matter of concern that tuberculosis services register low priorities from all the three points of view. The records maintained at PHCs of the services rendered are incomplete and haphazard. The recording and reporting of casefinding and caseholding of tuberculosis patients are not according to the manuals of the tuberculosis programme (NTI, 1978). Improvement of the system of maintenance of tuberculosis records & reports at the PHCs is essential for the monitoring and evaluation of the tuberculosis programme. In general, there is an urgent need for improvement in the handling of data at the PHCs. Duplicate data in different records should be weeded out, items that need to be recorded should be reduced to the minimum and items which become obsolete due to changes in the system should be eliminated. The data would also be more meaningful if they are more in terms of the number of people who benefit from the services rather than from the point of utilisation of equipment and supplies.

Tuberculosis services offered from the PHCs were short of expectations both in case-finding and caseholding. In the opinion of the MPWs, tuberculosis services were of the lowest priority. They were the only group of services that showed a slightly higher recording at the three PHCs where the MPWs were trained for the purpose. These findings suggest that integration of the different programmes at the infra-structural level requires more important considerations than functional integration.

Even in a pressurised situation such as the one where the MPWs were accompanied during work in the villages, the time spent for the day's work was hardly for a duration of four hours. A little more than half the time spent in the village was actually spent in household visits and offering services to individuals. Even with a responsibility for 5,000 population the MPW would have to visit at least fifty houses per day in a month of twenty days of field work. This permits an average of less than three minutes per house. With the enforced as well as accepted priorities for family welfare and malaria, tuberculosis services tend to get ignored. It has been found that if MPWs collect sputum smears from symptomatics of the age group of 20 years and above during their routine visits to each household of the specific population allotted to them and despatch the smears to the PHC for examination there is a possibility of augmenting the casefinding activity by 4-5 times (Aneja et al, 1980).

It is of importance to make the 'tasks' of tuberculosis services more precise and less time consuming. Symptom screening to identify the symptomatics should be elicitive and concise in the wording and sequence of questions. The collection and preparation of smear and disposal of sputum at the homes and in village conditions have to be laid down as against such work in the clinic or laboratory where better, if not optimum, situation for such work might prevail. Motivation of a patient for regular consumption of drugs should also be on specific points. A training programme has been drawn up to impart the knowledge & skills for anti-tuberculosis services to the MPWs (Aneja & Srikantan, 1981). The importance of tuberculosis as a major public health problem should also be emphasised in the training to create an attitude which ensures the tuberculosis programme a higher priority in the multipurpose work and primary health care.

Acknowledgement

We express our gratitude to the research teams on the "Feasibility of Involvement of multipurpose workers in improving casefinding and caseholding under District Tuberculosis Programme" for their co-operation in enabling us to conduct this study in their selected PHCs and service areas.

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ANNOUNCEMENT

The Proceedings of the International Symposium held in New Delhi on the 8th of October, 1982, which were to be a supplement to the April 1983 issue of this Journal, have been delayed for unforeseen reasons and will now be out with the July 1983 issue of the Journal Delay is very much regretted-

Editor

PLEUROSCOPY

H.B. DINGLEY

Summary : Superiority of pleural biopsy under direct vision through a thoracoscope (pleuroscopy) blind needle biopsy is described. Complications are minimal and positive results considerably

Pleuroscopy was introduced by Jacobeus in 1910 as a diagnostic procedure. During the era of collapse therapy of pulmonary tuberculosis, it was used mainly for the lysis of pleural adhesions. With the advent of anti-tuberculous drugs and the development of resectional therapy, its utility in the treatment of tuberculosis disappeared and pleuroscopy was nearly forgotten. Recently, there has been renewed interest in this procedure (1-5) mainly for establishing the etiology of pleural effusions.

This report summarizes our experience in 57 patients.

Material and Methods

Simultaneous pleuroscopy and needle biopsy were performed in 57 patients of pleural effusion; 44 (77.1%) were males and 13 (22.9%) females ranging in age from 15 to 65 and above (Table 1).

TABLE 1
Age & Sex Distribution

Age (years)	Males	Females
15-24	18	4
25-34	12	2
35-44	4	3
45-54	8	4
55-64	—	—
65 and above	2	—
Total	44	13

and tuberculin reaction to PPD ITU RT23 was >10 mm in 44(78.9%).

Both the procedures i.e. needle biopsy and pleuroscopy were done under local anaesthesia with 2% xylocaine. Vim Silvermarm's needle was used for needle biopsy and ptearoscopy was carried out with the standard thoracscope. In six patients pleuroscopy was carried out twice,

Results

Of the 57 patients, 13 (23%) gave positive histopathological findings with needle biopsy and 43 (75.4%) with pleuroscopy. All the 13 who were positive by needle biopsy were also positive by pleuroscopy also and the 14 who were negative by pleuroscopy were negative by needle biopsy also. Thus, there were 30 cases where pleuroscopy gave a satisfactory result but needle biopsy failed. In 14 cases both pleuroscopy and needle biopsy failed. Correlation between pleuroscopy and needle biopsy is shown in Table 2.

TABLE 2
Correlation between pleuroscopy and needle biopsy

		Pleuroscopy		
		Positive	Negative	total
Needle	Positive	13	0	13
	Negative	30	14	44
	Total	43	14	57

All the 13 (23%) patients who gave positive findings by needle biopsy showed tuberculous

Effusion was right-sided in 36 (63.1%) and left sided in 16 (28.1%). In five cases effusion was bilateral.

pathology. In the 43 (75.4%) with positive findings on pleuroscopy, the histopathological findings were consistent with tuberculosis in 33, carcinoma in two, parasitic infiltration in one, mononuclear cell infiltration in three,

Associated pulmonary disease was present in 11 (19.2%) cases. Sputum was positive in 11 (19.2%)

fibre-collagen tissue in three and necrosis with 14 infiltration with polymorphs in one.

Morbid appearances of the pleura on pleuroscopic examination were as follows:

1. Acute form with hyperaemic pleura and sometimes showing areas of haemorrhages—six cases.
2. Acute forms with white or yellowish plaques and fibrin deposit—11 cases.
3. Chronic forms showing thickened and shining pleura with some vascularity—7 cases.
4. Tuberculous forms characterized by small white or grey nodules spread over the pleural surface with or without detectable inflammatory changes—19 cases.
5. In malignancy, appearances vary from a solitary nodule to a wide-spread generalized involvement of the pleura.

Complications

Complications were negligible. One patient had superficial surgical emphyema.

Discussion

Aetiology of pleural effusion is often a difficult problem and a definite diagnosis is often difficult without a histological study. Blind biopsy using a needle usually gives a high percentage of negative results. Diagnostic pleuroscopy has therefore been recommended but it is unfortunately not used widely even though the procedure is easy and safe.

Pleuroscopy appears to be the best method of making histological diagnosis in patients with pleural effusion. After considering the clinical and radiological findings the pleuroscopic appearances and the pleural biopsy can

lead to a definite aetiological diagnosis more frequently and more accurately than with other methods. The indications for pleuroscopy are:

- (i) Pleural effusion of uncertain aetiology,
- (ii) Effusions associated with lung tumours.

Pleuroscopy has the following advantages over blind needle biopsy:

- (i) Exact site for biopsy can be selected through the thoracoscope and this gives the maximum chance of a definite diagnosis.
- (ii) Biopsies are larger and less traumatic,
- (iii) Complications are minimal.

It is concluded that pleuroscopy when properly performed can lead to a definite aetiological diagnosis in most cases of pleural effusion.

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PULMONARY ACUTE MOUNTAIN SICKNESS

J.G. DICKINSON*

Summary : Pathophysiology of acute mountain sickness is discussed on the basis of seven autopsies. Pulmonary & Cerebral types are described. Reasons for preferring the term acute mountain sickness to high altitude pulmonary oedema are given. Urgent evacuation is the mainstay of management.

History

The first known historical reference to mountain sickness may be found in Plutarch's description of Alexander's army's crossing of the high passes into India, written in 326 BC. The Incas civilisation in the Andes, 1100-1530 A.D., was familiar with the disease, which it named "soroche". An early Jesuit explorer of the Tibetan plateau, Father Gruber, also mentioned the symptoms of mountain sickness, and in 1891 Mosso described the death of Dr. Jaecottet on Mont Blanc in France as being due to "capillary bronchitis and lobular pneumonitis accompanied by acute oedema of the lung." The first attempt at classifying "puna", or acute mountain sickness was made in Peru by Ravenhill in 1913, when he accurately described the pulmonary form but erroneously gave it the name of "cardiac puna", and contrasted it with "normal" and with "nervous puna". Hurtado in 1937 was probably the first to state that severe dyspnoea at high altitude was due to pulmonary oedema, and the 1969 description by Singh et al. of mountain sickness in Indian troops airlifted to Leh in Ladakh is the largest reported series of cases that we have, and is likely to remain so.

Acute Mountain Sickness (AMS) in Nepal

With the enormous increase in mountaineering and mountain tourism in Nepal over the last 30 years, an increasing number of cases has become inevitable. Though many trek to the Annapurna and other ranges, Everest remains the main attraction.

Even at Pheriche (14,000 ft., 4,300 m.) the terrain is easy and snow-free much of the year, and there are no major problems in ascending from there to Everest Base Camp at 17,500 ft. (5400m.), and even higher without special equipment.

Rapid access to the Everest region is available by air to the Lukla airfield at 9000 ft (2800 m.), or to Syangboche at 13,000ft. (4000 m.). Because the incidence of mountain sickness is proportional both to the absolute altitude and to the

speed with which it is attained, such air transport contributes greatly to the problem. The aeroplane is indeed the "vector" of acute mountain sickness.

Onset of acute mountain sickness in Nepal is usually between 12000 and 14000 ft. (3600 m and 4300 m) but has occurred as low as 7000 ft (2100 m) and as high as 23000 ft (7000 m).

Classification and Terminology

I do not wish to dwell on the subject of terminology, but will merely illustrate my own classification.

Benign AMS is a mild, non-life-threatening condition, but may lead to life-threatening malignant AMS. There are two main forms of this, pulmonary and cerebral AMS, but they are frequently encountered together. High altitude retinal haemorrhages and subcutaneous oedema may occur with or without the other forms of AMS. In a personal series of 50 cases of malignant AMS victims evacuated to Kathmandu, 6 had purely pulmonary AMS, 11 had purely cerebral AMS and 33 had both forms. I hope to show from the autopsy findings that there is more than oedema involved and therefore why I prefer the term "pulmonary acute mountain sickness" to "high altitude pulmonary oedema".

Clinical Findings in Pulmonary AMS

Exertion at high altitude may be expected to cause dyspnoea, but dyspnoea at rest strongly suggests pulmonary AMS. There is often cough and white sputum. Some series have reported haemoptysis but in my experience no patient has admitted to blood in the sputum. Tachypnoea and basal crepitations are usually found, and some patients are cyanosed.

In most cases, symptoms resolve rapidly on evacuation to a lower altitude, and even 3000 ft. (1000 m) of descent often produces considerable improvement. However one of my patients became progressively dyspnoeic and died even after evacuation to Kathmandu.

Physician, Shanta Bhawan Hospital; Professor of Clinical Physiology, Institute of Medicine, Tribhuvan University, Kathmandu, Nepal.

Chest X-Ray

Chest X-Ray may show a classical "butterfly" pattern of pulmonary oedema, but there is often patchy appearance to the shadowing. In some cases the oedema appears solely or predominantly in one lung.

Autopsy Findings

We have been unfortunate enough to see seven deaths from acute mountain sickness at Shanta Bhawan Hospital, but this has enabled us to add considerably to the relatively few published autopsy reports. All seven victims had evidence of cerebral and pulmonary disease.

Pulmonary oedema was found in 5 cases, but it is possible that it had resolved before death in the others.

Infection was present in all; bronchopneumonia in all seven and pleurisy in two cases. It is likely that infection was secondary to pulmonary oedema in most cases, but there was evidence in two victims that pulmonary infection was primary, causing a degree of hypoxia that summated with the effect of the high altitude environment to precipitate AMS.

Atelectasis in two cases was likewise probably secondary to oedema, though the possibility of interference with surfactant secretion and function is an interesting one.

Perhaps the most striking appearance was the pulmonary vascular thrombosis found in six of the autopsies. This involved the large and small pulmonary artery branches extensively in five victims. One patient also showed extensive cerebral thrombosis.

I believe that thrombosis and infection are as important in the pathophysiology of pulmonary AMS as oedema, and that atelectasis may also play a part in some cases.

Pathophysiology

I do not intend to discuss the pathogenesis of thrombosis at high altitude except to point out that it is quite common, even in leg veins, and that this is surprising when we consider how active are the trekkers and climbers involved. The ante-mortem haematocrit levels of my autopsy victims were not markedly raised except in one case, and I do not think that haemconcentration is the main factor. We will see later that decompression may play a part.

Though it is only part of the story, pulmonary oedema undoubtedly occurs at high altitude and its pathophysiology is intriguing and not fully established. Certain important facts need to be reconciled with any tenable hypothesis:-

- Individual idiosyncrasy. Some people are more likely to suffer from AMS than others.
- Left atrial and pulmonary wedge pressures are believed to be normal, though this investigation has only been reported in three patients.
- Pulmonary artery pressures, on the other hand, are raised, and former pulmonary AMS victims show greater pulmonary hypertension than controls when exposed experimentally to hypoxia.
- Patchiness of oedema and also patchiness of perfusion when former victims are exposed to hypoxia as shown by Dr. Viswanathan and his colleagues in 1979.
- Oedema fluid is probably proteinous, as indicated by staining techniques showing fibrin strands and hyaline membranes.
- An unexpectedly high incidence of pulmonary AMS has been reported in persons with congenital absence of the right pulmonary artery.
- Extensive thrombosis in pulmonary vessels. Some reports have indicated sludging and microthrombi at capillary level as well as large vessel thrombosis.

We may take it, then, that in pulmonary AMS, pulmonary blood flow is increased (due to increased cardiac output) but that overall resistance to blood flow is high, presumably due to a combination of hypoxic arteriolar constriction and thrombosis and microthrombosis. This is patchy, so that distribution of blood flow is far from uniform. Most discussions of the problem have concentrated on the vasoconstriction, which might well provide a basis for idiosyncrasy, but thrombosis also seems a highly likely cause in view of the autopsy findings. How, we must ask, can such patchy, high pressure blood flow be responsible for oedema?

The hypothesis of Hultgren is perhaps the most widely accepted. He believes that the necessary high blood flow in some areas of the

lung forcibly dilates arterioles so that arterial pressures are transmitted to the capillaries and oedema occurs as a result of increased intravascular hydrostatic pressure. However, there are certain disadvantages of the dog model used to support this hypothesis and also one might expect an increase of venous pressure in such circumstances. Another objection is that such a pressure oedema would contain relatively little protein as the intercellular endothelial junctions would be intact.

Staub has used a sheep model to produce pulmonary oedema by embolisation with microspheres, thus reproducing the presumed patchy circulation of pulmonary AMS. This model would appear to be a relevant one. He believes that high flow in the open capillaries produces shear-stress forces on the endothelial cells, disrupting the intercellular junctions and causing extravasation of protein and fluid. Such oedema in embolised sheep's lungs occurs when platelets and fibrin have been removed from the perfusing blood, but, interestingly, it is largely inhibited by the removal of leucocytes. Staub believes that leucocytes attach themselves to the luminal surface of endothelial cells and act as levers for the effect of the forces of blood flow upon the endothelium.

Leucocytes may, however, act to damage endothelium in other ways; through prostaglandin mediators, through enzyme release or through the mediation of toxic oxygen radicals. In Denver, Colorado, activation of leucocytes by phorbol myristate acetate has been shown to produce oedema in a dog lung preparation, and this action can be prevented by prostaglandin inhibitors. But how might leucocytes be activated at high altitude? One possibility is the presence of microbubbles of nitrogen and other insoluble gases in the blood as a result of the decompression from lower altitudes. This seems a possible cause of microthrombosis and possibly of larger thromboses, and nitrogen gas is also known to activate leucocytes. Thus we have a schema that could explain both

thrombosis and oedema and involve the hypobaria of high altitude in the pathogenesis of acute mountain sickness as well as hypoxia.

These various possible mechanisms may not be mutually exclusive. There are further possibilities that may explain or contribute to pulmonary oedema at altitude, such as:

- Impaired production of surfactant in the lungs;
- Release of chemical mediators from platelets;
- Shift of blood from the systemic veins to the pulmonary vascular bed.

Rescue and Treatment

It may be difficult to evacuate severely dyspnoeic patients down uneven and narrow paths. Evacuation by yak is an uncomfortable experience, especially with a temperamental animal, but has been highly successful. A bamboo chair on a Sherpa's back is comfortable and convenient and enables the victim to be evacuated in a sitting position using oxygen.

Many workers have commented on the lack of improvement when oxygen is given. This is probably because only relatively low oxygen flows are available in remote areas, whereas the minute volumes of such patients must be very high. Alveolar partial pressure of oxygen is probably little improved.

Diuretics would seem logical treatment, but carry a risk of inducing hypovolaemia.

The essential mainstay of the treatment of pulmonary AMS is still urgent evacuation, if necessary even by night. As air evacuation is costly and involves delays, emphasis must be placed on the methods of foot, or hoof evacuation which have been described.

Excerpts from the Presidential Address of Dr. J as want Singh

1. National Tuberculosis Programme will not fulfil the expectations till it is a 100% centrally sponsored programme. The National Programme must be extended expeditiously in all districts of the country.
2. Performance under the National Tuberculosis Programme must be taken into consideration when the work of a peripheral health institution is being assessed.
3. A DTO must be well-versed in the clinical aspects of tuberculosis as well as the managerial aspects of the Tuberculosis Programme. There must be complete collaboration between a district Tuberculosis Centre and Tuberculosis Departments of the Medical Colleges.
4. It should be obligatory for all teachers in Tuberculosis and senior officers of the Directorate of Health to attend the NTI seminars periodically.
5. The Community Health Guide's role in case-finding must be limited to identifying the symptomatics. It should be the duty of male health worker to collect the sputum from the suspects on their fortnightly visits to the village, make sputum smears and fix these in the Held and send the slides for staining and microscopy to the nearest microscopy centre.
6. Sputum collection centres and drug distribution centres should be established in urban areas, primarily slums, which may be at some distance from the tuberculosis centres.
7. Anti-tuberculous drugs should be stored in the sub-centres where male and female health workers are based and it should be their duty to take the drugs with them on their field visits and distribute these to the patients in their homes.
8. Prompt defaulter action should be taken by the male and female health workers as well as the community health guides.
9. Necessary steps must be taken to see that adequate quantity of anti-tuberculous drugs are always available in tuberculosis centres. Import/excise duty on anti-TB drugs, their raw material or intermediate compounds should be substantially slashed, if not completely abolished, to bring down the price of these drugs.
10. Time has now come to include the short-course regimens in the National Programme at least for smear positive freshly discovered cases to begin with.
11. General practitioners clinics should be recognised as peripheral health institutions for purposes of case-finding and free drug distribution if the general practitioners agree to keep adequate records and submit accounts of drug distribution as and when desired.
12. Tuberculosis Associations in the States and Districts must hold refresher courses for general practitioners in collaboration with the Indian Medical Association.
13. BCG vaccination must be continued as at present.
14. The government agencies must accept voluntary bodies engaged in tuberculosis control such as the Tuberculosis Association of India as equal partners in the fight against the disease and solicit their assistance in implementation of the programme which is the concern of both.
15. The unnatural bifurcation of the tuberculosis and chest diseases diploma into two separate diplomas, one for tuberculosis and one for chest diseases by the Medical Council of India, must be ended, as it has been done in the case of MD (Tuberculosis and Chest Diseases).

Summaries of the Papers presented at the 37th National Conference on Tuberculosis & Chest Diseases at Delhi from 6th to 10th October, 1982.

SECOND SHORT COURSE CHEMOTHERAPY TRIAL (TUBERCULOSIS ASSOCIATION OF INDIA)

(Paper being published in full)

SHORT COURSE CHEMOTHERAPY IN EXTRA-PULMONARY TUBERCULOSIS

ML. MEHROTRA, *et al.*

Results of short course chemotherapy in 90 cases of extra pulmonary tuberculosis were reported. Sixty three urban patients were given R₂ H₂ Z₂ S₂ for 4 weeks followed by R₂ H₃ Z₂ for 12 weeks and R₂ H₂ for 14 weeks. Twenty seven rural patients were given R₂H₂Z₂ for 16 weeks and R₂H₂ for 14 weeks. Sixteen urban patients and 7 rural patients missed more than 6 doses of treatment. Results were very satisfactory in cases of tubercular glands. Four weeks' addition of Streptomycin initially did not seem to make much difference. The number of cases involving abdomen and G.U. tract are too few for the present to permit valid conclusions.

SHORT COURSE CHEMOTHERAPY OF 3 OR 5 MONTHS' DURATION IN SPUTUM POSITIVE PULMONARY TUBERCULOSIS

R. PARTHASARATHY

A controlled clinical trial of 3 short-course regimens of 3 or 5 months' duration was carried out in adult sputum-positive patients with newly diagnosed pulmonary tuberculosis. The patients were allocated at random to one of the following 3 regimens: (1) Rifampicin plus Streptomycin plus Isoniazid plus Pyrazinamide daily for 3 months (R3), (2) as in (1) but followed by Streptomycin plus Isoniazid plus Pyrazinamide twice-weekly for 2 months, the total duration being 5 months (R5) and (3) as in (2) but without Rifampicin (Z5). In patients with initially drug-sensitive bacilli, the results at the end of chemotherapy were highly satisfactory with all three regimens but the relapse rates upto 16/18 months after stopping chemotherapy ranged from 3 to 18%. In patients with initial resistance to either isoniazid alone or to both isoniazid and streptomycin, the two rifampicin regimens fared significantly better than the non-rifampicin regimen. The incidence of jaundice was high (8 %) in the rifampicin series.

FATE OF BACILLARY PATIENTS : 3 YEAR FOLLOW-UP

A.G. PATEL, *et al.*

The fate of 307 bacillary cases treated with short-course chemotherapy is reported. 268 were converted, 3 remained sputum positive, 16 died and 20 were lost from follow-up. The last 20 cases, however, were sputum negative when follow-up ceased. Relapses were 10 out of 132 in patients who were treated from July 1976 to June 1979 and were followed for 3-5 years and 2 out of 85 in patients treated from July 1979 to August 1981 and followed for one year.

SHORT COURSE CHEMOTHERAPY—PROCEDURAL STRATEGIES IN DISTRICT TB PROGRAMME

P. JAGOTA

Operational aspects of short-course chemotherapy were reported. Regimens of a duration shorter than six months cannot be recommended. High degree of regularity is essential. As fully supervised administration of drugs is neither acceptable to most of the patients, nor is feasible under programme conditions, defaulter retrieval has to be made as intensive as possible to ensure drug regularity.

RIFAMPICIN—ITS BIOCHEMICAL AND MICROBIOLOGICAL BIOAVAILABILITY IN PATIENTS OF PULMONARY TUBERCULOSIS

M. KOICHA *et al.*

(Paper being published in full)

HEPATIC FUNCTION DURING TREATMENT OF TUBERCULOSIS WITH SHORT COURSE REGIMENS

G.R. SARMA

The rhythm of drug administration, particularly that of rifampicin, appears to influence hepatic toxicity significantly. Regimens containing rifampicin together with isoniazid and pyrazinamide carry a greater risk of hepatic toxicity when administered daily than when given intermittently. There is no definite evidence to implicate pyrazinamide in the development of hepatic toxicity. Non-rifampicin short-course regimens while carrying a negligible risk of hepatic toxicity have a limited application in that these are effective only in drug-sensitive patients. It is not unlikely that short-course regimens containing rifampicin may exacerbate sub-clinical viral hepatitis. Malnutrition and prevalent sub-clinical hepatic damage caused by factors like alcoholism may be other contributing factors.

PYRAZINAMIDE INDUCED HYPERURICEMIA AND ARTHRALGIA: FURTHER OBSERVATIONS AND EFFECTS OF INCORPORATION OF ETHAMBUTOL AND RIFAMPICIN IN PYRAZINAMIDE CONTAINING ANTI-TUBERCULOSIS REGIMENS

T.N. SHARMA, *et al*

Serum uric acid concentrations were compared in 118 patients on pyrazinamide containing regimens and 70 on non-pyrazinamide regimens. Hyperuricemia was seen in 45% by the end of one week, 72 % by the end of 2 week and 79 % by the end of four week in pyrazinamide cases but in none of the cases on non-pyrazinamide regimens, except in two cases who were taking ethambutol. Elevation in uric acid levels caused by ethambutol was lesser. Arthralgia was less amongst those pyrazinamide patients who were being given rifampicin in addition and responded well to aspirin and allopurinol.

HYPERURICEMIA INDUCED BY ETHAMBUTOL

R.K. NARANG, *et al.*

Seventy previously untreated cases of pulmonary tuberculosis and 20 healthy controls were included in the study. Eighteen of the tuberculous patients were given streptomycin and INH, 21 were given ethambutol and INH and 31 were given streptomycin, INH and ethambutol. Patients in the last 2 groups showed a statistically higher mean uric acid level in the 2nd, 3rd and 4th weeks of treatment as compared to the pre-treatment uric acid level. There was no difference in the serum levels after 4 weeks indicating that ethambutol hyperuricemia was independent of the drug dose. None of the patients developed gouty arthritis but two patients developed arthralgia serious enough to restrict the use of ethambutol. While salicylates were ineffective, probenecid caused a significant decrease in the serum uric acid level as against pyrazinamide induced hyperuricemia which responds to salicylates.

HEPATITIS IN PATIENTS ON ANTI-TUBERCULOSIS CHEMOTHERAPY

G.S. PERHAR, *et al*

Thirty patients with hepatitis while taking anti-tuberculous drugs were studied. Differentiation of hepatocellular injury caused by a drug from that caused by viral hepatitis is difficult. Absence of hepatitis B antigen supported the probability that majority of these patients had drug induced hepatitis. Hepato-toxic drugs are of two types. INH generally produces the cytotoxic type of hepatotoxicity while PAS produces mixed type of injury.

NON-SPECIFIC AORTO-ARTERITIS

K.K. DATEY, *et al*

Seventy-six male and 16 female patients of non-specific aortoarteritis were studied. Their ages were between 17 and 73 years. 11 cases had Takayasu's disease, 5 middle aortic syndrome, 20 Leriche's syndrome and 56 had peripheral vessel involvement. Common presenting features were: absence of peripheral pulse, chest pain, intermittent claudication, dizziness, hypertension, etc. All patients required surgery and the majority improved after surgical treatment.

A STUDY OF ELECTROCARDIOGRAPHIC PATTERN IN PULMONARY TUBERCULOSIS

S.N. GAUR, *et al*

ECGs of 110 cases of pulmonary tuberculosis were studied. Cases with haemoglobin less than 10 gms%, hyperproteinemia and hypertension were excluded. Eighty-seven cases were sputum positive and 22 cases had associated tuberculous or non-tuberculous complications. Abnormal ECG findings were seen in 46.36% cases. Cases with far advanced disease or fibrosis or associated with COPD and/or cor pulmonale had a higher percentage of abnormalities. ECG changes in pleural disease without parenchymal involvement were insignificant. In most cases, ECG returned to normal after about 5 months' chemotherapy.

CHRONIC RESPIRATORY DISEASES IN A RURAL COMMUNITY AND THEIR CONTROL

D. RAY

(Paper not received)

CHRONIC OBSTRUCTIVE PULMONARY DISEASE AS A CONCOMITANT OF PULMONARY TUBERCULOSIS

O.A. SARMA

Studies were carried out on 51 male and 38 female sputum positive cases of pulmonary tuberculosis during 1981-82. Forty males were smokers. Mean FEV₁ was less than 80% in all cases. Restrictive defect was present in all but 3 males but in all the females. Majority of the smokers had evidence of airway obstruction whereas this defect was present in about half the non-smokers. The obstruction was significantly reversible amongst non-smokers but the reversibility was poor amongst smokers.

AERODYNAMIC STUDIES AND ACID-BASE RELATIONSHIP IN PATIENTS WITH COPD AT MODERATE ALTITUDE (SIMLA)

V.K. ARORA, *et al.*

Twenty-five COPD cases and 25 normal subjects were studied in Simla (height above sea-level 2160 meters). At a barometric pressure of 574±5, normal resting arterial blood gases were found to be significantly lower as compared to normal values in the plains at a barometric pressure of 760. Severe type II respiratory failure was found in all COPD cases who have to contend with additional effect of high altitude hypoxia.

BACTERIOLOGICAL AND BIOCHEMICAL FINDINGS IN TUBERCULOUS MENINGITIS

H.B. DINGLEY

Four hundred and thirty-eight specimens of CSF were examined by culture for AFB. Of these, 92 cultures were contaminated and 105 specimens were positive by culture. AFB could be demonstrated by direct smear in 13 specimens only. Eighty-six or 81.9% specimens were positive in Kirschner medium, 19 or 18.1% in Lowenstein-Jensen medium and 19 were positive in both. The bacilli were sensitive to standard drugs in all the 105 cultures. Culture positivity

seems to be correlated to total leucocytic and lymphocytic count and sugar content of the CSF. History of contact was available in 16 patients and five index cases were known to harbour resistant bacilli.

CORRELATION OF CVTOCHEMICAL PARAMETERS WITH AFB CULTURE POSITIVITY IN C.S.F. IN TB MENINGITIS

D.R. SINGH, *et al.*

Correlation between CSF sugar level and blood sugar level with culture positivity for AFB in 27 cases of tuberculous meningitis was studied. CSF culture was positive for AFB in 4 cases. Mean CSF sugar level in culture negative cases was 43.5 mg% as against 50.6 mg% in culture positive cases. Mean protein level in culture positive cases was 197.7 mg% in culture positive and 154.2 mg% in culture negative cases. Mean CSF cell count was higher in culture positive cases. Turbid CSF was more likely to be culture positive.

EVALUATION OF DIAGNOSIS, PROGNOSIS AND TREATMENT OF 23 CASES OF TUBERCULOUS MENINGITIS AMONG CHILDHOOD

K.G. YEDURAPPA

Twenty three cases of tuberculous meningitis among children were studied in Mysore between November 1978 and February, 1980. The diagnosis was presumptive to begin with. CSF protein was more than 140 mg% and sugar less than 40 mg%. The recovery rate with anti-tuberculous treatment was 53%. Prognosis is bad when the patient is comatose at the time of admission. Mortality is also significantly higher in infants. Out of 11 deaths, six were in infants below 2 years in age.

PREVALENCE OF INITIAL DRUG RESISTANCE TO STREPTOMYCIN AND ISONIAZID IN RURAL AND URBAN AREAS OF MAHARASHTRA

M.D. DESHMUKH, *et al.*

The study was based on case-finding shibirs in rural and urban areas. The percentage of patients with resistant bacilli was 35% in rural areas and 40% in urban areas. The percentage was higher amongst old previously treated cases as compared to fresh untreated cases both in urban and rural areas. The authors recommend Taluka-wise shibirs for case-finding and treating cases so discovered with rifampicin and ethambutol in fresh cases and Ethambutol, Rifampicin and Pyrazinamide in old cases.

PATTERN OF DRUG RESISTANCE IN CASES OF PULMONARY TUBERCULOSIS IN CITY OF MADRAS

K.V. KISHNASVAMI, *et al.*

Symptomatics attending the clinic for the first time during a period of 3 months were investigated irrespective of the fact whether they had previous chemotherapy or not. Three sputum specimens were examined and sensitivity tests were carried out on one positive culture. Prevalence of initial drug resistance based on 750 cultures was 16.8% for streptomycin, 22.3% for INH, 8.1% for ethambutol, 2.7% for ethionamide and 0.7% for rifampicin. The initial drug resistance pattern in Madras has not changed significantly during the last 10 years.

PATTERN OF DRUG RESISTANCE IN NEWLY DIAGNOSED CASES OF PULMONARY TUBERCULOSIS IN BOMBAY

M. HINGORANI, *et al.*

Study is based on symptomatic patients attending the clinic for the first time between April and July, 1981. Out of 1,120 patients of active pulmonary tuberculosis, only 78 were culture positive amongst the previously untreated patients. Sensitivity tests were carried out on 40 out of these 78. Nine strains were resistant to one or more drugs, 12.5% were resistant to streptomycin, 7.5% to INH and 5% to ethambutol; 2.5% were resistant to both streptomycin and ethambutol.

PNEUMOCONIOSIS IN SILICA AND COPPER WORKERS

P.A. DESHMUKH, *et al.*

Sixty-nine cases of Silicosis (55 among copper mine workers and 14 among refractory workers producing silica and fire-clay bricks) diagnosed among symptomatics attending Tata Main Hospital, Jamshedpur were analysed. Age range was from 26 to 60 years and 65% were smokers. Main symptoms were cough and breathlessness; 40% were asymptomatics. In copper mine workers, radiological abnormalities were less intense; the small opacities were lesser in size and larger opacities were less in number. In refractory workers, these findings were reversed. Lung function studies among copper mine workers showed 16 cases had obstructive changes, 6 restrictive changes and 17 both restrictive and obstructive. Sixteen cases had normal lung function. In refractory workers, none of the cases had normal lung function; 10 cases had only restrictive ventilatory deficiency and 4 cases had both deficiencies. Obstructive ventilatory defect was seen more frequently among smokers.

RESPIRATORY DISEASES AMONG JUTE MILL WORKERS

BINAYAK ROY

Fifteen thousand Seven hundred jute mill workers were subjected to history taking, clinical and radiological examinations in 1979-80. Pathological examinations were undertaken where necessary. Prevalence of respiratory diseases amongst these was found to be 31.8% comprising mainly pulmonary tuberculosis, 5.8%, bronchitis, 6.2%, emphysema with chronic bronchitis, 11.4%, and bronchiectasis, 2.9%. Pulmonary tuberculosis was significantly more prevalent in weaving, spinning and engineering departments as compared to processing department. Bronchitis and emphysema were more prevalent in weaving and spinning departments. The prevalence of all respiratory diseases was higher amongst those who had put in longer periods of service.

CHANGING PATTERN OF PULMONARY TUBERCULOSIS IN INDUSTRIAL WORKERS DURING LAST TWO DECADES

S.R. TRIPATHY, *et al.*

The number of pulmonary tuberculosis cases per 1000 railway employees was 5 in 1961-62 and 4.9 in 1980-81. The highest frequency of cases has shifted from below 30 years to those above 30 years during the latter period. The number of bilateral, advanced and cavitary cases as well as bacillary cases has declined since 1961.

A STUDY OF TUBERCULOSIS SERVICES AS A COMPONENT OF PRIMARY HEALTH CARE

RADHA NARAYAN, *et al.*

(Paper being published in full)

CHANGING TRENDS OF NURSES' ROLE IN THE SHORT COURSE CHEMOTHERAPY

J.L. MONGA

Nurses' role in tuberculosis control has varied from time to time. Before 1882, there was not much that they could do. From 1882 to 1948 their main duties were in respect of preventive measures by the patients and the family, contact examination, assistance in observance of sanatorium treatment, collapse therapy etc. After 1948 when anti-microbial drugs became available and domiciliary treatment became the sheet anchor of management, their main role was to see that the patients took the drugs regularly and to identify and retrieve drug default by the patient as promptly as possible. The nurses have to take care of the psychological aspects of default also. The problems in the rural areas may be different from those in the urban area and have to be dealt with differently. Short-course chemotherapy increases the responsibility of the nurses.

CURRICULUM IN RESPECT OF TUBERCULOSIS FOR 'NURSING STUDENTS'

PREM SAXENA

Since tuberculosis is now integrated with the general health services, all categories of nurses and health visitors have to assist in case-finding, treatment and prevention of disease. Certain routine procedures like repeating the medicine and reference for sputum, x-ray and contact examinations can be attended to by nurses in order to save the doctor's time. The quantum of didactic lectures and practical training in tuberculosis for all categories of nurses were dealt with in detail. The necessity of periodical refresher/reorientation courses was stressed.

PRACTICAL PROBLEMS OF DOMICILIARY TREATMENT IN TUBERCULOSIS AND METHODS TO OVERCOME THEM

TB Training and Demonstration Centre and Chest Institute, Agra

Study was based on 206 newly diagnosed bacteriologically confirmed cases of pulmonary tuberculosis more than 18 years old. Nearly 1/3rd were males; 1/3rd of the cases belonged to Agra city, 1/3rd to the rural areas of Agra district and 1/3rd from other districts. Drug compliance was higher (72%) in patients given treatment from general practitioners of their choice. The working hours of the clinic are usually not so convenient for the patients. Problems of domiciliary treatment are many but most of them are self-created. If these problems are solved, there is no reason why compliance would not be better.

CHANGING FEATURES OF PNEUMONOLOGY

G. DADDI

While acute respiratory infections were becoming less frequent with the advent of anti-bacterial drugs, chronic conditions, opportunistic infections, occupational diseases and certain other conditions like Mycobacteriosis, primary atypical pneumonia, Legionnaire's pneumonia, etc. are becoming more frequent. Diffuse lesions create problems of differential diagnosis. Role of new sophisticated diagnostic procedures like scanning, xerography, bronchial arteriography, electron microscopy, nuclear magnetic resonance, etc. was referred to. Non-respiratory functions of the lung like its metabolic activity, defence activity, muco-ciliary blanket, action of prostaglandins, prostacyclins, serotonin were described. Association of cancer lung with ACTH and several other hormones was mentioned. Whole field of pneumonology with its past, present and future was reviewed.

PREVALENCE OF PULMONARY MYCOSIS IN CHRONIC PULMONARY TUBERCULOSIS PATIENTS

K.V. KRISHNASWAMI, *et al.*

Two hundred forty three cases of pulmonary tuberculosis who had completed specific treatment but complained of persistent respiratory symptoms were investigated for fungus. Criteria for proving fungus infection were persistently positive smear and heavy growth of fungus by culture in at least 3 specimens. In all 29% of the sputum specimens were positive for fungus. Candida was the commonest (57%) and aspergillus 36%. Skin tests were positive for all the 34 patients whose culture was positive for fungus and skin test could be carried out. The chances of fungus infection were directly related to the duration of previous chemotherapy but the presence of cavities had no relationship.

KLEBSIELLA PNEUMONIA

A.S. BAGGA, *et al*

Eighteen cases of Klebsiella Pneumonia were studied. Average age was younger in the acute variety. Diagnosis was based on finding gram negative bacilli in sputum smear and repeatedly positive culture for Klebsiella. With adequate chemotherapy, mortality was practically nil. Resolution, however, was rather slow, especially in chronic variety.

LUNG ABSCESS

N.K. GACHHAYAT, *et al*

Sixty cases of lung abscess admitted in SCB Medical College hospital during 1978-1979 were investigated; 53 were males, 50% were manual workers, 40% were habituated to betel-chewing and 3 were alcoholics. Unhygienic oral condition was the most important pre-disposing factor. Right lung was involved in nearly 2/3rd of the patients, lower zone in approximately half. Most common organisms were klebsiella pneumoniae, staphylococcus and streptococcus viridans. 91% of the patients improved with medical treatment. Surgical intervention was required in 5.4% and 3.5% died.

ELECTROPHORETIC PATTERN IN PULMONARY TUBERCULOSIS

V. THIAGARAJAN, *et al.*

Twentyfive cases of pulmonary tuberculosis of varying severity were studied to assess their immune status by estimating the immunoglobulin levels both qualitatively and quantitatively by radial immuno-diffusion technique. IgG was above the control group in 60% of cases and below normal in 40%. Alpha-1 protein was increased in 76% of the cases, Alpha-2 in 32% and globulin in 48%. In very severe cases, there was depression in serum protein levels. Level of IgG increase is helpful in assessing the severity of disease.

IMMUNE RESPONSES IN RELAPSED CASES OF PULMONARY TUBERCULOSIS

M.S. AGNIHOTRI, *et al*

The study has demonstrated that relapsed patients of pulmonary tuberculosis have depressed cell-mediated immune responses and hyperactive humoral immune response. The findings suggest that depression of cell mediated immune responses after adequate chemotherapy may be an important factor responsible for relapse in pulmonary tuberculosis.

A STATISTICAL METHOD FOR ESTIMATION OF THE INCIDENCE OF TUBERCULOSIS INFECTION

K.D. GAUTAM

A method using regression analysis and confidence limits for discriminating new tuberculosis infection is reported. Under certain assumptions, linear regression of (Y the increase in the size of tuberculin reaction between the two rounds), on X (the size of tuberculin reaction at the initial round), is fitted. Any Y value observed to fall about a particular upper confidence limit is taken as evidence of new infection. Incidence of infection can then be worked out provided the population at risk of new infection is known.

PULMONARY ACUTE MOUNTAIN SICKNESS

J.G. DICKINSON

(Paper being published in full)

DIAGNOSTIC SIGNIFICANCE OF DETERMINATION OF PLEURAL FLUID pH

H.V. BAHULKAR, *et al.*

In 95 cases of pleural effusion PH, Pco₂, Po₂ and Hco₃ values of pleural fluid were estimated to ascertain their diagnostic significance. pH around 7.2 strongly suggests tuberculosis while pH around 7.4 strongly suggests malignancy. However it is not helpful in differentiating tubercular pleural effusion and effusion due to late malignancy. It was not possible to differentiate exudate and transudate by values of pH and Hco₃⁻. In para pneumonic effusion pH varies widely. Values of Pco₂ and Po₂ do not have any diagnostic significance.

AN IMPROVED WATER-SEAL SYSTEM FOR CLOSED PLEURAL DRAINAGE

SWAMI LOKAHITANANDA

An improved two-bottle system with the loop of the connecting tube sufficiently long and raised to prevent intra-thoracic negative pressure from sucking water into the pleural cavity with serious consequences was described. A special carrier for the bottles was also shown. The carrier allows the patients to conveniently carry the bottles and walk about or squat without any fear even if the bottles get raised above the patient's shoulder.

REVIEW OF 99 CASES OF PYOPNEUMOTHORAX MANAGED WITH CLOSED INTERCOSTAL DRAINAGE ALONG WITH ADEQUATE CHEMOTHERAPY

K.C. MATHUR, *et al.*

Closed ICD is a simple and useful procedure for the management of pyopneumothorax cases. It is successful in more than three-fourths of such cases. Results are affected by age of the patient, duration of previous treatment, duration of pyopneumothorax, extent of initial collapse of lung and cavitory status of the lesion. Only in less than one-fourth, other surgical procedures may be necessary.

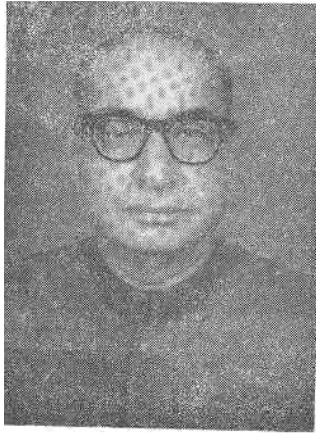
ROLE OF LUNG BIOPSY IN THE DIAGNOSIS OF PULMONARY DISEASES

R.C. JAIN

Eighty-six patients with diffuse pulmonary lesions were studied. Seventy-six had bilateral lesions. Youngest patient was 8 years old and the oldest 70 years. It was possible to establish diagnosis in 77 % of the cases. Post-operative complications were not serious and comprised pneumothorax in 3 cases and haemothorax in 2 cases. There were 2 deaths, one due to acute respiratory failure and the other due to extensive malignant dissemination.

Citation read on the occasion of the Presentation of TAI Gold Medal to Dr. H.B. Dingley, former Medical Superintendent, Lala Ram Sarup TB Hospital, Sri Aurobindo Marg, New Delhi-30, on 6.10.82

Born on 17th September 1917 Dr. Har Bhajan Dingley graduated in Medicine in 1941 and took his post-graduation in TB and Chest Diseases in



Dr.H. B. Dingley

1944. In the same year he was appointed as a Medical Officer in the New Delhi TB Centre and later joined the Lady Linlithgow Sanatorium, Kasauli. He was selected as the Medical Superintendent of the Lala Ram Sarup TB Hospital when it was established in 1953 and he continued to hold this post till he retired on the 30th of last month.

Dr. Dingley is the recipient of a Research Fellowship of the Rock Feller Foundation of U.S.A. in 1950 and the Chest and Heart Association Fellowship in 1964. He has participated in almost all National Conferences and several International Conferences by presenting papers and contributed several articles in various medical Journals and a chapter in the Text Book

of Tuberculosis published by the Tuberculosis Association of India, He was a member of the Technical Committee of the Tuberculosis Association of India during the years 1968-1981 and its Chairman in 1975-76, He presided over the 30th National Conference on TB and Chest Diseases held in Hyderabad in 1976. He is a member of the Research Committee of the Association and has participated in the various research programmes sponsored by it.

Dr. Dingley has spent his entire professional life extending over a period of 38 years in the care and treatment of TB patients. He is an Honorary Associate Professor of TB in the All-India Institute of Medical Sciences and the University College of Medical Sciences. He is actively engaged in the teaching and training of under-graduates and post-graduates of the Delhi University and students of the Raj Kumari Amrit Kaur College of Nursing. He is also an examiner for DTCD and M.D. students of the Universities of Rohtak, Rajasthan, Amritsar and Delhi.

In recognition of the meritorious services rendered in the field of TB, the Tuberculosis Association of India decided to award its Gold Medal to Dr. Dingley.

NEWS AND NOTES

ANNUAL MEETINGS OF THE TAI

The 44th Annual General Meetings of the Tuberculosis Association of India will be held at 11.00 A.M. on Saturday, the 23rd April, 1983, in the Conference Hall of the Association, 3, Red Cross Road, New Delhi. The Annual Meeting will immediately be followed by a meeting of the Central Committee of the Association.

The Conference of Secretaries of State TB Associations will be held in the afternoon on 23rd April, 1983.

A meeting of the Technical Committee of the Association will be held at 9.30 A.M. on Friday, the 22nd April, 1983.

CHAIRMAN, TECHNICAL COMMITTEE

Dr. S. Sivaraman, former Additional Director of Health Services, Kerala, has been nominated as Chairman of the Standing Technical Committee of the Tuberculosis Association of India for 1983 *vice* Dr. Jaswant Singh, whose term of office expired with the 37th National Conference held in New Delhi in October, 1982. Dr. Sivaraman will also preside over the 38th National Conference on Tuberculosis and Chest Diseases to be held in Panaji (Goa) from 27th to 30th October, 1983.

TAI AWARDS-1983

The Tuberculosis Association of India has decided that its prestigious "Khushi Ram Shield" for outstanding work done during the year 1982 be awarded to the Tamil Nadu Anti-TB Association. The Association has also decided that the "Bhai Mohan Singh Cup" for outstanding general activities and achievements during 1982 be awarded to the Andhra Pradesh TB Association. The Association has also decided to award Certificates of Merit for good work done during the year to TB Associations of Bengal, Goa, Daman & Diu.

The Association's TB Seal Trophy for highest collections from the 32nd Seal Campaign has been won by the Kerala Tuberculosis Association and the Runner-up Cup for the next highest collections by the Tamil Nadu Anti-TB Association. The Silver Cup for the highest collections by smaller States has been won by the Pondicherry Association. The Andhra Pradesh Association has won the Certificate of Merit for improving its Seal Sale Collections.

ROBERT KOCH—RANBAXY ORATION

Dr. K.N. Rao, former Director-General of Health Services, Government of India, has been selected to deliver this year's "Robert Koch-Ranbaxy Oration". The Oration will be delivered by Dr. Rao at the 38th National Conference of Tuberculosis & Chest Diseases to be held in Goa from 27th to 30th October, 1983.

WANDER-TAI ORATION

Dr. P.A. Deshmukh, Superintendent, Ardeshir Dalai Memorial Hospital, Jamshedpur, has been selected to deliver this year's "Wander-Tai Oration". The Oration will be delivered by Dr. Deshmukh at the 38th National Conference on TB & Chest Diseases to be held in Goa from 27th to 30th October, 1983.

38TH NATIONAL CONFERENCE—GOA

The 38th National Conference on Tuberculosis and Chest Diseases will be held in Goa from 27th to 30th October, 1983, under the joint auspices of the Tuberculosis Association of India and the Goa, Daman & Diu TB Association. Those who wish to attend the Conference and present papers at its Scientific Sessions may kindly send two copies of the abstract of their papers to the Secretary-General, Tuberculosis Association of India, 3, Red Cross Road, New Delhi-1, immediately.

ESSAY COMPETITION—1983

The Tuberculosis Association of India will award a cash prize of Rs. 500/- to a final year medical student in India for an original essay on Tuberculosis, adjudged best by a Special Committee of the Association. The subject selected for the 1983 competition is "Relapse in Pulmonary Tuberculosis". The essay should be written in English, typed in foolscap size, double-spaced, and should not exceed 15 pages (approximately 3000 words, excluding tables, diagrams, etc.). Four copies of the manuscript should reach the Secretary-General, Tuberculosis Association of India, 3, Red Cross Road, New Delhi-110001 before 31st July, 1983 and should be forwarded through the Dean or Principal of College/University.

CHANCHAL SINGH MEMORIAL AWARD-1983

The Tuberculosis Association of India will award a cash prize of Rs. 1,000/- to a medical graduate working in tuberculosis, below 45

years of age, for an original article not exceeding 30 double-spaced fool-scrap typed pages (approximately 6000 words), excluding charts and diagrams on a subject relating to Tuberculosis. Papers may be sent, in quadruplicate, to reach the Secretary-General, TB Association of India, 3, Red Cross Road, New Delhi-110001, before 31st of July, 1983.

STATE CONFERENCES

The XIth Gujarat State TB and Chest Diseases Workers' Conference was held on 23rd January, 1983 at Shri K.J. Mehta TB Hospital, Amargadh. The Conference was inaugurated by Shri Ratubhai Adani and the Scientific Session by Dr. G.D. Gothi. The subjects discussed covered important aspects of tuberculosis. More than 400 delegates from all over Gujarat State attended the Conference. A Souvenir was brought out on the occasion.

The Tripura branch of the Indian Medical Association in collaboration with the TB Association of Tripura organised its 14th Medical Conference in Agartala from the 11th to 14th February, 1983. Dr. S.P. Pamra, Honorary Technical Adviser, Tuberculosis Association of India, attended the Conference and delivered guest lectures on Diagnosis and Management of Tuberculosis.

REFRESHER COURSE

The TB Demonstration and Training Centre and Chest Institute, Agra, organised its Annual Refresher Course for medical practitioners from the 7th to 13th February, 1983. The course

included a Symposium on "Short-course Chemotherapy" with Dr. S.P. Pamra as Moderator and Dr. Eero Tala (Finland), Dr. H.B. Dingley and Dr. M.L. Mehrotra as main speakers.

SHIBIRS/CAMPS

The Maharashtra State Anti-TB Association conducted two block-wise anti-TB Shibirs for Sinnar Taluka, Nasik District on 19th December, 1982 and 2nd and 3rd January, 1983. A local Committee was formed under the chairmanship of Shri Suryabhanji Gadakh, the local M.L.A. In the first shibir 1742 persons were examined, of which 266 were x-ray positives, 84 were sputum positives and 10,389 were given BCG vaccination. In the 2nd shibir 545 persons were examined of which 37 were x-ray positives and 9 were sputum positives. A multi-diagnostic camp was also arranged in the premises of Sinnar Municipal Hospital. The number of persons examined was 904, of which 432 were screened, 98 were x-ray positives and 18 were sputum positives.

A Diagnosis and Treatment camp was conducted at Amalner on the 13th February, 1983 jointly by the Lions Club of Amalner, Pratap Charitable Hospital, DTO, Jalgaon, and Department of Tuberculosis and Chest Diseases, Sir J.J. Group of Hospitals, Bombay. In all 720 symptomatics were screened and 326 were detected as suffering from pulmonary tuberculosis. Spot sputum test was carried out and the patients were put on treatment under the DTO, Jalgaon. BCG vaccination was also given to the children.