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DIET IN TUBERCULOSIS

During the past centuries many a treatment had claimed cure for tuberculosis. Most of them were discarded after short or long use. Diet, for treatment, however, stood the test of time longest. The reason may not be far to seek. There was no direct measure to control the bacillary population and its growth in the body. All attempts to increase the body resistance to attain the purpose were, therefore, rational. Food was rightly thought to help in building up such resistance and was unreservedly advocated by medical profession.

Though fads and fancies prevailed in early years, in course of time, with the discovery of proximate principles, vitamins etc., diet was rationalised, but, in this disease, extra diet was recommended to compensate for lost weight, regain strength and fight the bacilli better.

The discovery of potent anti-tuberculosis drugs gave in the hands of man a powerful weapon to directly control the bacillary population in the body. In India, pioneering studies showed that diet had no discernable influence on the immediate recovery of patients provided the chemotherapy was adequate. Thereafter, controlled studies made by combined effort of the Indian Council of Medical Research, the British Medical Research Council, the World Health Organisation and the Madras Government vindicated this finding. Follow-up study for a few years also shows that the stability of recovery does not depend on the nature of diet.

These findings seem to prove that all patients can be treated equally well with diets to which they are used to: be it adequate or inadequate. They have, therefore, mitigated many problems of organised domiciliary treatment.

Findings of this nature, however, raise relevant questions on hospital diet. Past tradition and practice still maintain special diet for tuberculosis patients in the hospitals. It will be palpably unfair and unnecessary in a poor country to supply better facilities to one group and, in addition, special diet also and deny them to others. At the same time, the patients, the public and even the general practitioners are not quite aware of this change in age-

long accepted practice. A sudden cut in hospital diet may, therefore, cause resentment from these quarters and difficulties in administration.

A mid-way policy seems justified in a situation like this. Avoiding undue delay, the diet can be modified gradually in such a manner that soon it becomes a physiologically normal diet. It will be profitable to consult specialists on Nutrition and Dieticians for this purpose. At the same time serious attempts must be made to propagate this knowledge to the public, patients and the general physicians.

TUBERCULOSIS PROBLEM IN INDIA*

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Spectacular and awe-inspiring developments in the fields of science and technology have been taking place during the past few decades with immense potentialities for good and for evil. While on the one hand diabolic weapons for destruction are being devised, workers in the medical field are also making discoveries for promoting health and preserving human life. The world is fast contracting on account of rapid means of communication, and these have facilitated the concept of control of communicable diseases like tuberculosis as a global problem.

One of the major objectives of World Health Programme is the control and wherever possible, the final elimination, of the major communicable diseases. An essential condition for social and economic progress is the raising of the health standards of the people in developing countries and this depends on the extent to which these countries can rid themselves of the diseases which for centuries have been undermining the peoples' will to live and to work. Next to the eradication of Malaria programme is the conquest of Tuberculosis, a major public health menace. Today no part of the world can be free from tuberculosis as long as the disease exists in any other part, in spite of the fact that modern anti-biotics have revolutionised our ideas on tuberculosis control and the management and treatment of the tuberculous patients. There are still about 12-15 million infectious tuberculosis cases in the world with a population of about 3,000 million. Each year this number is augmented by two-to-three million new cases and depleted only by about one-to-three million deaths. Now-a-days many do get cured, but the vast mass of people living in the developing countries (and in some developed ones also) are still unaffected by the treatment services so far provided. The tenacity with which tuberculosis is persisting is obvious from the fact that no country, even the most advanced ones, has yet achieved a point of control, where there is less than 1% prevalence of natural reactors to tuberculin among children below 14 years of age. In other words, specific allergy to tuberculin is found in an appreciable degree in every country. In our own country, the number of patients is increasing with the growth of population as the incidence and prevalence have not been appre-

ciably affected so far by the control measures we have been able to undertake. It must, however, be realised that the view that control of tuberculosis can be brought about by an improvement in the standards of living only is no longer tenable. On the other hand, control of this communicable disease would help in the raising of standards of living. Use of modern anti-tuberculosis drugs for the prevention of break-down of lesions and the conversion of infectious into non-infectious cases has changed all concepts of the long term trends in the epidemiology of tuberculosis. The new drugs have no doubt opened new horizons. Their use in different stages of the disease and even as a Chemo-prophylactic has given a new hope that tuberculosis control would be attainable in a reasonable time. Still new drugs are being introduced and there are endless possibilities to develop newer tuberculosis control methods with future discoveries.

Human health depends on economic standards, education of the public and the organisation of health services which in turn depend on the availability of adequate funds, technical personnel, physical facilities like clinics, dispensaries, hospitals etc and adequate supply of drugs, dressings and equipment, etc. All these have a bearing on the tuberculosis problem. It is generally known that the extent of tuberculosis in a community depends largely on the living standards of its people, and that malnutrition, poor housing and overcrowding are particularly congenial to the development of this disease. It is also recognised that a complex set of factors associated with the change of environment consequent on the movement of people from rural to industrialised or urban or semi-urban areas do play a part in the epidemiology of tuberculosis specially in the developing countries. Nevertheless to-day we have the means to initiate and develop anti-tuberculosis measures even in a developing country like India, by bridging the gap between the existing knowledge and its application.

2.1 India is a large country with an estimated population of about 486 million, distributed in 16 States and nine Territories with a total of about 330 districts. 82% of the population live in the rural areas in about 600,000 villages widely scattered throughout the country. In India each State is responsible for the health of the people through the district health organisations, hospitals, dispensaries and health centres in the community development blocks. The Government of India provides

*Text of the Presidential address delivered at the 21st Tuberculosis & Chest Diseases Workers' Conference held at Calcutta from 11th to 14th February, 1966.

assistance to the States for training and research and coordinates the efforts of the States in combating national health problems. There are about 12,000 health institutions run by the Governments. In addition, there are about 2,000 institutions run by voluntary bodies to provide health and medical care to the people. Of the 2,50,000 hospital beds in the country, 35,000 beds are exclusively for tuberculosis which are distributed in about 82 hospitals and 68 sanatoria and in the tuberculosis wings of general hospitals in the country with a few beds attached to the tuberculosis clinics. This means that there is one bed for 150-200 tuberculous patients. Since the beginning of the Second Five Year Plan, the entire country is divided into 5,200 Community Blocks. Initially the population of each Block was 60,000, but with the growth of population it is now over 75,000 per Block. In each Block, a coordinated and integrated development of agriculture, industry, education, health, housing, animal husbandry etc. have been taken up. By now most of the Blocks have a primary health centre each with three sub-centres to provide the integrated, curative and preventive services. Malaria has entered the maintenance phase in 142 units covering about 1,400 Community Development Blocks with one primary health centre in each. A sub-centre is being established for about 10,000 population with one basic health worker and one Auxiliary Nurse Midwife. These primary health centres are designed to meet the basic medical and public health needs of the rural population.

2.2 Our medical manpower consists of about 95,000 doctors of modern medicine giving a ratio of one doctor for 5,800 population. 80% of these are distributed in the urban areas where only 18 per cent of the people live while 20% of the doctors only have settled in the rural areas, where 82% people live. Expenditure on health services per head of population today varies from State to State. It is highest in Bengal at Rs. 2.20 paise while the less developed States spend only Rs. 0.50 paise per head per year though per capita income in India is over Rs. 300.00.

2.3 Our health problems are numerous and our resources are limited. Our major health problems today are communicable diseases like Malaria, Smallpox, Tuberculosis, Leprosy, Gastro intestinal diseases, Nutritional and Population pressure. Our population increases by 2.2 per cent per annum, which means an addition of 10 million people every year to the already existing population of 480 million. Rapid growth of population brings a twofold demand on the Public Health profession. First, the health needs of existing number of people have to be met and unless

there is a proportionate increase of technical personnel along with population growth, the situation will become acute. Secondly, Public Health must assume the share of responsibility for public awareness of population growth which results from death control from communicable diseases. Birth control, therefore becomes a responsibility of each physician who is responsible for death control. Without increase of economic production, population growth will only add to pauperisation and ill-health, particularly tuberculosis. Poverty breeds tuberculosis and tuberculosis breeds poverty. The social and sociological significance of increase of tuberculosis morbidity in relation to population growth should be taken note of.

3.1 Tuberculosis Problem in India

The National Tuberculosis Survey conducted in 1955-58, showed that 1.4 to 2.5% of the population have clinical tuberculosis more or less equally distributed in the urban and rural areas. Further studies in the epidemiology have increased our knowledge of tuberculosis in India. It is now estimated that there are about six million active cases of tuberculosis in India, about 1.8 million of whom are infectious. There is no definite evidence that bovine tuberculosis is a threat to the community though occasional reports of tuberculosis in cattle do disturb us. The variations in the virulence of tubercle bacillus in India from strain to strain is considerable in contrast to the strains in the European countries. It has also been found that the Indian tubercle bacillus is less virulent. Primary drug-resistance has not yet increased to any dangerous level though there is evidence that it is increasing. In the urban areas preliminary results of drug resistance survey indicate that not more than 12% of the patients show primary drug resistance to INH, 8 per cent to Streptomycin and 3 per cent to PAS. It is noteworthy that the development of disease after infection in India is much later than what has so far been reported from the Western countries. We have, therefore, to devise ways and means to combat tuberculosis in our own country according to our needs in the light of the epidemiological data and modern developments in the control methods.

3.2 Economic Aspects of Tuberculosis

In recent times, health economics have come into great prominence in order to appreciate the health situation and to give priority in Health Planning. The direct and indirect cost of illness of 6.8 million tuberculosis patients is roughly as follows:

(a) *Direct costs* : It is estimated that 1.8

million cases are infectious who need hospitalization. If they are to be hospitalised, it would roughly cost about Rs. 360 crores at Rs. 2,000 per bed per annum. But if they are treated on ambulatory basis, the cost would be about Rs. 24 crores, at the rate of 1/15th the cost of a bed. The expenditure on domiciliary treatment of live million cases is estimated to be about Rs. 66.5 crores.

This does not take into consideration the capital costs of construction.

- (b) *The Indirect costs:* Taking the cost of bringing up a child up to an age of 18 years the loss to the nation due to death of 0.5 million persons due to tuberculosis is about Rs. 1,500 crores. Loss to the nation due to disablement of 6.3 million such persons calculated at per capita income of Rs. 300 per annum is Rs. 189 crores making the total indirect costs at Rs. 1,689 crores. If both direct and indirect costs are taken into account, it is over Rs. 2,000 crores per annum.

If we have to reduce this colossal waste of funds towards the cost of illness and premature death, funds will have to be made available for the prevention and control of the disease, which would cost very much less than this expenditure per annum. This will greatly facilitate increased economic production and better health to our people.

4. National Health Plans and Tuberculosis Control

India has taken up planned socio-economic development. When these plans were first initiated it was clearly visualised that planning is a continuous process. Each of our Five Year Plans is a milestone in a long term development of thirty years. Long term objectives to be achieved by 1975-76 aimed at:

- (a) A cumulative increase of national growth as far as possible to 6% per annum so as to secure double the national income of Rs. 330 of 1960-61 to Rs. 530 in 1975-76;
- (b) creation of employment in non-agricultural pursuits for more than 46 million people; and
- (c) provision of universal education. Our objective is also to control and stabilise the growth of population over a reasonable period.

The national health plans envisage expansion of rural health services and hospitals, development of training programmes to increase the medical man-power, control of communicable diseases, provision of wholesome water supply, planned parenthood,

environmental sanitation, improvement of nutritional standards and education of the masses on health matters. With the eradication of Malaria, today Tuberculosis poses the most important major public health problem. Tuberculosis control forms one of the priority items in our National Health Programmes. Our basic health services will be "on ground" throughout the country, in the next few years. Tuberculosis control programme has to be integrated in the general health services in order to make it a success.

5.1. History of Tuberculosis Services

Though prevalence of tuberculosis was recognised in India from the time of Rig Veda (2500 B.C.), the consciousness of its existence as a major problem was recognised only in the early part of this century. Public spirited organisations and philanthropists started caring for tuberculosis patients by establishing a few sanatoria up in the mountains. The establishment of the Tuberculosis Association of India in 1939 marked the first national voluntary effort. The Association advocated, as a matter of expediency, that tuberculosis patients be treated in their homes. The anti-biotics had not seen the light of the day then, but establishing institutions to treat all tuberculosis cases was outside practical sphere. Unfortunately, at this time the second world war broke out and consequently all nation building endeavours came to a standstill. Then came Independence in August, 1947 and the aftermath of partition was another serious national calamity. The Government of India set up a separate Tuberculosis Section in the Directorate General of Health Services in 1948, which gave fillip to the initiation of tuberculosis services by the Government. Almost simultaneously the anti-biotics came into the field and made their powerful impact. The pneumothorax treatment which had held the field from the twenties of this century gave place to antimicrobial drug therapy. Streptomycin, P.A.S., Isoniazid, Thiacetazone and later Pyrazinamide, Cycloserine, Ethionomide and a host of drugs have now been added to our armaments, and these have considerably improved the status of the individual patient and the control of tuberculosis in the community. There is, however, considerable scope for further research in the treatment of tuberculosis with anti-biotics in various combinations, and intermittently instead of continuous therapy of drugs.

The clinic system and home treatment have gained momentum. The objective is to establish a fully equipped clinic with miniature X-ray in every district as early as possible. These clinics should develop district tuberculosis

control programmes as evolved by the National Tuberculosis Institute after considerable trial. Little stress is laid now on establishment of tuberculosis beds as patients can be successfully treated in their homes. Domiciliary services through the clinics, primary health centres, dispensaries and all health institutions should, therefore, be developed. Institutional beds should be utilized to treat surgical and emergency cases or cases which are drug resistant. Patients failing to respond to domiciliary treatment should also be hospitalised for special treatment that is not possible in the home. Chronic cases require hospitalisation and this can be done in cheap designed buildings. The existing 35,000 beds should therefore be rationally used and attempts made to add 15,000 more beds with proper geographic distribution in the next few plans.

In short, tuberculosis control programme covers a wide field of activity such as Preventive services, Tuberculosis Clinics, Hospitals and Sanatoria, Rehabilitation, Research and Health education. In the light of new knowledge emphasis is being given to the preventive and clinical services and domiciliary antimicrobial therapy.

5.2 National Tuberculosis Programme

National Tuberculosis Programme rests on epidemiological knowledge and the socio-economic situation prevailing in the country. We want to avail of our diagnostic and treatment facilities which are effective and within our means. Our ultimate objective is the conquest of tuberculosis if not eradication by the end of the 5th Plan period. Our programme therefore is based on the following :—

- (1) It must be countrywide in both urban and rural areas and should be established on a permanent basis.
- (2) The programme has to be "felt need oriented", which means that our stress should be on detecting patients either at homes or when they come with symptoms to our health centres and hospitals and treatment must be provided.
- (3) As it would not be either economical or feasible to have specialised services throughout the country, the Tuberculosis Programme should be integrated with the general health services while the specialised services at the District and State level should provide training and organisational guidance to the peripheral services.
- (4) All services to be established must be within our physical and economic resources.

5.3 Implementation

For the implementation of the national programme trained personnel are required. For this training facilities at tuberculosis demonstration centres, medical colleges and hospitals are organised. The National Tuberculosis Institute at Bangalore is training teams of tuberculosis workers, consisting of a medical officer, a health visitor (treatment organiser), a laboratory and X-Ray technician, a statistical assistant and a B.C.G. team leader. The UNICEF is assisting us with X-ray units, and Laboratory equipment, vehicles, films and Isoniazid. A factory has been set up at Ooty in the Nilgiris for manufacture of X-ray films and it is expected that self-sufficiency in X-ray films would be achieved soon. X-ray units upto 200 m.a. capacity are manufactured in India. Anti-tuberculosis drugs specially Isoniazid, PAS, Streptomycin and a small quantity of Thiacetazone also are being manufactured in the country though self-sufficiency has still to be achieved

5.4 Evaluation of the programme

Uniform methods for maintaining basic records are being developed so that the achievements could be measured throughout the country on a uniform basis. Standard/criteria for evaluation of the problem of tuberculosis should be followed throughout the country. Here we should depend more or less on international criteria and those provided by the W.H.O. can be a guide.

5.5 Development of the programme

5.5.1 The Domiciliary District Tuberculosis programme now being implemented all over the country has been first put to test in the areas round about Bangalore. In the course of the test-runs shortcomings are noted. These are again tested in field areas. Solutions for shortcomings are developed and are fed back for retrial into the programme. Thus, test-runs and feed back information from these runs is utilised for the improvement of the programme. In course of time all the 330 districts in the country would be able to implement a district-wide comprehensive tuberculosis service through all the existing health agencies including primary health centres on a uniform basis.

5.5.2 Case finding

Even though finding cases by X-ray appears attractive there are serious shortcomings in this method as a mass programme. Apart from the lack of precision in diagnosis by X-ray readings and the shortage of X-ray films in the country, it is extremely difficult to

organise X-ray case finding programmes in the rural areas. It is possible in urban areas where communications are good. Sputum case finding from among the symptomatic patients either at home or who come to the health centres or dispensaries appears to be the only practical method which is applicable to India. Dr. B.K. Sikand had made a significant contribution in his article in the September (1965) issue of Indian Journal of Tuberculosis on "A TB Clinic without X-ray". With the development of basic health services for every 10,000 population and the availability of trained technicians for microscopic work it would be possible to detect infectious cases in the community for treatment.

5.5.3 BCG Vaccination

India's BCG programme has been one of the greatest mass health programmes of the world. However, our shortcomings have been the poor coverage of the population in this BCG campaign. Preservation of the BCG vaccine has been extremely difficult in the interior places and in the desert areas where ice is not available. Freeze-dried vaccine produced in the country will be available for use on a mass scale shortly. An attempt is also being made to improve the quality of the vaccine.

Direct vaccination without tuberculin test is now being practised almost throughout the country in the younger age-group and it is expected to achieve a better coverage by a single "prick". The problem of integration of BCG vaccination has been discussed now extensively. Attempts have been made to integrate it with other health services, namely at primary health centre level and with taluk hospitals. The State Governments have been advised to integrate all the BCG teams at the newly developing districts tuberculosis centres.

5.5.4 Chemoprophylaxis and Research

Primary chemoprophylaxis is not considered a feasible proposition at present. Even secondary chemoprophylaxis deserves to be studied further before applying on a mass scale. Contacts can be given Isoniazid for a whole year. Acceptability of taking drugs among non-symptomatic group has been found to be doubtful. Secondary chemoprophylaxis has a definite place in paediatric tuberculosis practice.

Research: Service, Education and Research are inseparable. Research is both fundamental and applied. Though fundamental research is carried on in a few institutions in India, applied research is of great importance to us. Operational research shows us new technique

and methods to approach our problem of tuberculosis. The Tuberculosis Chemotherapy Centre at Madras has done a great service to mankind by demonstrating the value of home treatment with Chemotherapy. The intermittent Chemotherapy procedure has been a great contribution of the Chemotherapy Centre. The value of domiciliary treatment has been recognised all over the world. The Madanapalle Field Research Unit has shown that infection rates in children can be reduced by 50% by concentrated case finding and treatment services. The National Tuberculosis Institute has developed techniques of organisation for District Tuberculosis Services. These are no small gains in the field of research in tuberculosis. However, there have been administrative and organisational inadequacies in applying the results of research. Considerable lacunae still remain in our technical knowledge of tuberculosis which will no doubt be elucidated in coming years.

5.5.5 Treatment

In the chemotherapy of tuberculosis first line drugs, Streptomycin, INH, PAS and Thiacetazone should be used. The use of second line drugs like Ethionomide, Cycloserine, Pyrazinamide, Ethambutol, Viomycin Kanomycin etc., should be limited to an institution in view of their toxicity and the need for observation.

It can safely be stated that the ideal regimen is the three standard first line drugs therapy, namely Streptomycin, Isoniazid and PAS taken continuously for a whole year. This would produce clinical cure in 98% of the drug sensitive patients. Cavities and active lesions heal and become bacteriologically negative by culture indefinitely. It has been found that treatment for another six months with Isoniazid and a companion drug prevents relapse. Streptomycin daily is not tolerated for long. Therefore, it is recommended till results of drug resistance are known. If the patient is found sensitive to all three standard drugs Streptomycin is stopped after 60 to 90 days and the remaining two drugs are continued and further treatment guided by drug resistance tests. If infectiousness still persists and resistance develops to INH and PAS and the patient is sensitive to Streptomycin he can be put on Streptomycin-Pyrazinamide combination or on the three second line drugs *viz:* Cycloserine, Pyrazinamide and Ethionomide for a whole year.

The ideal treatment is not always available to all patients. Under Indian conditions it is not often possible to undertake this treatment for most of the patients. Shortage of drugs, lack of facilities for injection, treatment for a

prolonged period, high rate of default in regular drug intake, lack of facilities for drug resistance test — all these prevent following an ideal drug regimen. Though a few individuals may still be able to follow these regimen, these cannot be applied on a large scale. Simpler effective regimens that can be taken without supervision and preferably by the oral route are to be preferred. It is vital for the patient that in the early stage of treatment triple drug therapy be given uninterruptedly and when sputum is converted, double drug including Isoniazid or Isoniazid alone be given for the rest of the period of treatment.

The value of Thiacetazone in place of PAS requires further consideration. First, it has been found to be as effective as PAS in combination with Isoniazid. Secondly, it is almost one tenth the cost of PAS. Thirdly, Thiacetazone does not jeopardise the future management of the patient with other drugs. If the combination of INH and Thiacetazone fails in effecting a clinical cure, then Streptomycin and PAS combination is available for treatment as this combination is an effective, well-tried accepted treatment. But if any other combination is first used and fails, then no other effective treatment would be available. If Streptomycin-INH is used and patient fails to respond and develops resistance to these drugs, then the remaining two drugs namely PAS-Thiacetazone combination would be too toxic and ineffective. There has not been much reported work on the value of Thiacetazone-Streptomycin combination, but it is surmised that it may not be as useful as PAS-Streptomycin or INH-Streptomycin regimen. There was a fear that Thiacetazone will be too toxic for mass use but these fears are not very valid. Even though occasionally cases of dermatitis have been reported, the condition is readily manageable. In fact, the toxicity of Thiacetazone is similar to the toxicity of PAS and Sulphenamides though a little more severe. If the daily dose of 150 mgs. is not exceeded the toxicity is in reasonable limits. This is the optimum dose to be effective though recent reports from Japan suggests even a smaller daily dose is useful. There are serious difficulties in obtaining PAS in sufficient quantities and reasonable rates in the country. As such, there is no alternative but to use Thiacetazone in place of PAS in spite of slight toxicity. Experience all over the country has demonstrated that Thiacetazone in combination with Isoniazid is an effective anti-TB drug for mass use. Due to limited foreign exchange, import of second line drugs is severely restricted and if they are to be used, they should be under proper supervision in an institution.

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5.5.6 Surgery in Pulmonary Tuberculosis

Treatment facilities would be incomplete unless surgical facilities are provided for treatment of those who fail to respond to drug therapy. As stated earlier, a certain number of hospital beds in every district are necessary to cater to the essential needs, namely for emergencies and for patients who cannot be treated in homes. It is highly desirable to develop thoracic surgery units on a regional basis preferably in the teaching hospitals, so that in a State all tuberculosis hospitals need not develop surgical facilities. Thus wastage by duplication of effort will be avoided at a time when economy is of utmost importance. Today most tuberculosis sanatoria and hospitals are equipped with surgical facilities, but majority of them remain unused. In large cities, thoracic surgery units in general hospitals should undertake surgery of tuberculosis.

Surgery, if necessary, must be undertaken well within the period when patient is still sensitive to drugs specially Streptomycin or Isoniazid, though most often these patients have to be operated under the cover of the second line drugs.

5.6 Tuberculous Mothers and Infants

The problem of the tuberculous mother is of vital importance. Not only pregnancy has a bearing on tuberculosis, but tuberculosis has a bearing on pregnancy. Though the general condition of the patient appears to improve during pregnancy, it may take a serious turn after parturition if untreated. In the partition of nutriment between the mother and the embryo, the embryo functions more as a parasite depleting all essential nutriment to its advantage than as a partner. With appropriate anti-microbial therapy, the condition of the tuberculous mother substantially improves. But the question whether the anti-tuberculosis drugs have any effect on the embryo has to be further investigated. Streptomycin has its effect on the Acoustic Nerve and it is very likely that there would be some effects on the hearing of the unborn child. Some of the anti-tuberculosis drugs may also have an effect on the growth and development of the child depending on the stage of pregnancy. If it is in the first three months of pregnancy, there is a likelihood of developmental abnormalities. There appears to be scope for further research in this field. After birth the proximity of the infant to the tuberculous mother if infectious, invariably causes neo-natal infection, which may result in miliary tuberculosis, Pneumonia, Meningitis, etc. Deaths due to tuberculosis during 0-1 year are not usually notified as tuberculosis. If infantile mortality on account of tuberculosis has to be reduced, it is very necessary to intro-

duce B.C.G. Vaccine to the new-born and give special attention to the tuberculous mother. Repeated pregnancy with improper spacing is likely to devitalize the mother further leading to relapse and irreversible process of tuberculosis. This, therefore, needs the active consideration of every attending physician to advise the tuberculosis mother to have fertility control or sterilisation.

6.1 Role of the General Practitioner

The General Practitioner has patients on his rolls for relief of their felt needs in matters of health. A medical practitioner will surely detect a large number of patients of tuberculosis in his clientele. Hence there ought to be a close cooperation between the General Practitioner and the Specialised Tuberculosis Service so that assistance for speedy diagnosis and guidance can be provided to them. It is necessary for the General Practitioner to appreciate that successful and complete treatment of every tuberculosis case should be his objective. Every patient should be followed up not only till clinically cured but also to prevent relapse. The care of the contacts and their follow up will be another important responsibility of the General Practitioner. If the patient defaults in taking treatment he should be called back for treatment. So far notification of tuberculosis has not been enforced. If our National efforts are to succeed, it is necessary that the General Practitioner cooperates in the notification programme. If any patient defaults in taking drugs he should be notified to the nearest tuberculosis clinic so that he can be followed up and persuaded to take adequate treatment, which will also prevent development of resistance as well.

6.2 Refresher Courses

Medical education is a life-long study. The practitioner and the specialist have to keep abreast of times and acquaint themselves with modern advances in medicine continuously if standards of medical care are to be kept high. As every speciality is increasing in its scope and depth, it is vital that periodic refresher courses should be available to the General Practitioners to reorient them to modern trends in tuberculosis control thereby. These refresher courses may be arranged in medical centres or tuberculosis institutions, either on short term or long-term basis. The preventive and public health aspects, socio-economic factors, latest trends in chemotherapy, modern methods of tuberculosis control should all be included in these refresher courses. Some of the refresher courses may be joint sessions in a broad pattern to cover recent advances in medicine.

7.3 Undergraduate Medical Education

The medical curriculum should emphasise teaching of common diseases in developing countries. Tuberculosis is a major health problem that requires to be taught to the students from all aspects sufficiently and well. The training of medical students in tuberculosis and chest diseases requires emphasis. The period of training requires to be increased to 4 weeks and the Professor of Tuberculosis and Diseases of Chest should be given enough curricular time to teach about chest diseases also. The training should also include demonstration at the District Tuberculosis Centre, where domiciliary treatment is implemented, so that the practitioner of tomorrow would have had all the basic training required for the management and control of tuberculosis in the community both in the urban and rural areas.

6.5 Postgraduate Medical Education

There has been some controversy over Postgraduate training of a tuberculosis specialist. Certain fundamentals have to be appreciated. The Medical Council of India has recommended that the doctor after one year of Pre-registration compulsory rotating housemanship, should complete one more year of house-surgeoncy and later take two years course of study for general M.D. and after obtaining the general M.D. should proceed to the specialization in Tuberculosis for another period of two years. For the Diploma in Tuberculosis, the candidate has to take a one-year course after doing one year House Surgeoncy subsequent to full registration. The present Diploma Course is not comprehensive enough to enable the doctor to take responsibility for community health and to be incharge of a District Demonstration Programme. This requires further reorientation at the National Tuberculosis Institute at Bangalore. It may be possible to revise the present curriculum of the Diploma Course to include certain training at the National Institute of Tuberculosis. Tuberculosis is now gradually becoming a vanishing speciality after the introduction of antibiotics. The medical specialist and the general practitioner are at present managing most of the cases. For a few who wish to specialise in Tuberculosis, the field is very restricted, but it is suggested that the training should be as broad as possible. Taking the analogy of the specialist training in U.K. and U.S.A. any specialization should be built on a broad-based training in medicine or surgery. However, in India, if there is still scope for tuberculosis specialists at the senior level, they may have both avenues of approach to either specialise directly or to specialise after M.D. in general medicine.

7. Voluntary Agencies;

A National Tuberculosis Programme is the sum total of all organised efforts of the Government, the profession and the voluntary agencies of the people in a country to bring about the control of tuberculosis, with the ultimate objective of eradicating it.

Interest of the people in the tuberculosis programme can be effectively mobilised only through the organised activities of a National Tuberculosis Association, which should include people from all strata of society. The motivation for such effort is the fear of disease in the community.

It may be of interest to note that in most countries of the world, anti-tuberculosis work started out of the enthusiasm created by voluntary bodies. In India the first move on a fairly organised scale was the work done by the King George Thanksgiving (Anti-Tuberculosis) Fund in 1929-39. At the State level the Bengal Association was established a few months before the King George Thanksgiving Fund was established and did pioneer work. In 1939, thanks to the efforts of the late Lady Linlithgow, the Tuberculosis Association of India was established. After India became independent, Rajkumari Amrit Kaur, our late lamented leader in health work, gave the Association a tremendous fillip as its President and as Union Health Minister. And now our worthy Health Minister, Dr. Sushila Nayar, is providing the drive needed. The Association today has twenty affiliated State bodies. The Association organises training programmes for medical practitioners and para-medical personnel. It holds annual conferences of tuberculosis workers which is the main forum for education and orientation of the tuberculosis workers to newer concepts of control work. It runs model clinics and tuberculosis¹ hospitals. The Association undertakes health education programme and organises the Seals Sale Campaign throughout the country. Its Standing Technical Committee guides the profession and the Government by their technical advice on various issues affecting the tuberculosis programme in the country. Most of the State bodies are also doing similar good work. I am glad to be able to acknowledge that the Bengal Tuberculosis Association has undertaken extensive service programme. As one associated with the National Association for long in one capacity or the oilier, and now as its Chairman, I appeal to you to strengthen the hands of the Tuberculosis Association and its branches to fight tuberculosis.

The national T B. Association is a confederation of State Associations and their local organisations— such as District Associations.

The function of such a confederation is partly in assisting the State branches in performing or improving their work, and in creating general public interest in the national programme. Its influence should be used to secure the necessary interest and support for an effective national programme. It should endeavour to see that sufficient funds are allocated for official programmes and such funds are used for tuberculosis work and tuberculosis work only. As and when the tuberculosis problem shows evidence of decline, or as and when official programmes show signs of effective functioning, these Associations can extend their activities to fields other than tuberculosis. They can participate in general health activities, education on nutrition, family planning, and environmental hygiene, all of which do have, in ultimate analysis, a bearing on tuberculosis. As long as the voluntary association is prepared to perform the voluntary work which the tuberculosis programme demands and not sacrifice any of that work into other health programmes it may not matter that a tuberculosis association has other interest also.

8. W.H.O. Report

The W.H.O. Technical Report Series No. 290 of 1964 is an important document. It is the culmination of the deliberations of a group of experienced tuberculosis workers and it covers various aspects of tuberculosis control work. The recommendations made in this report are applicable to the conditions existing in India. It almost recommends our national programmes for acceptance to the entire developing world. The document is a landmark in the history of -tuberculosis control and satisfies the needs of the developing world.

9. National Emergency

The National emergency places great responsibility on the profession. Defence needs require priority for foreign exchange, etc. In the larger interest of the country we have to restrict imports of unessential items. Import substitution has to be encouraged. Self-sufficiency in every field should be attempted. You are already aware that there is acute shortage of X-ray films in India which is so vital for national tuberculosis programme. We have to utilise our limited resources economically and the small number of films that are available to the best of our advantage.

10. International Organisations

We have been receiving the best cooperation of international agencies like the W.H.O. and UNICEF during the last many years for the development of national tuberculosis programme including the National Tuberculosis Institute, Bangalore. The British Medical Research Council has assisted us through W.H.O. in the establishment of the Tuberculosis Chemotherapy Centre, Madras. The United States Public Health Service is also assisting two projects viz. the Feasibility Study of Chemoprophylaxis for the Prevention of Tuberculosis and Isolation of atypical myco-bacteria in the etiology of low grade tuberculin allergy in India. The International Union Against Tuberculosis is assisting the Mysore State Tuberculosis Association in organising voluntary effort in that area. Tuberculosis is a field which could bring peoples of the world together and encourage development of one world society through international cooperation.

11. We have a vast reservoir of accumulated knowledge about tuberculosis control measures. As practical men we should use them to our advantage and to suit our circumstances.

“Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time”

—Longfellow

Many a “footprint” made by great men in the past have turned into solid stepping stones for those engaged in the tuberculosis movement today. It is neither necessary nor enough, however, to step in these same footprints and merely repeat the steps taken by distinguished workers in the past. We must move forward in new directions in a spirit of dedication and with determination to each our goal which is the control of tuberculosis in India in our life time.

CHRONIC BRONCHITIS IN DELHI AS REVEALED BY MASS SURVEY

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Even though chronic respiratory disorders involving the bronchial tree cause so much of suffering and disability all over the world, its true prevalence is still not known. Gaps in this knowledge in our country are even bigger. Most of the studies reported in literature are based on symptomatic cases attending voluntarily to seek relief at various clinics and hospitals. True prevalence is likely to be significantly greater. An epidemiologist encounters several difficulties in estimating it with any reasonable degree of accuracy. The first and the foremost difficulty is caused by imprecise definitions -the term 'chronic bronchitis' is often applied loosely to cover various clinical entities leading to cough and expectoration. The same patient may be diagnosed chronic bronchitis by one, emphysema by another, and perhaps chronic bronchitis with emphysema by a third. The current diagnostic criteria constitute another difficulty. For example, antemortem diagnosis of emphysema without lung biopsy is always equivocal, as the diagnostic criteria are based entirely on pathological changes. The diagnosis of 'chronic bronchitis', on the other hand, is based on the patient's history of the duration of cough and quantity of expectoration. Not only that some of these patients may have no cough or sputum, but history taking too is highly subjective both regarding the questioner and the patient with the result that inconsistent accounts of illness are not uncommon. We have often noted that two experienced clinicians with time, patience, and deep probing, within a short period of each other, independently elicit almost contradictory accounts of the nature and duration of symptoms from the same patient. This has also been reported by Cochrane et al (1951) and Fletcher (1952).

Further, co-relation between symptoms, physical findings and radiological appearances is frequently poor. A normal chest x-ray is not inconsistent with even marked degrees of chronic bronchitis. It is not always possible to differentiate between chronic bronchitis and a mild degree of bronchiectasis without bronchography. To obviate these difficulties, physiological parameters are being advocated as diagnostic criteria (American Thoracic Society 1965). Obviously, elaborate and complicated physiological estimations requiring extensive and expensive equipment and specialized staff, cannot be made use of on a mass scale for epidemiological purposes, howsoever useful or necessary they may be for clinical purposes.

To resolve some of the semantic confusion, it is being recommended that all conditions variously labelled as chronic bronchitis, emphysema, asthma, etc. be grouped under one heading 'chronic obstructive lung disease' (American Thoracic Society, 1965) or 'chronic non-specific lung disease' (Ciba symposium, 1959). In the study under report, the term 'chronic bronchitis' has been used as synonymous with non-specific chronic lung disease, as a group diagnosis for cases of periodic cough and expectoration of two years' duration or continuous cough over one month, with or without x-ray changes suggestive of 'chronic bronchitis', where no other specific cause like pulmonary tuberculosis, new growth, pneumonitis, gross bronchiectasis, sinusitis, heart disease etc. was present. The diagnosis in our material, thus, is based entirely on clinical history and physical and x-ray examination, as no functional studies were possible.

Material

The New Delhi Tuberculosis Centre has an urban population of about 30,000 under surveillance with longitudinal x-ray surveys with the object, inter alia, of finding the prevalence and incidence of pulmonary tuberculosis in this population. The area is a slum, inhabited, by and large, by people of the lowest economic group. Hindus and Muslims are almost equal in the area, the number of Sikhs and Christians being negligible. Most of the males are labourers, unskilled workers and petty shop-keepers. There is a fair sprinkling of butchers and dairy workers and illiteracy, on the whole, is high.

In the last survey carried out between September 1964 and February 1965, 22,621 persons were x-rayed. Miniature films (70 mm), taken in the field, were read independently by two readers. Persons whose films were read as 'abnormal' by either reader were called for further investigations to the Centre. The final diagnosis was arrived at after clinical radiological and bacteriological examinations including culture of sputum for AFB. If the sputum was negative for AFB by direct smear, the diagnosis was often made after a follow up of 2 to 6 months. The coverage was nearly 90% of the eligible and available persons and the percentage of absentees (who did not attend for x-ray examination or subsequent detailed investigations, if called) was more or less the same in all age groups.

This material has been used to throw some light on the prevalence of 'chronic bronchitis' in Delhi. The present report comprises two studies:—

(A) Prevalence of x-ray changes consistent with diagnosis of 'chronic bronchitis'

With a view to standardize radiological diagnosis, a pilot study of 2,000 miniature films was arranged. One of the most eminent radiologists in the country, Dr. N.G. Gadekar, was requested to read these films and his readings were compared with ours and differences jointly discussed to standardize radiological interpretation. The following criteria were finally adopted for radiological diagnosis of 'chronic bronchitis' based on the observations from Gadekar and Sharma (1962) and Laws and Heard (1962):—

- (1) Peri-Bronchial thickening.
Shadow of a Bronchus, longitudinal or end-on, discernible more than 2 cms from the Hilum.
- (2) Lung markings exaggerated and/or extending far out towards the periphery.
- (3) Fibrous nodule.
- (4) Emphysematous changes:—
- (a) Increased radio-translucency
and
- (b) At least 2 of the following four:—
 - (i) Diaphragm at the level of the 11th rib
 - (ii) Narrow 'hanging' heart
 - (iii) Constriction of Vascular shadows
 - (iv) Bullae

(B) Symptomatic Sample Survey

In nearly 1/5th of the families (randomly selected), the census clerks enquired and recorded the presence or absence of various symptoms from persons 15 years or more in age, before the X-ray examination. The main object of this subsidiary study was assessment of the efficiency of various symptoms for TB case-finding in a selective survey. A total of 2,839 persons were thus questioned for one or the other of the following symptoms :—

- (i) Continuous cough of more than one month's duration.
- (ii) Interrupted cough with expectoration of over 2 years' duration.

As the study was primarily from the point of view of tuberculosis, the exact duration of continuous cough (if more than one month)

was not recorded. It is realized that whereas the symptom (ii) is in accordance with the accepted criterion for diagnosis of 'chronic bronchitis', symptom (i) may not always be so. However, persons with this symptom who had evidence of pulmonary tuberculosis, heart disease, or any other specific pulmonary disease having been excluded, the remaining with no radiological evidence of disease have been assumed to be suffering from 'chronic bronchitis'. It is not unlikely that some of them could be cases of upper respiratory catarrh, sinusitis etc. but their number is not likely to be high enough to exaggerate the estimate of prevalence appreciably.

Results

(A) *Prevalence*: In view of the different approach to the problem in the two studies as mentioned above, the estimates of the prevalence of 'chronic bronchitis' are given separately for the two studies.

(i) The results of the first study based on an initial radiological examination of 14,460 persons aged 15 years or more and subsequent questioning and physical and bacteriological examination of persons whose films were suggestive of 'chronic bronchitis', are shown in Tables 1 and 2. It would be seen that 431 persons (3 %) showed radiological evidence of 'chronic bronchitis'. Table 2 shows the prevalence by age and sex. The figure for women is slightly less than for men, 2.6% against 3.3% and the difference is just on the verge of significance at 5% level. However the prevalence rises with age in both sexes, reaching a maximum of 13.6% in persons 55 years or above in age.

Of these 431 radiologically diagnosed persons, 161 denied having any symptoms suggestive of chronic bronchitis when subsequently called for investigations. To what extent this denial was inaccurate and deliberate in order to escape the label of tuberculosis is not clear. The age and sex distribution, however, of those denying symptoms was almost similar to those admitting the symptoms. It is likely that in most, if not in all of these cases, symptoms were really present.

However, in view of the current definition of 'chronic bronchitis' a 3 % prevalence based on abnormal films only may not be taken as true prevalence.

(ii) An estimate of prevalence based on a preliminary census of symptoms as in the second study is likely to be more accurate. Table 3 shows the age-wise frequency of the two relevant symptoms viz. continuous cough one month or more in duration and interrupted cough 2 years or more in duration. In all,

77 or 2.7% of the persons questioned had cough of more than one month's duration and 101 or 3.6% had cough of more than 2 years' duration.

Final diagnosis of these 178 'symptomatics' is shown in Table 4. Pulmonary tuberculosis and other specific diseases accounted for 16 or 0.6% of the total 2,839 persons. In other words, the remaining 162 persons (5.7%) of the total group are eligible to be labelled as 'chronic bronchitis', subject to the reservation already made regarding persons complaining of continuous cough of over one month's duration.

Age and sex distribution of these 162 patients is shown in Table 5. On the whole,

there is significantly less disease ($P < .01$) in women than in men (4.3% against 7.0%). The prevalence in both sexes shows a continuous rise with age.

Subsequent reference to the X-ray films of these 162 symptomatics showed that while 66 (2.3%) had been marked as 'chronic bronchitis' on radiological evidence also, in the remaining 96 (3.4%) the survey X-ray film had been read as normal. Comparing the 66 cases with additional radiological evidence and the 96, whose X-ray films were within normal limits, it is interesting to find that the age and sex differences get heightened in the former, 18.2% in males and 11.4% in the females above the age of 55 years, giving over-all pre-

TABLE 1

Final diagnosis of persons aged 15 years and over x-rayed in the Survey

I. Total x-rayed	14,460	100.0%
II. Chronic Bronchitis	431	3.0%
III. Active TB	291	2.0%
IV. Other pulmonary diseases	47	0.3%
V. Heart disease	36	0.2%
VI. No evidence of disease	13,655	94.4%

TABLE 2

Prevalence of 'Chronic Bronchitis' by age and sex as found by X-ray survey (Radiological diagnosis)

Age groups (Years)	15-24	25-34	35-44	45-54	55-	Total
Male						
Number examined	2,665	1,934	1,352	943	984	7,878
Chronic Bronchitis Cases	0.3	0.9	3.2	6.2	13.9	3.3
Female						
Number examined	2,251	1,781	1,156	779	615	6,582
Chronic Bronchitis Cases	0.1	0.6	2.7	5.8	13.2	2.6
Total						
Number examined	4,916	3,715	2,508	1,722	1,599	14,460
Chronic Bronchitis Cases	0.2	0.8	2.9	6.0	13.6	3.0

TABLE 3

*Frequency of Chest Symptoms
(Percentages)*

Age groups (Years)	15—24	25—34	35-44	45-54	55-	Total
Number of persons questioned	1,079	743	487	305	225	2,839
Continuous cough one month and more	2.8	1.2	3.1	5.6	2.7	2.7
Interrupted cough two years and more	2.6	4.0	3.3	2.6	8.4	3.6
Total	5.4	5.2	6.4	8.2	11.1	63

TABLE 4

Final diagnosis of persons with chest symptoms

		Pulmonary Tuberculosis and other specific disease	Chronic Bronchitis		
			With Radiological evidence	No Radiological evidence	Total
Continuous cough - 1 month or more	77 (27%)	6 (0.2%)	22 (0.8%)	49 (1.7%)	71 (2.5%)
Interrupted cough — 2 years or more	101 (3.6%)	10 (0.4%)	44 (1.6%)	47 (3.2%)	91 (3.2%)
Total	178 (6.3%)	16 (0.6%)	66 (2.3%)	96 (3.4%)	162 (5.7%)

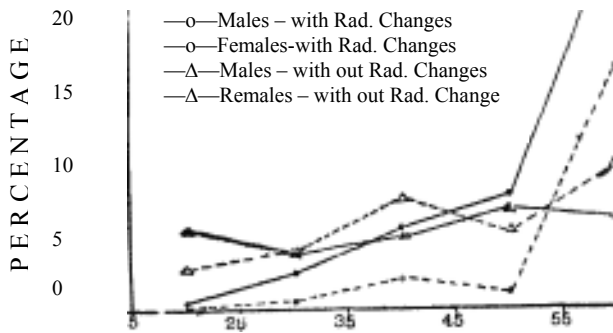
TABLE 5

Prevalence of Chronic Bronchitis by age and sex as found by 'symptom survey'
(Percentages)

Age in years		15—24	25—34	35-44	45-54	55 &	Total
Number examined	M	587	363	256	166	137	1509
	F	492	380	231	139	88	1303
Symptomatics without Radiological changes	M	3.7%	2.5%	2.5%	4.8%	4.4%	3.6%
	F	1.8%	2.6%	5.2%	3.6%	6.8%	3.2%
Symptomatics with Radiological changes	M	0.2%	1.7%	3.9%	5.4%	18.2%	3.4%
	F	0.0%	0.3%	1.3%	0.7%	11.4%	1.1%
All Cases	M	3.9%	4.1%	7.4%	10.2%	22.6%	7.0%
	F	1.8%	2.9%	6.5%	4.3%	18.2%	4.3%

valence of 3.4% in males and 1.1% in females. On the other hand in the latter i.e. symptomatic but X-ray negative cases, there is hardly any age and sex variation. This difference is shown diagrammatically in Figure 1 and further discussed later.

PREVALENCE OF CH. BRONCHITIS BY AGE & SEX AS FOUND BY 'SYMPTOM SURVEY'



(b) *Smoking and Chronic Bronchitis*: Table 6 shows the smoking habits of 'chronic bronchitis' cases as well as the remaining males in the subsidiary study. As in practically all

studies on the subject, it was found that association between the two is statistically significant ($X^2=91.3$ for 1 d.f. $P<0.01$). Not merely was smoking more frequent among the 'chronic bronchitis' patients but the proportion of heavy smokers too was significantly higher in this group. Among them 14% were heavy smokers*, 27% medium smokers and 24% light smokers, whereas in the "non-bronchitis" persons the corresponding percentages were 5, 11 and 11 respectively.

(B) *Chronic bronchitis and the fuel used in the household*: Wig (1960) had hinted at the possibility of smoke from the fuel used in the homes being a factor in the causation of 'chronic bronchitis' in females. With a view to test this hypothesis, information about the type of fuel used in the homes of female 'chronic bronchitis' cases as well as the other homes was collected and is shown in Table 7. The proportion of 'chronic bronchitis' patients using cowdung cakes and wood (which emit a lot of smoke) as fuel was very much higher (73.6%) than the corresponding percentage in the "non-bronchitis" homes (17.2%). The association between 'chronic bronchitis' and fuel used was found to be highly significant statistically ($X^2=10.9$ for 2 d.f. $P<0.01$).

Discussion

Most of the existing knowledge about 'chronic bronchitis' is based on study of the

*Heavy smokers 20 cigarettes or bidis per day 10-19
Medium smokers 10
Light smokers

TABLE 6

Chronic Bronchitis in males in relation to smoking

	Smokers and ex-smokers	Non Smokers	Total
Chronic Bronchitis	75 71.4%	30 28.6%	105 100.0%
No Chronic Bronchitis	374 8%	1022 73.2%	1396* 100.0%
Total	449 29.9%	1052 70.1%	1501* 100.0%

* Excluding 8 persons whose smoking history could not be ascertained.

TABLE 7

Chronic Bronchitis in Females in relation to fuel used

	Dung cakes	Wood and sawdust	Hard Coke and Charcoal	Total
Chronic Bronchitis	19 33.3%	23 40.3%	15 26.3%	57 100.0%
No Chronic Bronchitis	84 7.1%	121 10.1%	984 82.8%	1189* 100.0%
Total	103 8.3%	144 11.6%	999 80.2%	1246* 100.0%

* Excluding 84 persons about whom information regarding fuel used could not be collected.

cases reporting with symptoms at the various general and specialized clinics and hospitals. Very few surveys have been carried out in the general population in India or abroad. Wig et al (1964) carried out a survey of about 1400 persons in a village near Delhi and reported a prevalence of 3.3% in males and 2.2% in females with an over-all prevalence of 3% in rural population. A survey of nearly 600 persons carried out by the same workers in a selected urban population (AIIMS Campus) showed the prevalence to be 1.4% in males and 0.56% in females with an over-all prevalence of 1%, the differences noted in these two surveys being attributed to difference in the economic status

and smoking history. Vishwanathan (1964) in a comparable urban population (Delhi University Campus) found the prevalence to be 7% in males and 4.9% in females with an over-all prevalence of 6.1%. Further, Vishwanathan found no difference in prevalence in various income groups. The dissimilarities in the findings of these workers are obvious.

In a representative sample of persons, 15 years and above in age, a survey of symptomatics carried out by us showed that 3.6% had interrupted cough of more than 2 years' duration and 2.7% had persistent cough of more than one month's duration. This frequency of cough is much less than in the Western coun-

tries. For example Wynder et al (1965) reported 45% of New York males complaining of persistent cough, out of whom 14% were non-smokers and 68% heavy smokers.

After excluding 0.6% persons found suffering from pulmonary tuberculosis or other specific chest diseases, the remaining 5.7% may be taken as constituting the maximum prevalence of 'chronic bronchitis' in this population. It has already been mentioned that the exact duration of cough, if continuous and over one month, was not recorded, though many of the patients may have fulfilled the diagnostic criterion of continuous cough of more than one year's duration (Vishwanathan 1964). If because of this lacuna, the 1.7% cases who had no radiological evidence of 'chronic bronchitis' and whose duration of cough was uncertain (but continuous and more than one month) are excluded, the prevalence comes to 4.0%. It may therefore be concluded that the prevalence of chronic bronchitis' amongst persons of 15 years or above in this population lies between 4.0% and 5.7%.

Garston et al (1961) reported a prevalence of 36% in males of 30 years or more in age, and 4 times more disease amongst men than in women in United Kingdom. Brinkman et al (1962) reported a prevalence of 17.4% in males in the age group 40 to 44 years and 24.7% in the age group 60 to 64 years in U.S.A. It is difficult to say whether the difference in prevalence in Delhi and the Western countries is, entirely or mainly, due to climatic conditions, atmospheric pollution, smoking habits etc. which are all supposed to influence the prevalence of 'chronic bronchitis' or whether it is also due to a different natural history in varying ethnic groups.

The association of smoking with chronic bronchitis is too well established to need any further comments, except to state that the present study also corroborates the relationship.

This study further tends to suggest a significant co-relation between the fuel used in the household and the prevalence of 'chronic bronchitis' amongst females. It has been shown that whereas cowdung cakes, sawdust and wood, which produce smoke the most, were used as fuel by nearly 3/4th of the families with 'chronic bronchitis' cases, less than 1/5th of the families which had no female case of 'chronic bronchitis' used this fuel. No doubt cowdung cakes and wood are used as a fuel, at least in cities, by low income group only; and the relationship of 'chronic bronchitis' to economic status, *per se*, could not be studied in this population, firstly because almost the entire population belongs to the low income group and secondly because assessment of real econo-

mic status (as different from family income) is not easy. The available evidence, therefore, does not establish a causal relationship between the use of cowdung cakes as fuel and 'chronic bronchitis', though the association is highly significant.

A noteworthy feature of this study is, that the persons who showed radiological evidence of disease appear to be different from those who were radiologically negative, symptoms being common in both (Figure 1). Whereas the prevalence of disease without radiological evidence showed no marked age and sex variation, cases with radiological evidence were more frequent amongst males than females (3.4% against 1.1%), and the prevalence increased with age. The following questions naturally arise:—

1. Do these persons who have symptoms suggestive of 'chronic bronchitis' but no radiological evidence of disease really suffer from 'chronic bronchitis'? Or is the cough due to some other cause e.g. Sinusitis, upper respiratory catarrh etc. in many, if not all of them? Radiological abnormality is not always present in 'chronic bronchitis'. Burrows et al (1964) reported little or no radiological change in 36% of definite cases of 'chronic bronchitis' and Vishwanathan (1964) in 32%. The X-ray was within normal limits in as many as 60% of our symptomatics.

2. Is it that the radiological change is an evidence of severity and/or longer duration of the disease, and the cases with radiological change in addition to symptoms were the severer ones and the remaining cases (which were more than half of the total) who had only symptoms but no radiological change were milder and/or of shorter duration?

3. Is the present definition of 'chronic bronchitis', based entirely on the history of symptoms as given by the patient adequate, more so, when it is known that the patient's version of nature and duration of complaints is neither always correct nor consistent? How far can radiological and physiological findings be included in the definition?

Answers to these questions are necessary to clarify the obscurities in definition, prevalence and natural history of 'chronic bronchitis', as also to explain the differences in the pattern in India and the Western countries. Only longitudinal surveys by keeping a fairly large population under surveillance for a sufficiently long period can provide the answers.

Summary

Material from an X-ray survey in a population of about 30,000 and symptomatic survey in a representative sample of 2,839 persons, 15

years or more in age, has been utilized to estimate the prevalence of 'chronic bronchitis'. The prevalence as judged from the presence of symptoms only, appears to be between 3.9% and 5.6% in this population but only about half of these symptomatics had, in addition, radiological features associated with 'chronic bronchitis'. The pattern regarding age and sex distribution in these two sub-groups is different. Long term surveillance of a large population is necessary to assess the significance of these differences, remove the shortcomings of the current definition and study the natural history of the disease in our country.

The study corroborates association of 'chronic bronchitis' in males with smoking. A study of the fuel used in the household has shown highly significant co-relation between 'chronic bronchitis' in females and use of cowdung cakes, wood and sawdust as fuel.

Acknowledgement

Grateful thanks are due to Dr. N. G. Gadekar, Professor of Radiology, All India Institute of Medical Sciences, Delhi, for his invaluable help in interpretation of radiological

criteria for diagnosis, reading of nearly 2,000 miniature films independently and then discussion of differences jointly.

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THE ROLE OF NUTRITIONAL FACTORS IN TUBERCULOSIS

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Introduction

Malnutrition and tuberculosis are both problems of considerable magnitude in most underdeveloped regions of the world. The prevalence of widespread malnutrition in the population may be expected to pose some special problems with regard to the control of tuberculosis in developing countries.

The role of nutritional factors in tuberculosis has attracted wide interest. Considerable epidemiological, experimental and clinical evidence pointing to the importance of nutritional factors in tuberculosis has been adduced. The direct evidence or proof, however, of the effect of nutrition on the morbidity and mortality of tuberculosis in human population is difficult to obtain. This is because the role of nutritional factors is often obscured by a whole complex of coincident environmental factors. However, the "involuntary mass experiments" necessitated by the world wars have provided circumstantial evidence of the role of nutrition in the epidemiology of tuberculosis.

An enquiry among Indian Army Personnel showed that married men had a significantly higher incidence of pulmonary tuberculosis than unmarried men. Sanyal (1958) concluded that this was partly the result of infection transmitted from family members in their overcrowded accommodation and partly the result of their defective nutritional status arising from economic circumstances.

Some of this epidemiological evidence is confusing and contradictory and much of it can hardly be described as precise, conclusive or indisputable. Despite these limitations, the weight of evidence still favours the view that malnutrition may be an important factor in the high morbidity and mortality from tuberculosis in population subjected to food shortage. Excellent reviews on the subjects of the relationship between malnutrition and tuberculosis are available.

Apart from the question of whether malnutrition predisposes to tuberculosis or not, the coexistence of malnutrition and tuberculosis poses some special problems with regard to the control of tuberculosis in developing countries. The object of this note is to draw attention to some problems of tuberculosis in

under-nourished communities, which would seem to merit further investigation.

In any consideration of the role of nutrition in tuberculosis, three important questions arise: Does malnutrition predispose to tuberculous infection? Does malnutrition influence or modify the course of established tuberculous infection? Do nutritional factors influence the response to chemotherapy? The last question, which presents fewer difficulties in investigation than the other two, may be considered first.

Role of diet in the treatment of pulmonary tuberculosis

The clinical trials carried out at the Tuberculosis Chemotherapy Centre, Madras, where two groups of patients, one treated in the homes and the other in the sanatorium, were investigated, have thrown considerable light on this question. The protein intakes in the dietaries of the "home" patients were significantly lower than in those of the sanatoria subjects. Thus while 96% of the cases treated in the sanatoria had protein intake of over 60 g. daily, only 30% of the home patients had this level of protein. Also, while all patients treated in the sanatoria had a daily intake of at least 30 g. of animal protein in the diet, only 8% of "home" patients had this level of animal protein. However, it was observed that the response to chemotherapy of the patients in the home series closely approached that of the sanatoria patients. The same combination of drugs was used in both groups. Thus it was apparent that in the current context of potent chemotherapy, diet was not of crucial importance in attaining of quiescence. The sanatorium patients, however, showed a greater reduction in the erythrocyte sedimentation rate and a greater increase in body weight than the home group. The significance of these differences between the two groups remain to be assessed.

A four-year follow-up of the cases admitted for the study in the trials at the Madras Tuberculosis Chemotherapy Centre showed that though during the period of follow-up all these patients were managed on a domiciliary basis about 90% of the patients in both series maintained quiescence throughout the four-year period follow-up in spite of the fact that

they were living under great stress of socio-economic conditions including poor diet. Furthermore, the few (12) patients who had a bacteriological relapse were at no special dietary disadvantage in comparison with those who had quiescent disease throughout.

In the vast literature on the subject of nutrition and tuberculosis, there is apparently no record of a largescale investigation in which the response to treatment of two groups of tuberculosis patients differing from each other with regard to their diet alone have been compared.

To elucidate the specific role of dietary factors, it would seem desirable to carry out a study of the responses to treatment of two groups of tuberculosis patients receiving identical therapy under identical environmental conditions, but maintained on two different dietary regimes under controlled conditions. Such a study obviously can be undertaken only in a hospital or a sanatorium. In such an investigation, it will be possible to avoid wide intra-group dietary differences (of the type encountered in the Madras study) which often vitiate inter-group comparisons. The results of such a study may present fewer limitations and difficulties in interpretation from the point of view of the role of dietary factors.

A study of this kind may be considered to be complementary to the investigation already undertaken at the Tuberculosis Chemotherapy Centre in Madras.

In comparing the radiographic responses to treatment in the two dietary groups, it would seem desirable to include among the criteria of assessment the degree of fibrosis and calcification also. It has been shown that undernutrition may impair the proliferation of fibrous tissues in liver following on parenchymal damage. Thus it was found that the degree of fibrosis following on carbon tetrachloride injury was considerably less in the undernourished group than in the well-fed controls (Sriramachari—personal communication). In the light of this, it can be argued that, in undernutrition, healing by fibrosis may be impaired. In support of this view, it has been claimed by some workers in India that fibrosis in the lungs following on tuberculosis is far less in evidence in the undernourished segments of the population than in the well-to-do. This is a subject that would seem to require further investigation and may have a possible bearing on the question of relapse. In any investigation of this kind, it will be necessary in the first place to define the precise criteria for the assessment of fibrosis in a radiograph.

It may also be possible to decide through this investigation whether the develop-

ment of drug resistance is influenced by the nutritional status of the host. This is obviously a question of fundamental and practical importance. There is at present no definite information on this important aspect apart from the data from the Tuberculosis Chemotherapy Centre in Madras regarding the incidence of drug resistance in "home" and "sanatorium" groups of patients.

The work in the Tuberculosis Chemotherapy Centre had indicated that the patients treated in the sanatorium showed a greater reduction in the erythrocyte sedimentation rate and a greater increase in body weight than those treated at home. In the first place, it has to be determined whether a similar difference in the reduction in the erythrocyte sedimentation rate is observed also in two groups, on different dietary regimes, treated under identical environmental conditions as suggested here. If such a difference is observed, then its significance will deserve further investigation.

The significance of the greater increase in body weight in the tuberculosis patients receiving better diets during treatment would also merit more detailed investigation. Nitrogen-balance studies in tuberculosis cases have indicated a striking capacity on the part of the patients to retain large amounts of nitrogen but there is often no parallelism between nitrogen retention and increase in body weight (Narasinga Rao and Gopalan, 1958). It appeared from these studies that, in the active stages of the disease, a high-calorie and high-protein diet may result mainly in the deposition of body fat which may later be lost when the disease is being controlled. It would, therefore, be important to investigate how far the differences in the increase in body weight between two groups on different dietary regimes are attributable to an increment of body fat and how far to tissue protein. Such studies in body composition will throw better light on the significance of weight changes and help to assess the optimum dietary requirements in tuberculosis.

Malnutrition and bacterial virulence

While a good nutritional status promotes optimal levels of antibody production, it may also favour bacterial multiplication. The balance of evidence, however, seems to indicate that the adverse effects of inadequate nutrition are felt more on the host than on the parasite. In experimental tuberculosis, malnutrition whether qualitative or quantitative, prior to and during the course of infection exerts an adverse effect on the survival period of the host (Sirsi). In addition, the tubercle bacilli are capable of lying dormant for long periods of

time, to become reactivated during periods of nutritional deprivation—an observation supported by the marked rise in the incidence of tuberculosis during famine and war conditions.

Indian strains of tubercle bacilli have been reported to be a low virulence and drug sensitive (Dhayagude and Shah 1948; Mitchison et al 1960). These studies have mostly been carried out on bacilli isolated from patients of the poor economic groups. It would be of some importance to determine whether the high prevalence of low virulence strains observed in this country is, in fact, related to the poor nutritional status of the patients. Cultivation of tubercle bacilli on synthetic media deficient in certain nutrients has been known to convert virulent strains into avirulent mutants. (Youmans and Youmans 1956). In view of this experimental observation and in view of the reported wider range of virulence of bacilli in Indian patients as compared to English patients it may be desirable to determine the pattern of virulent strains in Indian patients belonging to the low income groups who are undernourished and those belonging to the upper income groups who are well nourished.

It may also be necessary to examine the virulence of the tubercle bacilli in the large number of tuberculosis cases observed in subjects suffering from frank nutritional deficiency disease, to decide if, in such a grossly undernourished group, the virulence is specially low.

Investigations on these lines may help to bring the subject of inter-relationship of nutrition and tuberculosis into better focus.

The problem of nursing mothers and infants

In developing countries, nursing mothers constitute the most important population segment affected by tuberculosis. They are also a highly vulnerable segment from the nutritional standpoint. All available evidence points to a relatively high incidence, in under-developed regions, of pulmonary tuberculosis in women in the child-bearing period. Nearly 80% of women suffering from pulmonary tuberculosis admitted to the hospitals in South India have been found to be mothers between 15 and 35 years of age; in a great majority of them, the onset of the disease was found to be within the first six months after delivery. Apart from the high incidence, tuberculosis in nursing-mothers presents some special problems which are of considerable importance to the community.

In poor Indian communities, women breast-feed their infants for prolonged periods often extending up to two years (Gopalan,

1958). Despite their poor health and nutritional status, such mothers secrete adequate amounts of breast milk of food quantity (Gopalan, loc. cit). But for this satisfactory lactation, the problem of protein malnutrition in the children of these poor communities would be even worse than what it is today.

Considering these factors, it is reasonable to expect a high incidence of tuberculosis in infants and children in these communities. The observations of Achar (1958) who found a very high incidence of tuberculous meningitis among children of poor communities in Madras are in line with these expectations. It has also been observed that nearly one-third of all cases of tuberculous meningitis in Madras occurred in infants below one year of age, whereas, in a series in Los Angeles, only 9% of cases were infants below a year. Further, in Madras, there were several cases in infants of less than six months of age, while there were none in the Los Angeles series. The problem of the prevention and treatment of tuberculosis in nursing-mothers in the underdeveloped regions is, therefore, of immense practical importance.

In advanced countries, when tuberculosis is detected in the mother, the infant is normally segregated and brought up on "artificial" foods. In many developing countries, however, this is not feasible and the best method would perhaps lie in the thorough treatment of the mother, and probably BCG vaccination of the infant and/or chemoprophylaxis (Canetti, 1956).

Both PAS and Isoniazid have been shown to pass into the breast milk of mothers receiving these drugs orally. (Renovanz and Schattmann, 1953; Lass and Hunger, 1953; Ricci and Copaitich, 1954; Camurri, 1952). The effect of small amounts of the drugs consumed by the infants over prolonged periods on the possible development of drug resistance and consequent interference with treatment in the event of infection, requires consideration.

Drug toxicity

The pathogenesis of isoniazid-induced peripheral neuropathy has now been investigated in several centres including the Tuberculosis Chemotherapy Centre in Madras. Among well-nourished population groups, peripheral neuropathy is reported to be rare in patients receiving dosages of isoniazid of the order of 5 mg/kg, though it is frequently found in subjects receiving higher doses. In poor Indian communities, peripheral neuropathy of nutritional origin has been observed frequently among poor segments of the population, especially in women.

While there is good evidence that isoniazid-induced peripheral neuropathy is probably related to pyridoxine deficiency, there are certain aspects of the problem that seem to require further investigation. The finding that peripheral neuritis following isoniazid treatment responds to a vitamin B complex preparation containing thiamine, riboflavine, and nicotinamide, but not pyridoxine, (Turner 1959, personal communication) and the observation of Cedrangolo (1955) that the administration of glutamic acid with isoniazid prevents the development of peripheral neuritis, raise other possibilities.

The possible role of induced copper deficiency would also seem to merit investigation in this connection. It has been shown that isoniazid and copper may form a complex which may compete with hydrogen peroxide for a place in the catalase molecule (Maher et al, 1957). It has also been shown that pyridoxine deficiency may be accompanied by increased elimination of copper (Guha—personal communication).

In the management of peripheral neuropathy complicating isoniazid administration, the optimum dosage of pyridoxine to be employed is obviously of importance, particularly since it is claimed that pyridoxine and isoniazid may have effects on the bacilli, which are antagonistic to each other. (Pope 1952, 1956 McCune et al, 1957). Other workers, however, have not been able to detect such effect (Ungar et al 1956, Teehert Koff 1957). Of practical significance would be the finding by the Chemotherapy Centre at Madras, that supplementation of 2 mg. of pyridoxine daily, to patients receiving isoniazid, almost completely prevents the incidence of peripheral neuritis.

Incidence Of Tuberculosis In Malnutrition

A study of the incidence and clinical behaviour of tuberculosis in grossly undernourished subjects may be expected to provide some information regarding the inter-relationship between nutrition and tuberculosis. A reference to this aspect has been made earlier. The common types of nutritional deficiency disease encountered in South India are nutritional oedema arising from calorie and protein undernutrition, iron deficiency anaemias aggravated by hook-worm infection, pellagra and vitamin B complex deficiency among adults, and kwashiorkor (protein-calorie malnutrition) and vitamin A deficiency among children. The incidence of tuberculosis in these patients as shown by radiological evidence was far greater than the reported figures for the incidence of the disease in the general population in these regions. The response to combined chemo-

therapy and nutritional rehabilitation in these patients was adequate, though it may be mentioned here that between chemotherapy and nutritional rehabilitation, the more important of the two appeared to be chemotherapy.

Role Of Various Constituents Of Food In Tuberculosis Morbidity

It does, however, seem probable that protein deficiency may have an adverse effect on acquiring immunity, since adequate antibody production is impaired in protein malnutrition states. It has been shown that with radiological evidence of tuberculosis the tuberculin reaction can be negative in children who are grossly under-nourished. Nutritional rehabilitation of such children renders the tuberculin test positive—indicating thereby the antibody status and the limitation of assessment of the incidence of tuberculosis on the basis of tuberculin reaction in malnourished populations.

Though a high incidence of pulmonary tuberculosis is present in persons suffering from gross malnutrition, such persons rarely seek treatment. The long waiting list for admission to tuberculosis hospitals and sanatoria in developing countries, makes it virtually impossible for these poorest segments to obtain treatment in hospitals and it is not possible to persuade these patients to undergo thorough treatment at clinics. Thus this segment with the highest incidence of tuberculosis, which constitutes, as it were, the base of the disease pyramid, is today hardly touched by the available methods of control and treatment. This untreated segment may be expected to constitute the reservoir of infection in these poor communities. The manner in which this situation has to be rectified required special consideration.

Conclusion

It is widely believed that nutrition is among the dominant factors that determines body resistance to disease and to stresses and strains. Therefore, it is likely that one of the factors responsible for higher prevalence of tuberculosis in under-developed countries is poor nutrition. But in countries where malnutrition and undernutrition are widespread, improvement of nutritional status as a public health measure in tuberculosis control does not appear to be immediately possible from the practical standpoint. For a number of reasons, the problem of nutrition must be tackled over a wider range and on a long term basis.

Information now available regarding the various facts of the relationship between nutrition and tuberculosis is perhaps still inconclu-

sive. In order to elucidate such relationship much more study needs to be carried out and it is necessary that the attention of workers be drawn towards the direction which such studies should take. However, on the basis of current knowledge regarding the disease and the understanding of treatment procedures generally in use it is perhaps wise to emphasise the relative importance of drugs vis-a-vis nutrition, in the management of the disease. This is necessary specially in the developing countries where undue emphasis on the role of nutrition in tuberculosis may result in lop-sided development of treatment facilities and allotment of limited resources. This, however, should not be interpreted as indicating that nutrition has little or no role in the disease process.

The problems on which further study and research is called for are:

1. Response to treatment of two groups of tuberculosis patients receiving identical therapy under the same environmental condition but maintained on two different dietary regimes under controlled condition. In comparing the radiography responses in the two dietary groups it would seem desirable to include among the criteria of assessment the degree of fibrosis and calcification. The significance of quicker return of erythrocyte sedimentation rate to normal and the greater increase of body weight in tuberculosis patients receiving better diets during treatment also needs evaluation.
2. The influence of host nutritional status on the development of bacterial drug resistance.
3. The relationship between host nutritional status and bacterial virulence.
4. Prevention and treatment of tuberculosis in nursing mothers and their infants.

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A FIELD STUDY ON THE IMPORTANCE OF SYMPTOM SURVEY IN EARLY DETECTION OF TB CASES IN AN URBAN COMMUNITY*

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Introduction

The common methods used for the early detection of tuberculosis cases are: (1) X-Ray, (2) Sputum Examination and (3) Tuberculin test. Out of these, X-Ray is the costliest and is not within the reach of the general medical practitioners or health centres. It is also not practicable for public health purposes due to shortage of trained staff, difficulty in transportation, frequent break-downs and repairs. The second method, namely the sputum examination, is cheap, economical and within the reach of every medical officer, because it requires only a small laboratory with a microscope, stains and slides. This method can succeed only by active co-operation of the general public which is almost always very difficult to get. Hence, it is also an equally difficult method for detection of new cases in mass survey. Third method, the tuberculin test is not diagnostic in the sense in which it is required. It is being used for mass B.C.G. programme, and is only a preliminary to carry out further detailed investigations.

The National Tuberculosis Institute of India, Bangalore, has carried out a Sociological study of Awareness of Symptoms among persons with pulmonary Tuberculosis (Banerjee, et al 1961). The result of the investigation was that only 27 per cent of the radiologically active cases were found to be known to the relatively efficient tuberculosis service. Most of the sputum positive persons detected in the course of an epidemiological survey were found to be symptomatic by direct questioning. They also observed that 69.4 percent of cases gave a history of cough. It was suggested that as an exploratory possibility this can be used as a mass screening method in the urban and rural communities. Banerjee et al conducted the study amongst the patients attending the clinics, whereas, no study has been carried out in the general population. The objective of our present study was to know that —

- i. how many active and probably active tuberculosis cases can be detected by symptom survey?
- ii. is there any difference in the number of detection of cases between qualified doctors and para-medical personnel?

* Editor's Note: This is the usual working method of any clinic with a propaganda wing. The Author's study is particularly directed to personal contact of the population by BCG teams etc.

- iii. what symptom harvests maximum number of cases?

Materials and methods

This study was carried out in the Urban Health Centre area of the Department of Preventive and Social Medicine covering 5113 population by house-to-house survey. Majority of the population is of lower socio-economic condition with very few rich people. The commonest occupations are fisherman, domestic servant, rickshaw puller, unskilled labourer and petty businessman. Ninety per cent of the houses are single-room thatched huts with mud floors.

The whole Urban Health Centre area is somewhat like a slum of a big town though the area is provided with the basic amenities like water supply, electricity, road, open drainage and public latrines. This health centre caters for their comprehensive medical care including domiciliary treatment of tuberculosis in co-operation with tuberculosis clinic. The treatment of tuberculosis, however, started only after our present study was over when the cases were known in the area.

The area was divided into two parts: (1) Kurichikuppam and (2) Vazhakulam. One area was given to the House Surgeons posted in the Department of Preventive and Social Medicine and other one to the para-medical personnel working at the Union Health Centre, viz., Social workers, Public Health Nurse and Midwives, for carrying out house-to-house survey. An enquiry was made on a prepared schedule for recording the information.

Each family was enquired about any member of the family giving a history of cough, its duration with or without expectoration, presence or absence of haemoptysis, history of fever and chest pain.

Once the initial survey was over, those family members who gave the history of cough, irrespective of its duration or any other associated symptoms, their sputum was examined for acid fast bacilli. Only one sputum specimen (early morning) was collected. A sputum collection tin was given in the evening and the individual was explained about the objective and the procedure. The sputum was collected next day in the morning and examined in the laboratory. Only two of the specimens were found to be positive for A.F.B. Besides this, all

of them were subjected to screening of the chest.

The total number of cases† in the area were checked afterwards by (1) tuberculin test which was carried out with the help of B.C.G. team and suspected cases thus detected were subjected to further investigation for confirmation of diagnosis and treatment; (2) the total number of cases from the study area who were under treatment at the Pondicherry state Tuberculosis clinic, upto now which were unknown to the Health Centre and the survey team. Non-availability of portable X-ray machine made us to depend on the present method for assessing the total number of active cases in the community.

Results

Table I shows the population distribution, expected number of cases in the population based on All-India figures, and cases under treatment at T.B. Clinic (Not known to the Health Centre before Survey) and total number of cases detected by the present survey.

economic and housing conditions, etc. of the population. But actual active cases detected and now under treatment are only 46. The number of cases detected by our present survey were only 13, that is 19 per cent of the expected cases. So by this method only one fifth of the cases were detected. Cases on the basis of Sputum Survey (0.2 per cent rate—ICMR 1958) should be 9-11 (only bacillary active) which is less than the total bacillary cases which were detected by our present symptom survey. From this data, it appears that a comparatively simpler symptom survey is more effective in detecting total number of active cases in a community than sputum survey which requires more co-operation from the public for early detection of cases. One of the obvious reasons for this, is the fact that the sputum survey can detect only the active bacillary cases and not the active abacillary one. Out of the total 18 cases who were already taking treatment from the State T.B. Clinic during the present survey, only three of them were detected, as well, by the symptom survey. Rest of the 10 cases were new detection.

TABLE I

Showing the Population Distribution and expected No. of Cases

Category of survey personnel	Area	Population	Expected No. of cases (Bacil.+)	Total expected no. of active cases (Bacillary + active abacillary).	Total No. of active cases detected by symptom survey.	Total No. of active cases already known to TB. clinic	Total No. of active cases actually detected by mass screening afterward + Total No. of cases already known to
Qualified doctors	Kurichikuppam	2731	5—6	35	9	14	30
Paramedical Personnel	Vazhakulam	2382	4—5	31	4	4	16
Total:		5113	9—11	66	13	18	46

On the basis of 1.3 per cent prevalence rate (ICMR 1958) we should expect 66 cases in a population of 5113 though we presume that the average figures of the National Sample survey may not be exactly applicable to all areas since it has been provided that there is variation in the prevalence of disease in relation to socio-

* (Hereafter the word 'cases' will denote total number of active bacillary & abacillary cases unless it is mentioned otherwise.);

It is evident from the Table I that the number of cases detected in Kurichikuppam by qualified personnel is nearly double as compared to the cases detected by the para-medical personnel in Vazhakulam. For this, we may be tempted to make the conclusion that case detection rate by the qualified personnel is almost double than the rate expected by the para-medical personnel. But from the Table I, it is clear that the percentage of cases 'Not

detected' by both type of personnel is almost the same (70 per cent and 75 per cent respectively). Obviously, the reason is that there are a large number of cases in the area where the medical personnel carried out the survey. This brings out an important point, that even the para-medical personnel can be equally effective in detecting new cases by symptom survey. From the findings in Table I, it seems also that the mass screening by symptom survey is only next to the best method of survey, e.g. X-ray chest. However, this observation needs further exploration before we come to some definite conclusion.

cough, fever and chest pain- together, we can detect maximum number of cases. This leads us to think that cough, fever and chest pain combination may be used conveniently for detection of cases for mass screening in the community. However, this needs further study before it can be recommended as an alternative mass screening method where resource of the health authority is limited.

This study brings out that the symptom survey can be used conveniently for preliminary mass screening purposes which may be followed by further laboratory investigations. Though it is a simpler method, it harvests more number

TABLE II

Showing the percentage of cases not detected by cough survey

	No. of persons with history of symptoms.	No. of active cases out of col. (1)	CASES	
			Total No. of active cases actually detected by mass screening	Not detected by symptom survey
Kurichikuppam	20	9 4	30	21(70)
Vazhakulam	24		16	12(75)
	44	13	46	33(1.7)

(Figures in the bracket indicate percentage)

The Table II also shows that about 44 people who gave a history of any of these symptoms, only 13 were proved to be active cases, while the actual number of cases detected afterwards were 46. It shows that 71.7 per cent of the existing cases could not be detected by the cough survey.

Combination of Symptoms

Table III and IV show the relative proportion of various symptom groups and its relation with case detection rate. It seems that out of 44 cases 42 gave a history of cough. Out of the symptoms a history of cough was given by 95 per cent, fever and chest pain in 38 per cent and haemoptysis by 9 per cent. In active cases (both bacillary and active abacillary) history of haemoptysis was most important.

Four cases were detected with cough and fever, whereas cough, fever and chest pain increased 3 more cases, chest pain and haemoptysis another 3 cases. It is also evident from the Table IV that when we combine the

of active cases comparing with what can be expected by sputum survey, as the later can detect only the active bacillary cases. The sputum survey requires active co-operation of the public, trained personnel and materials, whereas the present method is free from all these disadvantages. It will be a good idea if the B.C.G. Team while doing their home visiting for mass B.C.G. programme can simultaneously carry out symptom survey and refer the persons with positive sputums to the T.B. clinic for further investigation.

SUMMARY

1. Tuberculosis symptom survey was carried out in an urban community in Pondicherry.
2. Only 28 percent of the active cases could be detected by the present symptom survey.
3. There is no significant difference between the rate of disease detection when the qualified doctors were used for survey as compared with para-medical personnel.

TABLE III

Showing number of persons giving history of any one' or more symptoms

Symptoms	Total persons with symptoms	Active cases (Bacllary + active abacillary)
1 Cough	42 (95)	10 (23.8)
2 Haemoptysis	4 (9)	3 (75.0)
3 Fever	17 (38)	7 (41.2)
4 Chest pain	17(38)	7(41.2)

(Figures in bracket indicate percentage)

TABLE IV

Showing the combination of symptoms with which the cases were detected

Symptoms	Total	Cumulative
Only cough	2	2
Cough + fever	4	6
Cough -f chest pain	1	7
Cough + fever + chest pain	3	10
Cough + chest pain + haemoptysis	3	13
Total	13	

4. Cough was the singularly important symptom present in all cases and a combination of cough, fever and chest pain increased the number of case detection.

5. It seems symptom survey in a community brings out little more number of active cases than what can be expected by sputum survey.

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HEPATIC DYSFUNCTION IN PULMONARY TUBERCULOSIS

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Hepatic involvement in Tuberculosis was observed as far back as 19th century by French Physician Lewis. Most of the studies in the past were based on autopsy material and revealed the presence of Tubercles in the liver in 63% to 99% of cases (Ullom, Saphir, Jone and Peck). Fatty degenerative changes were found in 34% to 42% of their cases, dying of pulmonary tuberculosis. Vanbek and Haex¹⁶ (1943) found Millitary lesion in all type of chronic Tuberculosis. But the type of pulmonary and extra-pulmonary tuberculosis in which the liver may be involved remained undefined. Recently, introduction of more accurate methods of assessing liver functions has led to large number of studies. In 1956, Arora et al noticed liver dysfunction in 78% of their 102 pulmonary and extra-pulmonary tuberculosis cases. Present study was undertaken with a view to see the extent of liver derangement in pulmonary tuberculosis cases and its possible correlation to the progress and course of the disease.

Material And Methods

40 cases of pulmonary tuberculosis between ages of 15 to 55 years were selected and divided into four groups:

Group I of 15 untreated cases

Group II of 15 partially treated cases for 2-5 months.

Group III of 5 drug resistant cases.

Group IV of 5 healed cases treated for 1-2 years - Inactive-clinically, radiologically and bacteriologically.

Cases with complications like diabetes, etc. were not taken

Complete history and thorough clinical examination was done in all cases. Investigations consisted of X-ray chest, sputum examination, BSR and Liver function tests. These investigations were repeated after 3 and 6 months.

Liver functions tests consisted of:

1. Thymol turbidity and flocculation test: Performed by Neef's modification of Maclagan's technique. Results were noted from 0 to four plus (++++) depending on extent of flocculation.
2. Cephalin cholesterol flocculation test: done by Dick's technique. Cephalin cholesterol antigen of Diffco Laboratories was used. Readings were taken after 24 to 48 hours and labelled as 0 to four plus depending on type of flocculation and clarity of supernatant solution.

Functional derangements manifested by these tests was labelled as mild, moderate and gross. Criteria for such labelling is shown in Table—1.

TABLE I

Showing the Criteria for Assessment of Degree of Liver Function Tests

	Name of the test	Normal Limit	Mild	Moderate	Gross
1—	Thymol turbidity	0—4 uniss	4—5.5 units	6—7.5 units	
2—	Thymol flocculation	0—±	+ to + ±	++ to +++ ±	+++ and above
3—	Cephalin cholesterol	0- +	+ ± to ++	+++ to +++ ±	++++ to +++++
<p>Over all assessment of the degree of liver function was done from average of all the tests</p> <p style="margin-left: 40px;">Mild : Below ++</p> <p style="margin-left: 40px;">Moderate : Between ++ to +++ ±</p> <p style="margin-left: 40px;">Gross : +++ and above.</p>					

Findings

40 cases of Pulmonary Tuberculosis aged between 15 years and 55 years were studied. 27 cases were male and 13 were female. 12 cases (30%) were sputum negative and 28 cases (70%) were sputum positive.

TABLE II
Showing Extent of Disease

Extent of disease	Number of cases	%age
Unilateral	13	32.5
Bilateral	27	67.5
Minimal	5	12.5
Moderately advanced	24	60.0
Far advanced	11	27.5

TABLE III
Showing the Degree of Liver Dysfunction in the Group Under Study

Degree of liver Dysfunction	Initial	After 3 months	After 6 months
Mild	7(17.5%)	7(17.5%)	13(32.5%)
Moderate	26(65.0%)	32(80.0%)	27(67.5%)
Gross	7(17.5%)	1(2.5%)	Nil

Table—II shows that 32.5% cases were suffering from unilateral and 67.5% cases from bilateral disease. 60% of cases were having moderately advanced, 12.5% of cases minimal and 27.5% far advanced disease.

30 cases (75%) showed cavitory disease and 10 cases (25%) showed non-cavitory disease. The cavitory cases were having single or multiple cavities of varying size in one lung or in both the lungs.

It is seen from Table—III that out of total No. of 40 cases which included all the groups, in the beginning 17.5% showed mild damage, 65% showed moderate and 17.5% showed gross impairment of liver functions. After 3 months the number of patients with mild dysfunction was the same i.e. 17.5%, but the number of cases with moderate impairment increased upto 80%, while in severe impairment there was only one case i.e. 2.5%. After 6 months, the mild dysfunction was seen in 32.6%, moderate in 67.5% and there was no case with gross dysfunction.

Table No. IV shows that in the beginning out of 15 cases of Group No. I i.e. untreated cases, 73.3% cases showed moderate dysfunction and 26.7% showed gross dysfunction of the liver. After 3 months all the cases showed moderate liver dysfunction, but after 6 months there was mild dysfunction in 20 per cent and moderate in 80% cases.

In group No. II i.e. partially treated cases, initially 13.3% cases showed mild impairment, 73.3% showed moderate and 13.4% showed gross liver impairment. After 3 months, num-

TABLE IV
Showing Liver Function Test in Various Groups Under Study

Group No.	Degree of impairment	Initial		After 3 months		After 6 months	
		No. of cases	%age	No. of cases	%age	No. of cases	%age
I	Mild	—	—	—	—	3	20
	Moderate	11	73.3	15	100	12	80
	Gross	4	26.7	—	—	—	—
II	Mild	2	13.3	2	13.3	5	33.3
	Moderate	11	73.3	13	86.7	10	66.7
	Gross	2	13.4	—	—	—	—
III	Mild	—	—	—	—	—	—
	Moderate	4	80.0	5	100	5	100
	Gross	1	20.0	—	—	—	—
IV	Mild	5	100	5	100	5	100
	Moderate	—	—	—	—	—	—
	Gross	—	—	—	—	—	—

her of cases with mild dysfunction was the same i.e. 13.3% while the percentage of cases with moderate dysfunction increased upto 86.7%. There was no case with severe dysfunction. After 6 months the percentage of cases with mild impairment increased to 33.3% and percentage of cases with moderate impairment decreased to 66.7%.

Regarding group No. III i.e. resistant cases, 80% of cases had moderate liver dysfunction and 20% had gross dysfunction. After 3 months all the cases had moderate dysfunction which persisted even after 6 months.

As regards group No. 4 i.e. healed or inactive cases, all the cases had mild dysfunction throughout.

Discussion

Hepatic derangement in cases of pulmonary tuberculosis have been subject of study since long. Pigment metabolism is not changed in pulmonary tuberculosis, but significant changes have been recorded in protein metabolism. Low albumin values associated with the rise in serum globulin, hypocholestraemia, abnormal prothrombin values have been observed by many. Their publications showed hepatic derangements ranging from 10% to 80%. Sweany Weather and McClusky observed increased globulin, decreased albumin and hypocholestraemia in their cases. Steidle and Heise are of opinion that hepatic insufficiency occurs quite commonly in pulmonary tuberculosis. Impaired Bromosulphal-in excretion was observed in prolonged protected cases by Kruger and Gerber. Hypoprothrombinaemia was noticed by Reddy and Venkataramayya. Seife et al in their study of 70 cases reported hypocholestraemia in advanced cases. Study of 60 cases by Brindaban showed abnormal thymol turbidity in 45 and increased Bromosulphalin retention in 51 cases. Sarin et al found moderate and marked derangement of hepatic functions in 31 out of 103 cases.

Arora, Akbar Ali and co-workers found liver damage in 71% of cases. In 36.3% of cases the results could be co-related with severity of disease. 41.2% shows liver dysfunction without showing enlargement of the liver. Mital et al' in a study of 50 cases found severe liver damage in 60% of advanced cases, 29.4% of moderate cases and 12.5% of minimal cases. They are of opinion that direct relationship exists between severity of disease and liver dysfunction.

The present study shows that there was moderate derangement of liver in the begining in majority of cases i.e. 66%. Pulmonary tuberculosis being generalised disease possibly

affects the liver to some extent. Excluding the cases of group No. IV i.e. healed or inactive cases of this series there was moderate derangement of liver functions in 74.3% of cases and 17.1% showed gross damage, whereas 8.6% showed mild dysfunction. Arora et al found liver damage in 78.0% of cases as judged by liver function tests.

Analysing the liver function in each group it is seen that in 'group No. I i. e. untreated cases, there has been progressive improvement in the liver functions. In group No. II i. e. partial treated cases, there has also been change for the better. In group No. III i. e. drug resistant cases, all had moderate dysfunction throughout the period of study. It can be safely concluded that with the improvement of the disease clinically and radiologically, the liver function tests also show a change and there seems to be definite relation between the activity of disease and the liver functions. How far liver functions can be taken as one of the criteria to judge the prognosis of the disease is difficult to say as their application in routine cases seems to be impracticable but in controversial case these liver function tests may help to judge the prognosis of the case.

Summary

Liver function tests were done in different groups of cases, initially, after 3 months and after 6 months. Disturbances in liver functions were observed in different groups to varying degree. Liver function tests may be of some value in controversial cases.

Acknowledgement

Thanks are due to all concerned who guided me with their valuable opinion from time to time in conducting this study. My grateful thanks to Dr. S. K. Khanijo, M.D., D.T.D. and Dr. G.G. Mansaramani, M.D., helping me in preparing this paper.

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OMISSION

The following figures were inadvertently left out from the article entitled "Enhancing of Tuberculin Allergy by previous Tuberculin Test(s)" by Raj Narain, S. S. Nair, G. Ramanatha Rao. P. Chandrasekhar and Pyare Lal which was published in the March 1966 issue of Indian Journal of Tuberculosis. The omission is regretted.

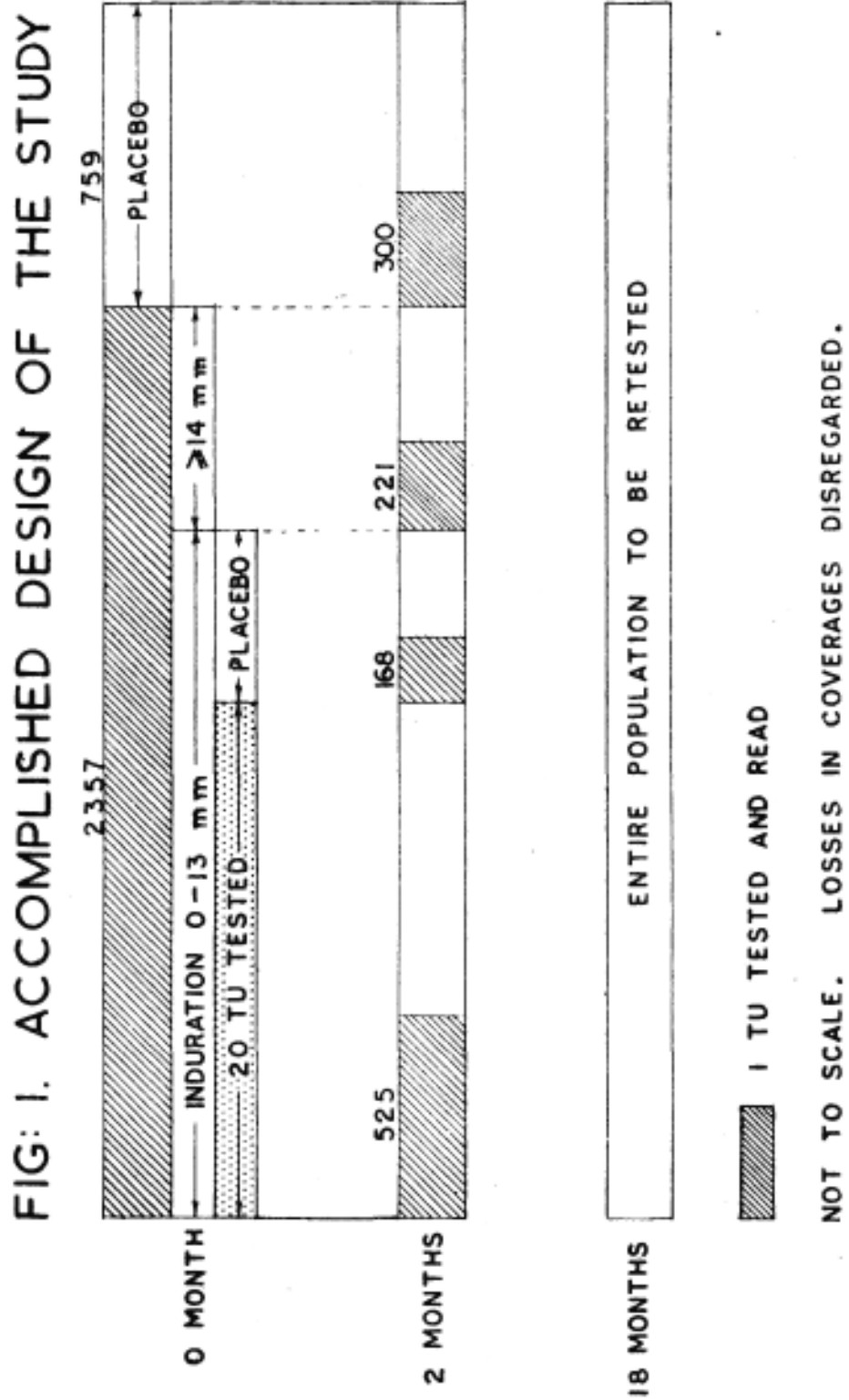


FIG. 2

COMPARISON OF I TU REACTIONS FOR THE CONTROLS,
THE TESTED AND THE RETESTED IN TWO AGE GROUPS.

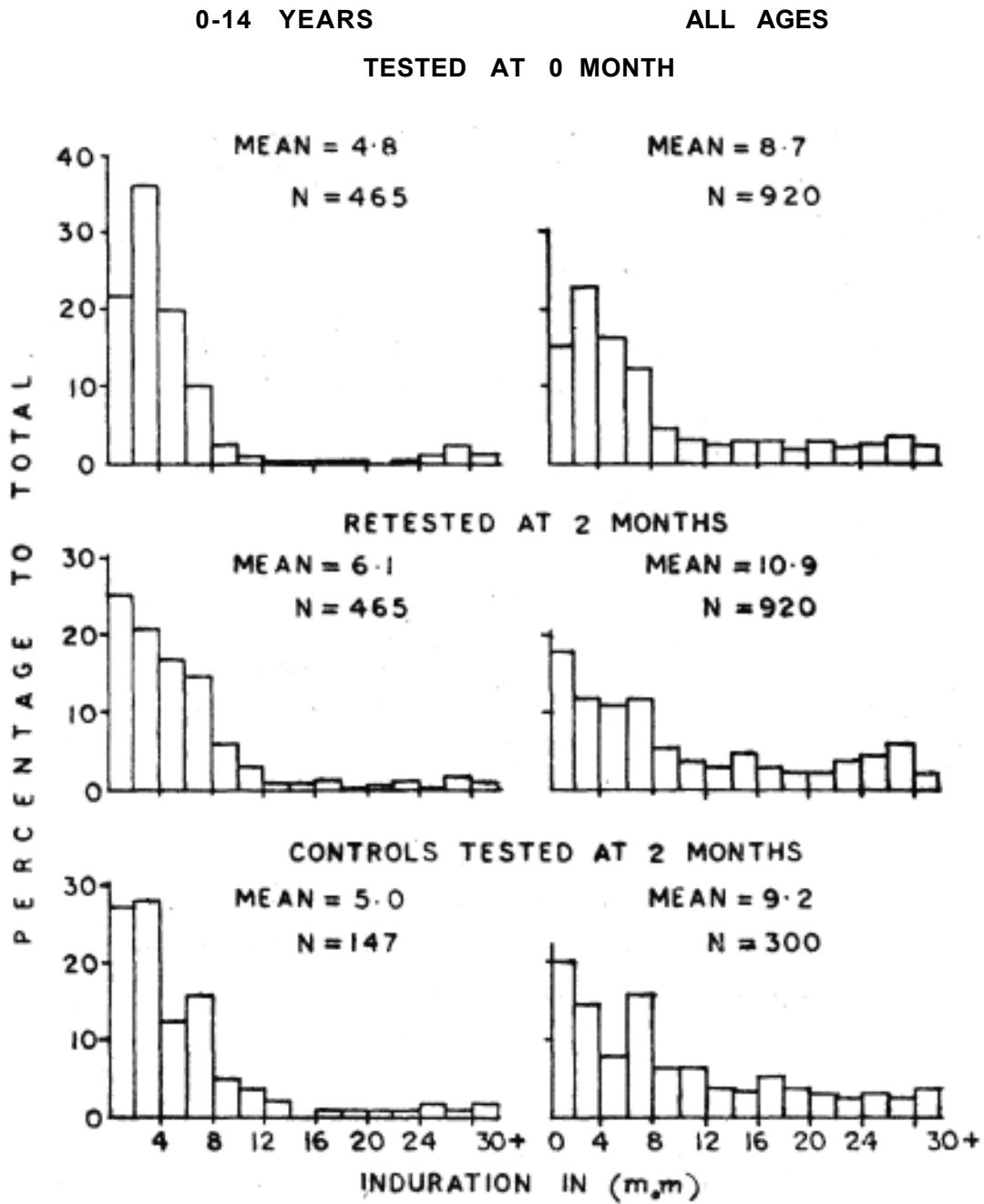
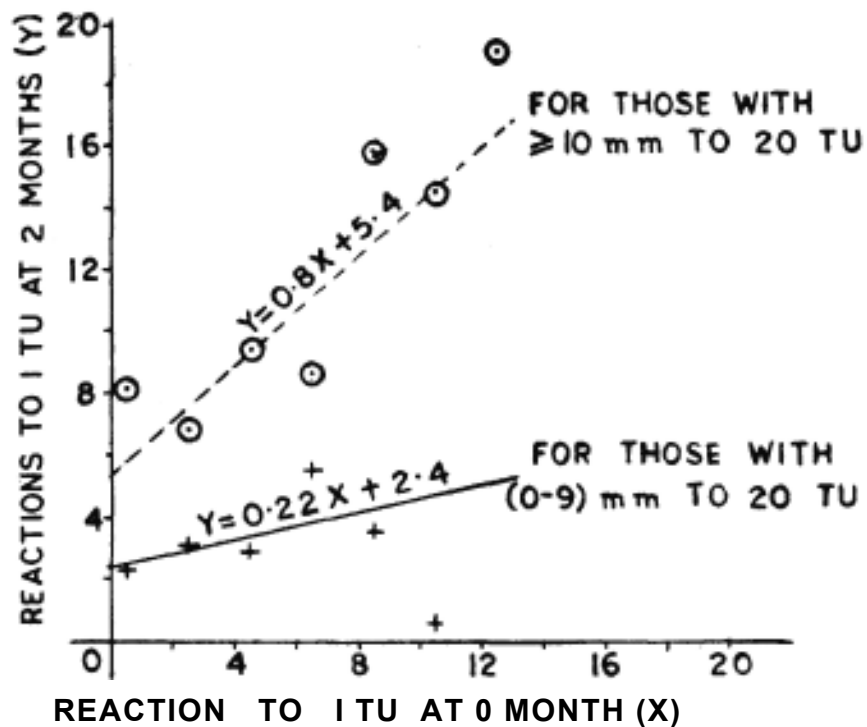


FIG. 3

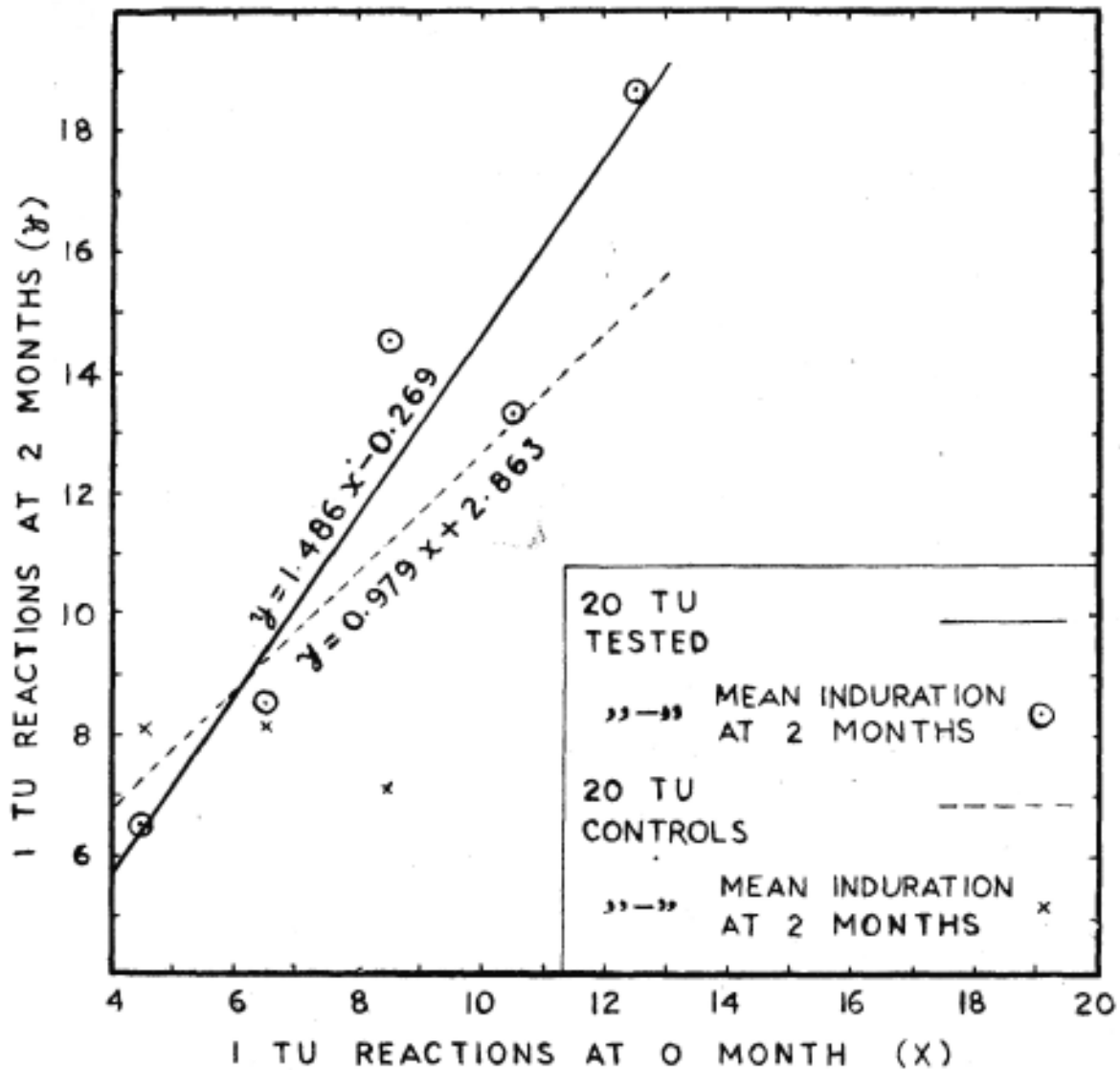
REGRESSION OF INDURATIONS AT 2 MONTHS ON REACTIONS TO 1 TU AT 0 MONTH FOR THOSE WITH 0-9mm AND > 10mm REACTIONS TO 20 TU



NOTE: MEAN INDURATIONS TO 1 TU AT 2 MONTHS ARE INDICATED BY O AND + FOR THE TWO GROUPS*

FIG. 4

REGRESSION OF INDURATIONS AT TWO MONTHS ON INITIAL REACTIONS TO 1 TU 4 - 13 mm AMONG THE 20 TU TESTED AND CONTROLS



AT 2 MONTHS.
WITH 10 mm OR BIGGER
20 TU AT 0 MONTH

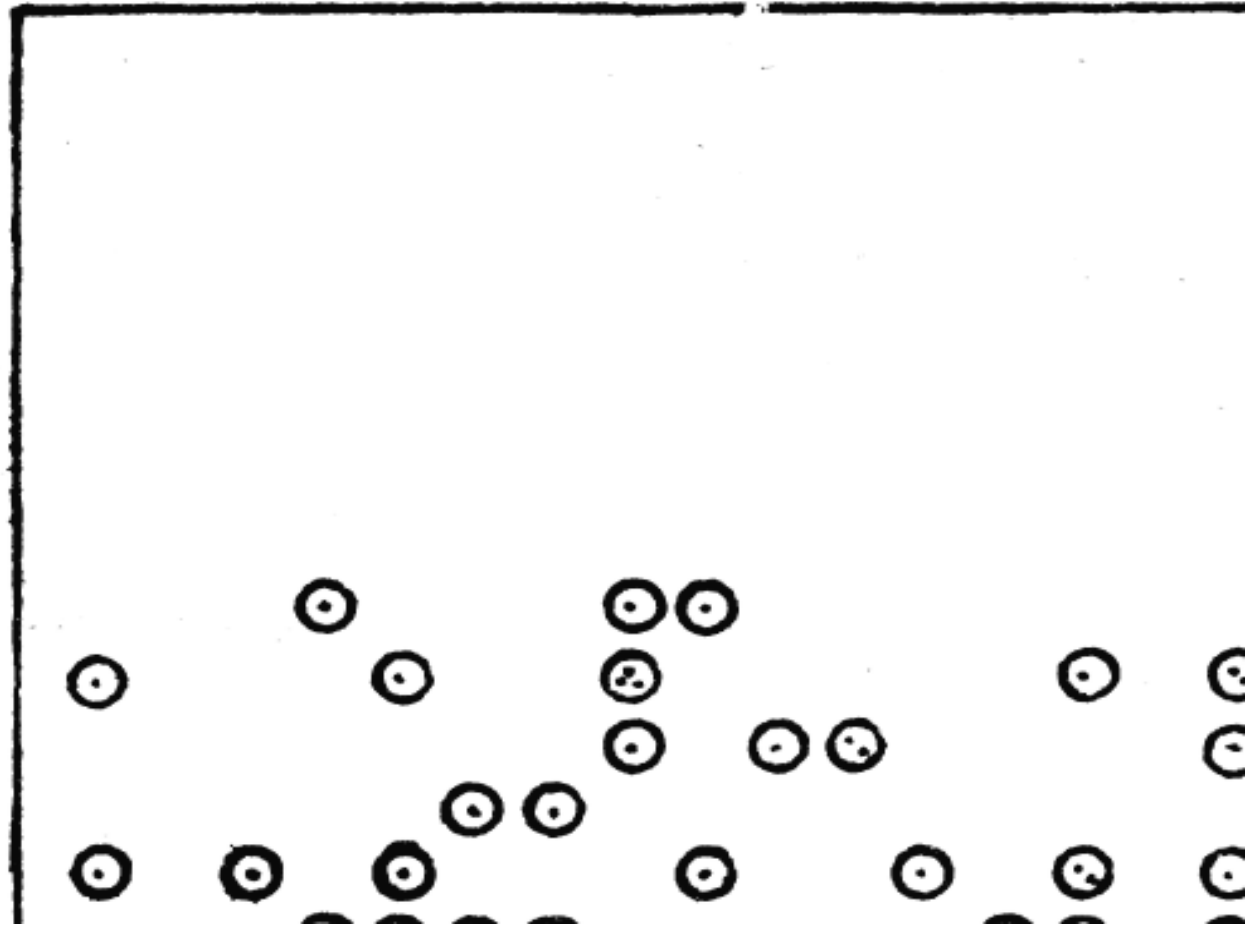
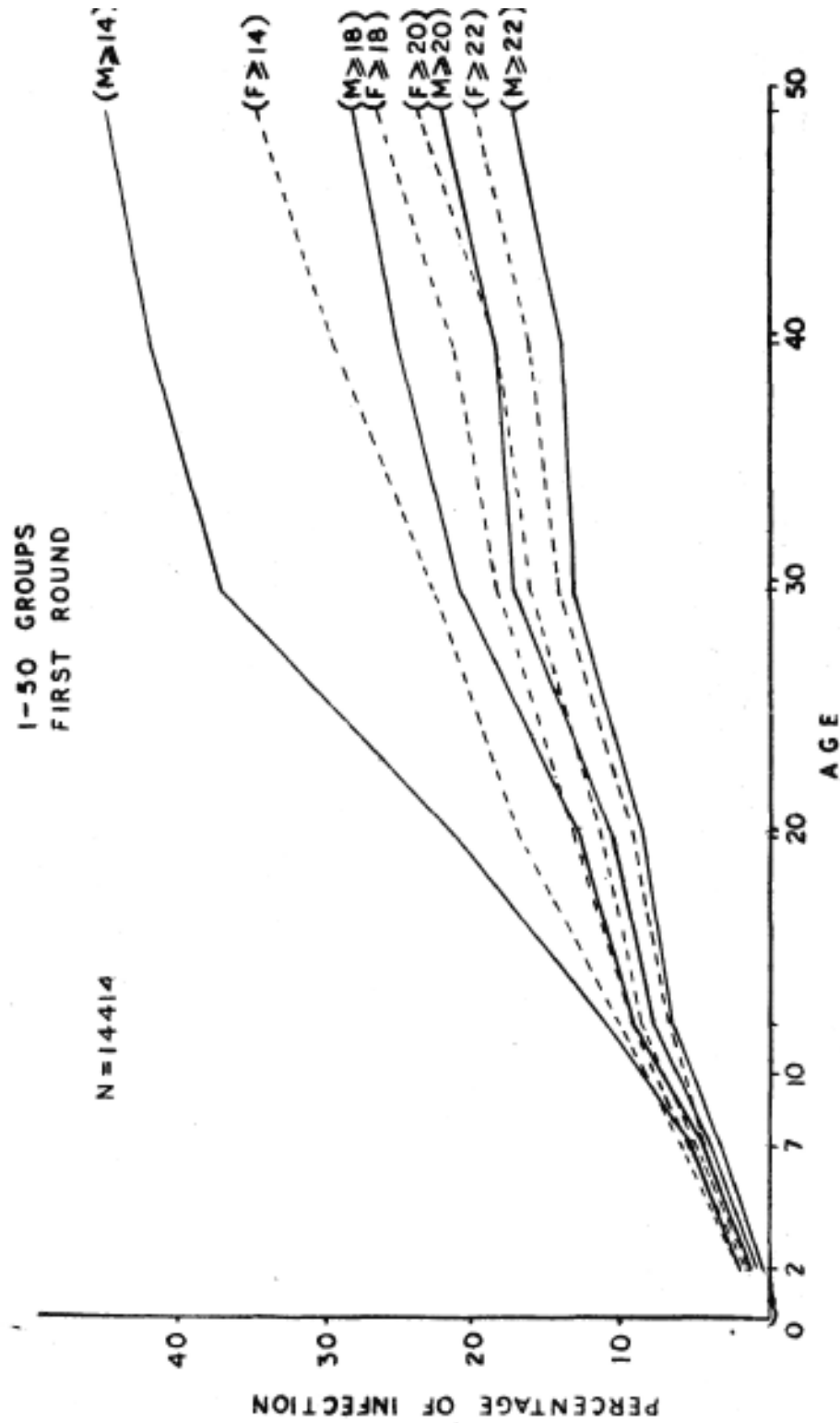
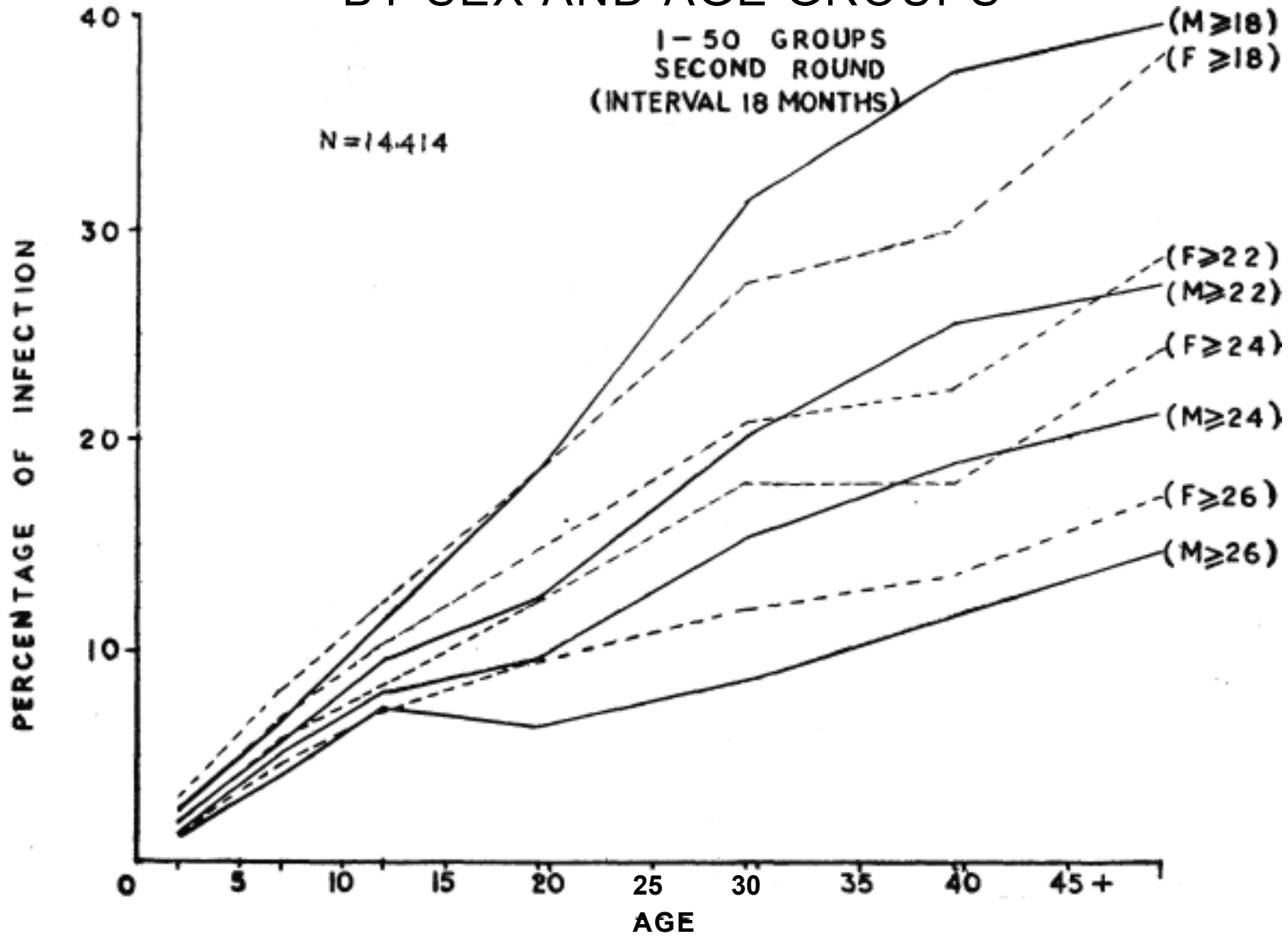


FIG 6 PERCENTAGE OF REACTORS AT VARIOUS LEVELS
BY SEX AND AGE GROUPS



PERCENTAGE OF REACTORS AT VARIOUS LEVELS BY SEX AND AGE GROUPS



Recommendations of the Standing Technical Committee of the Tuberculosis Association of India on the Presidential address of Dr. K. N. Rao, Director General of Health Services, Government of India and Chairman of the Association, at the 21st Tuberculosis and Chest Diseases Workers' Conference held in Calcutta from 11th to 14th February, 1966.

A. General

(1) As the economic progress of a developing country is closely related to the health standards of its people, our health plans should be so evolved as to enable early and effective control of a disabling disease like tuberculosis, which undermines people's will to work and thereby hampers the nation's economic progress.

(2) As our resources in finance, technical personnel and physical facilities are limited, we should utilise the existing health facilities to the maximum extent for the care of all health problems including tuberculosis. In other words tuberculosis case detection and treatment service should develop at all health facilities.

(3) Industrialization and development of communications create problems leading to tuberculosis. This fact must be kept in view while planning tuberculosis services.

(4) Increase in population without corresponding increase in economic production will only add to pauperisation and ill-health and help the spread of diseases like tuberculosis. Therefore, tuberculosis control should be planned as an integrated development programme in which all social services are provided for and there is a total planned development.

B. Drug Therapy

As anti-bacterial drugs have considerably improved the chances of cure of the individual patients of tuberculosis, its control on a community basis is not feasible and practicable. The Committee felt that there was considerable scope for further research in the treatment of tuberculosis with anti-microbials in various combinations and intermittency instead of by only continuous therapy. All infectious TB patients should be provided with effective drug therapy. Specially in the initial stage of treatment continuous uninterrupted treatment preferably is recommended. After sputum conversion drug therapy be provided at least for a year or even longer.

C. Treatment

(1) The Committee advised that in view of the toxicity and the need for observation, the use of second line drugs like Ethionamide,

Cycloserine, Pyrazinamide, Ethambutol, Viomycin, Kanamycin, etc. should be limited to institutions only. It felt that it was vital that in the early stages of treatment triple drug therapy be given uninterruptedly, and when sputum became converted double-drug including I.N.H. or I.N.H. alone be given for the rest of the period of treatment.

(2) The Committee also felt that in the chemotherapy of tuberculosis first line drugs, like Streptomycin, I.N.H., P.A.S. and Thiacetazone should be used. As for the use of second-line drugs the Committee was of the view that Pyrazinamide should be given first preference with Ethionamide as the next best. These drugs must be used in combination with other drugs.

D. Home Treatment

The Committee noted that our first objective was to establish a fully equipped clinic with miniature X-ray in every district as early as possible and agreed that these clinics should develop District Tuberculosis Control Programmes as evolved by the National Tuberculosis Institute, Bangalore, particularly through existing health services of districts, so that all areas in a district are provided at least with minimum essential services for treatment of those who seek treatment there.

E. Programme

As our aim is the control of tuberculosis (if not its eradication) speedily by the Fifth Plan period the Committee emphasised that our programme should be based broadly on the following principles:

- (1) It must be countrywide uniformly in both urban and rural areas and should be established on a permanent basis. It should not be patchy or one time effort campaign.
- (2) It should be "felt need oriented", which means that emphasis should be on detecting patients when they come with symptoms to health centres and hospitals and on providing full treatment at their homes with effective anti-TB drug therapy.
- (3) As it would not be either economical or feasible to have specialised services throughout the country, the Tuber-

culosis Programme should be integrated with the general health services while the specialised services at the District and State levels should provide training and organisational and technical guidance to the peripheral service. The specialised centre would also provide assessment of the programme. (4) All services to be established must be within our physical and economic resources and as acceptable to our people.

F. Personnel, X-Ray, Films And Drugs

(1) The Committee recognised the importance of trained personnel for implementing our national programme and emphasised the need for utilising the training facilities available in Tuberculosis Training and Demonstration Centres, Medical Colleges and Hospitals and in the National Tuberculosis Institute, Bangalore, to the maximum extent. It was essential that teaching in community control of Tuberculosis should be started at the Medical College level.

(2) The Committee noted with grateful appreciation:

- (a) that the UNICEF was assisting India with X-ray Units, X-ray Films, Laboratory equipment, vehicles and drugs;
- (b) that a factory had been set up at Ootacamund for manufacturing X-ray films and it was expected that self-sufficiency in this regard would be achieved soon; and
- (c) that anti-TB drugs especially I.N.H., P.A.S., Streptomycin and to some extent Thiacetazone were also being manufactured in the country though it may take some time to achieve self-sufficiency.

G. Evaluation

The Committee noted that uniform methods of maintaining basic records, which would help assess our achievements on a uniform basis must be used throughout the country. Regarding the measurement of the problem of tuberculosis international standards be uniformly followed throughout the country.

H. Curriculum for Different Categories of Para-Medical Personnel

The committee felt that the time had come when basic health workers should be trained and integrated in the tuberculosis control pro-

gramme. It was resolved that a sub-committee consisting of Drs. N.L. Bordia, D.R. Nagpaul and K. Somayya may consider this question and make suitable recommendations.

I. Case-Finding

In regard to case-finding, even though X-ray appeared to be an attractive method, the Committee emphasised that its short-comings in a mass programme arising from the lack of precision in X-ray reading, the shortage of X-ray films in the country and the difficulties in organising mass X-ray case-finding programmes specially in the rural areas should be noted. In the opinion of the Committee finding cases by sputum examinations appeared to be more practical method in rural India and emphasised the fact that with the development of basic health services for every 10,000 population and the availability of trained technicians for microscopic work it should be possible to detect infectious cases in the community by this method.

J. B.C.G.

The Committee noted that direct B.C.G. Vaccination without tuberculin test was now being carried on almost throughout the country in the younger age group and this was expected to achieve better coverage. If any complications arose these should be observed and reported.

K. Chemoprophylaxis

(1) The Committee was of the opinion that primary prophylaxis was not a feasible proposition. Even secondary chemoprophylaxis deserved to be studied further before applying on a mass scale though this had a place in paediatric tuberculosis practice.

(2) It was also of the opinion that contacts could be given I.N.H. for a whole year even though acceptability of taking drugs among non-symptomatic group was found to be doubtful. In the opinion of the Committee the whole subject of Chemoprophylaxis deserved study.

L. Research

The Committee emphasised that Service, Education and Research were inseparable. Research was both fundamental and applied. While fundamental research was being carried on in a few institutions in India applied research should be considered as of great importance to us. While there may be administrative and organisational inadequacies in applying the results of research, considerable

lacunae still remained in our knowledge of tuberculosis which should be elucidated in the coming years.

M. Utilisation of Institutional Beds

(1) The Committee noted that this matter had already been discussed earlier and certain recommendations made. It also noted that the Union Health Minister had addressed the State Governments in this regard and felt that this matter needed further review.

(2) The Committee felt that the Government of India should take up with the various agencies Government, Semi-Government, Public Undertakings who contemplate establishing hospital beds for the treatment of tuberculosis to use the existing vacant beds especially in institutions maintained by voluntary bodies and save the expenditure involved in establishing new institutions.

(3) The Committee agreed that the existing 35,000 beds in tuberculosis institutions should be rationally utilised specially to treat surgical and emergency cases and cases which are drug resistant or which fail to respond to drug treatment.

(4) In the opinion of the Committee only about 15,000 more beds need be added to the present bed-strength of hospital beds and these should be properly distributed in the country.

N Surgery

The Committee requested Dr. N.L. Bordia to collect necessary data as to how many surgical beds were available in various institutions in India and what were the facilities available in them. In this connection the Committee felt that the State Governments should review the present situation in this regard and utilise the existing thoracic surgical facilities to the fullest extent before starting new ones.

O. Tuberculosis Mothers and Infants

The Committee resolved that:

- (a) The teaching and practice of Family Planning should be extended to the patients of chest clinics (TB Clinics). This should be taken with the cooperation of both the organisations, the clinics and the family planning organisations.
- (b) Under certain conditions like 'possibly incurable cases' excreting drug resistant bacilli and other serious types of the disease, termination of pregnancy should be considered in individual cases.

P. Role of General Practitioners

The Committee noted that this matter had

already received its Consideration and a circular in this regard had been sent out by the Tuberculosis Association of India to all concerned. The Committee, however, felt that this may be given more publicity.

Q. Refresher Course

It was resolved that the Refresher Courses conducted by the Governments, Medical Association, Colleges and Tuberculosis Associations have to be integrated with tuberculosis programmes.

R. Medical Education

The Committee noted that this matter was under its consideration and certain suggestions had already been formulated. It was, however, emphasised that:

- (a) Professors of tuberculosis and diseases of the chest in the various medical colleges in the country should visit the National Tuberculosis Institute, Bangalore and approved Regional and TB Demonstration Centres for a reorientation training atleast for ten days.
- (b) the diploma course in tuberculosis now being conducted by Universities should avail of the four weeks training in TB control methods at the National TB Institute, Bangalore, as a part of their diploma course.
- (c) M.D. in Tuberculosis should be encouraged.

S. Voluntary Agencies

It was resolved that voluntary Tuberculosis Associations should develop their activities with a view to establish their branches even at the Taluk levels in this country. Every State Association must see that all their district Associations work closely with the district TB control units and spread their activities to the peripheral level. They should include in their activities programmes for intensive health education to cover not merely the prevention and care of tuberculosis but subjects like family planning, nutrition, anti-smoking, environmental hygiene, etc. all of which have direct bearing on health generally and tuberculosis in particular.

T. W.H.O. Expert Committee Report on Tuberculosis

The Committee noted that certain recommendations have already been made by it on this Report. It, however, felt that the Report required to be further carefully studied and that every TB worker should draw on this Report.

Chronic Obstructive Lung Disease

*(A Statement of the Committee on Therapy.
Amer. Rev. Resp. Dis. Sept., 65, Vol. 92, No. 3)*

Chronic obstructive lung disease is a disorder characterized by chronic diffuse, irreversible airway obstruction.

The condition can be designated as Chronic Bronchitis, Asthma and Pulmonary emphysema, or chronic non-specific respiratory disease. By chronic Bronchitis we mean a disorder characterized by hypersecretion of bronchial mucus, usually accompanied by chronic or recurrent productive cough for a minimum of three months a year for at least two successive years in patients in whom other causes for these symptoms have been excluded.

Asthma:—is a disease characterized by an increased responsiveness of trachea and bronchii to various stimuli. It is manifested by widespread narrowing of the airways which leads to varying degrees of air flow obstruction which changes in severity either spontaneously or as a result of therapy. Emphysema is defined as an Anatomic alteration of the lungs characterized by an abnormal enlargement of the distal airspaces, accompanied by destructive changes of the alveolar walls.

Thus chronic obstructive lung disease and chronic bronchitis are denned in terms of their clinical manifestation whereas emphysema is and must be defined in terms of pathologic changes demonstrable only by direct morphologic examination of lung tissue.

Etiology

The cause is as yet not known. Chronic bronchitis especially that associated with cigarette smoking, appears to be the major pathogenic factor in the development of chronic obstructive lung disease in a susceptible individual.

Air pollution, occupational exposure to irritating fumes and dusts, recurrent respiratory infections, bronchiectasis, chronic sinusitis and Muscoviscidosis may be the other factors. No specific etiological factor has been found out. The predilection for males, increased incidence with age and development factors in the development of disease have not been explained.

Pathogenesis of chronic obstructive lung disease

Airway obstruction may result from an inflammatory or degenerative bronchiolitis with anatomic weakening and expiratory collapse of the bronchiolar walls, excessive mucous secretion, mucosal edema and Proliferation and broncho constriction. The relative importance of each of the above factors in the production of chronic airway obstruction is not clear and varies in individual subjects.

Similarly the Pathogenesis of diffuse anatomic emphysema is not fully understood.

Following factors may contribute to the production of changes:

1. Destruction of alveolar walls as a direct result of chronic inflammation or of deposition of carbon pigment or other chemical irritants.
2. The presence of airway obstruction leading to
 - (a) air trapping in expiration causing marked increase in intra-alveolar pressure and rupture of aleveolar walls.
 - (b) Sudden increase in inter-alveolar pressure due to coughing.
3. Obliteration of the Pulmonary or bronchial blood vessals with secondary pulmo nary parenchymal atrophy and destruction.
4. Degenerative changes in the bronchii and alveoli.

A strong co-relation exists between cigarette smoking and prevelance of chronic bronchitis and chronic obstructive lung disease.

Natural history of chronic obstructive lung disease

Chronic recurrent smokers' or morning cough is abnormal and may be the first sign of future difficulties.

Majority of patients with chronic airway obstruction show a slow gradual deterioration over a period of several years.

This is generally followed by chronic Corpulmonale and right heart failure. Common causes of death are respiratory tract infection with respiratory failure, cardiac arrhythmias, myocardial infarction, pulmonary emboli and intractable congestive heart failure.

Clinical manifestations

Clinical manifestations are variable.

Dyspnea is the chief complaint. There may be a history of chronic or intermittent cough for several years. Some patients may not develop cough and sputum. Loss of weight may be there but it is not clearly understood. Loss of appetite due to associated gastric distress, increased work of breathing or inactivity due to severe dyspnea are enough to explain weight loss and muscle wasting.

Peptic ulcer is frequent in this group of patients and epigastric distress is common even in those without ulcer.

Co-relation between symptoms, physical findings and findings on roentgenologic examination of chest is frequently poor.

Measurement of expiratory flow rate should supplement a careful physical examination of patients with chronic cough or dyspnea.

Laboratory tests including detailed pulmonary function studies do not replace a thorough careful history and physical examination.

Prevention of chronic obstructive lung disease

As the cause of disease is not known, it is not certain whether or not the disease can be prevented.

As chronic bronchitis is the main factor to predispose to chronic obstructive lung disease, therefore prevention is best directed to the prevention and treatment of chronic bronchitis and of chronic bronchitis with reversible airway obstruction.

Cigarette smoking is to be discouraged. Other factors are :

1. Early vigorous treatment of acute respiratory tract infection such as acute bronchitis and sinusitis.
2. Avoidence of bronchial irritants.
3. Elimination of industrial and environmental exposures to irritating fumes and dusts if feasible especially in those persons with recurrent or chronic bronchitis.
4. Vigorous treatment of chronic bronchitis.

Therapy of chronic obstructive lung disease

Attitude of the patient: —The success of treatment depends to a greater extent on the attitude of the patient and his physician towards chronic pulmonary disease. The patient must understand the reason for prompt treatment of each pulmonary infection, regular use of bronchodilators, stopping smoking and follow other regimens of diet, exercise and medication.

The patient may be explained the limitations imposed by his disease, for example he can learn to alter the speed of his gait. He can develop an exercise pattern consisting of brief periods of exertion interposed between rest periods.

Use of Bronchodilators : — Ephedrine and allied oral drugs are of value for patients with airway obstruction.

Long-acting preparations may be helpful for overnight therapy. Inhaled aerosolized bronchodilators may be of some value. Owing to the development of tolerance to the nebulized forms of epinephrine, their use should be restricted to no more than three or four times in 24 hours. Intravenous aminophyllin is useful in severe bronchospasm but should be given slowly over a 10-15 minutes period. Oral aminophyllin tablets are often poorly tolerated especially in the dose required to produce effective concentrations in the blood. High blood concentration of theophyllin are attainable with Choline theophyllinate, alcoholic aminophyllin solutions and with aluminium hydroxide gel aminophyllin suppository are sometimes useful but their value unpredictable because of irregular absorption.

Rectal aminophyllin given as a retention enema is not free from local irritation but is of value as an emergency measure. Antihistamines are of no value as bronchodilators in patients with chronic airway obstruction.

Use of inhalation therapy in the ambulatory patients

There are many successful methods for the administration of bronchodilator aerosols to patients.

- (a) Hand bulb nebulizer.
- (b) Nebulizer powered by compressed air or oxygen.
- (c) Nebulizer powered by electric motor air pump.
- (d) Frozen power Cartridge Nebulizer.
- (e) Intermittent positive pressure breathing equipment with nebulizer.

The most frequent error made by patients trying to inhale medication is the failure to exhale completely prior to each inspiration. Deposition of the aerosols on the Bronchial surface is enhanced by a short inspiratory pause after each inhalation of medication.

Patients should be taught to rid the lungs of these secretions to permit better distribution of aerosols. Too forceful a source of air or oxygen is a common error and produces an aerosols with particles too large to reach the small bronchioles.

Advantage with Intermittent Positive Pressure breathing is by improving the penetration of nebulized medication into the smaller airway and by providing a means of giving oxygen more safely to patients with elevated arterial Carbon dioxide tension but it may not be of help to patient with moderately severe disease, who is capable of inhaling the medication deeply and exhaling fully before each inspiration.

Use of breathing exercises

Patients generally breathe at the top of the lung that is towards the position of full inspiration. Simply teaching such patients to exhale slowly emphasizing expiration rather than inspiration may be of benefit.

Measure to Assist in the raising of bronchial secretions

Adequate hydration of the patient is an important consideration in facilitating the removal of bronchial secretions and a good water intake should be maintained.

Potassium Iodide is a useful secreting expectorant. The value of other expectorants is less convincing.

Postural drainage should be tried by those patients who retain a large quantity of secretions.

Cuffing, cupped-hand or mechanical percussion of the chest during postural drainage may aid in mobilizing secretions in some patients.

Prohibition of smoking: —is most important therapeutic measure in the treatment of Chronic Obstructive Lung Disease.

Use of antimicrobial drugs

Drugs are best used with laboratory support. Infection should be healed as it arises giving full therapeutic doses and appropriate antimicrobials for an adequate period of time. Change in sputum colour, volume and odour may give a clear signal for anti-microbial therapy.

Choice of specific antimicrobials may be guided in these situations by the results of bacteriologic and susceptibility tests.

Continuous prophylactic use of antimicrobials may be of benefit to select patients who otherwise have repeated severe intercurrent infection.

Generally the patients with well defined acute reversible airway obstruction respond best to steroid therapy.

Before steroids are used, however other therapeutic measures should be given a vigorous reasonable trial.

There is no convincing evidence that steroids

given by aerosols have any therapeutic advantage over comparable doses of oral steroids.

Use of oxygen therapy

Oxygen is indicated in the decompensated hypoxic.

Carbon dioxide narcosis is a serious complication.

Oxygen is desirable in the hypoxic patients with right ventricular failure, in whom diuresis and improved Cardiovascular function may not occur until oxygen is given.

Patients with respiratory insufficiency should use oxygen under observation and initially at a very low flow rate or with positive pressure breathing because of possibility of respiratory depression and carbon dioxide retention. Oxygen also permits patients to exercise who otherwise would be unable to do so because of dyspnoea.

Patients should not be allowed to tie themselves Psychologically to the oxygen tank or to breathe more oxygen than is needed especially during sleep.

The management of acute exacerbations

The treatment should include hospitalisation, specific antimicrobials, bronchodilators and ventilatory assistance with pressure or volume cycled devices.

Emergency aspiration of tracheobronchial secretions by tracheal incubation, bronchoscopy or tracheostomy may be needed.

Treatment may be required for acid-base balance, electrolyte disturbance and heart failure.

The response to oxygen may be evaluated by determination of arterial blood gases (CO_2 tension and O_2 tension or saturation).

H.B.D.

The Present Status of Genito-Urinary Tuberculosis

(*Am. Rev. Resp. Dis., Sep., 65, Vol. 92, No. 3*)

Urinary tract tuberculosis is usually haematogenous. The kidneys with great vascular supply than any other urogenital organ are most frequently infected.

In Haematogenous tuberculosis renal involvement is a part of generalised process and is bilateral.

Chronic renal tuberculosis is secondary to haematogenous dissemination from a focus of infection elsewhere generally in lungs. It often appears to be unilateral even though tubercles are present in both kidneys.

Renal Tuberculosis is more common in adults, possibly because of the long latent

period between the initial infection with tuberculosis. Spread is Canalicular down the ureter to the bladder and may involve the prostate, seminal vesicle and epididymites. The causative micro-organism is myco-bacterium tuberculosis.

Untreated chronic genito-urinary tuberculosis rarely heals without treatment. The prognosis of untreated cases is poor and if involvement is bilateral, approximately 80% die within a few years after diagnosis. Tuberculosis can spread to close contacts via the urine and the semen and suitable precautions should be taken to protect contacts until urine and semen cultures are negative.

Diagnosis

There may be no early symptoms or only mild dull aching pain in the flanks, therefore patients with any form of tuberculosis should have a urine analysis every six months.

In a patient with history of tuberculosis, it should be suspected in any patient with recurrent or persistent urinary infections, prostatitis or epididymitis, un-explained Haematuria, contracted bladder, ureteral stricture or renal calcification. A tuberculin test should always be performed, since failure to react to P.P.D. or O.T. excludes Tuberculosis except for the rare anergic case.

Pyuria without demonstrable Pyogenic bacteria is suggestive of urinary tuberculosis.

More than five cells in a diluted urine per high field, a search should be made for tuberculosis of urinary tract.

Smears alone are unreliable because of the frequent presence in healthy persons of the smegma bacillus which is likewise acid fast. Cultures are as reliable as guinea pigs for diagnosis.

Cystoscopy is valuable to demonstrate ulceration, 'golf-hole' or ureteral orifices or rarely tubercles. Cystogram may show contractures of the bladder or ureteral reflux. Pyelogram may show an irregular, fuzzy outline of the Pelvis or Calyces and later cavities reflecting parenchymal caseation, necrosis and sloughing.

Poor visualization or non visualization of an affected kidney is common in far advanced lesions. Partial or complete obstruction of a calyx, usually the upper, is also fairly frequent. Complete obstruction at the neck of calyx usually leads to a blocked cavity. Partial obstruction on the other hand may lead to both destruction of the renal parenchyma and persistent drainage of tubercle bacilli in the urine. Variable degree of Hydronephrosis results from ureteral strictures secondary to fibrotic healing of tuberculous granulation tissues.

Strictures occur most frequently in the lower ureter at the uretero-pelvic junction and at the neck of Calyx. Due to the frequency with which strictures develop in these areas, any patient with renal tuberculosis should be followed with Intravenous pyelograms at four months intervals atleast for the first year of treatment and every six months thereafter for five years.

Treatment

Continuous chemotherapy for atleast 24 months and even longer in complicated cases. Combined drug therapy with Isoniazid 5 mgm per Kg. as one drug.

Excellent results have been reported with triple drug therapy consisting of daily P.A.S. 200 mgm per Kg. and Isoniazid with Streptomycin 1 Gm. daily for 6-12 weeks and then Bi-weekly.

For older patients Streptomycin may be given in half doses.

Excellent results have been reported utilizing Isoniazid and P.A.S. with Cycloserine 250 mgm twice daily instead of Streptomycin. Of the second line drugs, Cycloserine is preferred because it is concentrated in the tubules of the kidneys.

At all times patient should have atleast two drugs with adequate drug dosage, susceptible organisms and if patient takes drugs for long periods, all Genito-urinary tuberculosis can be controlled by drug therapy.

Surgery:—is mainly indicated in cases with strictures.

Follow up:—Urine cultures and pyelograms every six months for atleast five years and subsequently at year's interval for atleast another five years. H.B.D.

Resectional Surgery for Pulmonary Tuberculosis

(Robert J. Potter; Eugene G. Laforet & John W. Strieder *Amer. Rev. Resp. Dis.* 1966, 93, 30)

The results of a 10-year series of 435 resections in 420 patients of pulmonary tuberculosis in Boston have been reviewed. One hundred and forty two patients were operated from 1948 to 1952 and the remaining 278 from 1953 to 1957. In the earlier series, 20.6% of the patients received no drug therapy pre-operatively and 5% non post-operatively. In the latter series virtually all patients were treated with multiple drug therapy for at least 6 months pre-operatively and 12 to 18 months post-operatively. If the bacilli were resistant to the standard drugs in patients of the latter

series, short term umberalla with second line drugs including viomycin, PZA and cycloserine was provided.

Mortality rate for the first 2 years was 9%—2.1% during surgery or within 24 hours, 2.4% during first 6 months after the operation and 4.3% from 6 months upto 2 years after the operation. The total mortality was 13.6% in the earlier series and 6.8% in the latter series. The deaths during the operation were almost invariably associated with excessive and often inadequately replaced blood loss, or with episodes of hypoxia. Operative, post-operative and late deaths occurred predominately in males with far advanced disease and a positive pre-operative bacteriological status.

Operative complications were noted in 32% of the patients—35% in the earlier series and 30% in the latter. The Tuberculosis-related complications were far more abundant than the Surgery-related complications. Significant among the various factors affecting the incidence of operative complications were the pre-operative stage of disease, bacteriological status and the type of resection. Complications occurred more often among patients who underwent lobectomy plus segmental resection. The presence of a large, unfilled space and of an open, intersegmental plane was responsible for high complication rate.

At the end of 5 years' follow up, the disease in nearly 90% was inactive and apart from deaths and the untraced, nearly 0.5% had active disease. The factors which had the greatest influence on the 5 years' results were again the pre-operative stage of disease and bacteriological status. It is concluded that, if possible, the candidate for resection should have attained negative sputum prior to surgery. If this cannot be accomplished, surgery should be performed under effective "second line" antimicrobial umberalla or the decision regarding resection at all, must be carefully reviewed.

S.P.P.

An Epidemic of Tuberculosis in a Staffordshire School

(*J. Aspin and M. Sheldon Tubercle; 1965, 46, 321*)

Out of the 423 children in a Grammar School in England between the ages of 11 and 15 years, 24 children were found suffering from pulmonary tuberculosis. The source was found to be a student who was suffering from adult type of disease with positive sputum. No case occurred amongst the 79 children who had

been BCG vaccinated earlier. One hundred and two children who were free from the disease but had a positive tuberculin test were prescribed PAS and INH for 6 months. Only 50% took the treatment regularly and out of the irregular children, one developed pleurisy with effusion 3 months after the epidemic. A total of 198 children who were still found to be tuberculin negative were vaccinated with INH resistant BCG and a fortnight's administration of INH. One out of these children developed adult type of disease in the 3rd year of follow up. Except 24 children developing the disease originally and the two subsequently, no other child developed manifest disease during the 3 years follow up.

S.P.P.

A Localized Epidemic of Tuberculosis in New Zealand

(*A.J. Taylor and J.R. Mein Tubercle; 1965, 46, 345*)

An epidemic of tuberculosis occurred in a country district in New Zealand with a population of 4,000. Twenty cases of tuberculosis were found amongst them whereas there had been only 4 cases during the previous 4 years. The source was an inactive case of pulmonary tuberculosis working in the local textile mill, whose disease had become active and at the time of epidemic was found to be sputum positive. Eighteen of the 20 new cases had been in contact with this case or any of his victims. Of the 20 new cases, 9 showed enlarged hilar glands, 6 pleural effusion and 5 adult type of pulmonary tuberculosis and in all 10 were found to be excreting tubercle bacilli.

S.P.P.

Ethionamide, 750 mg. Daily, plus Isoniazid, 450 mg. Daily, in previously Untreated Cases of Pulmonary Tuberculosis

(*A. W. Lees Amer. Rev. Resp. Dis. 1965, 92, 966*)

Hundred patients with previously untreated, sputum positive pulmonary tuberculosis were given Ethionamide, 750 mg. daily plus INH 450 mg. daily. In a total of 80 patients who completed at least 6 months of treatment there was cent per cent sputum conversion with excellent clinical and radiological improvement. In 55 patients who completed further 6 months treatment, progress was maintained, there was no reversion of sputum and there was no

evidence of emergence of bacterial resistance to either of the drugs. Drug side-effects, however, were troublesome and frequent. This dosage schedule is not recommended for domiciliary treatment.

S.P.P.

Tuberculosis First Registered at Death

(David G. Simpson *Amer. Rev. Resp. Dis.*, 1965, 92, 863)

A group of 82 cases of tuberculosis (10.8% of the total new cases) were first notified after death in the city of Baltimore during 1963. Of these, 36 or 44% were active infectious and untreated cases of tuberculosis, comprising 4.6% of all new cases for that year. Twenty of these 36 were males above the age of 50 years.

S.P.P.

Glomectomy for Severe Bronchial Asthma

(W.S. Cut-ran; J.F. Oser; A.N. Longfield; E.G. Broderick and B.M. Culvahouse *Amer. Rev. Resp. Dis.* 1966, 93, 84)

Unilateral carotid excision (glomectomy) was the subject of a double-blind study in 23 patients, 10 having the real procedure, and 13, the control procedure. Although the major effect of the operation appeared to be psychological, a small but significant improvement in pulmonary function was demonstrated in the group having the real operation compared with the control group, 6 weeks after surgery. By 6 months after the operation, however, there was no significant difference in the functions of the two groups of patients.

Glomectomy does not seem to produce enough improvement in severe, chronic asthma (as measured by ability to discontinue long-term corticosteroid treatment and objective "blind" evaluation) to warrant its widespread use in this condition.

S.P.P.