cases of the second survey come up mostly from the X-ray normals and some from the X-ray abnormals of the second survey. There is considerable auto-healing and deaths that almost matches with the number of patients breaking down into disease annually. Experts hold the view that environmental and socio-economic conditions play such a key role that it is perhaps difficult to fight TB by programme alone[94]. The programme must take all these and other key factors like available infrastructure support and people's perspectives in its reckoning. Further, any programme however well researched is likely to develop operational difficulties while functioning. There must be an in-built ongoing mechanism for modifying it to find durable solutions. There must also be periodic scrutiny and evaluation so that the programme stays fine tuned. This underscores the importance of the enduring views steadfastly nurtured by the NTI in all aspects of its work including training and research.

4.2. Surveillance through annual risk of infection

As a national institute, the NTI had been concerned with the evaluation and responsible for

Field work of Tuberculin surveys

monitoring the NTP. By using the data contained in the quarterly reports sent by the DTCs the disease burden could be estimated. But, present monitoring suffers from two major drawbacks leading to non-utilisation of the data for TB surveillance. i) All the DTCs do not send the reports regularly and on time. More often, the reports contain omissions and discrepancies affecting the quality of information. There is no in-built supervision by NTI which greatly reduces the credibility of using the reports for inferential analysis. ii) Another limitation is that reports originate from the data of functioning of the GHS and population's utilisation rather than the prevalent epidemiological situation. These reasons prompted the NTI to search for alternate methods especially with regard to the estimation of the disease burden as prevalent in the community. Since conventional surveys are costly and cumbersome in methodology, an urgent need was felt to develop an alternative method. The method chosen should also be suitable for continuous use so that changing trends in the situation could be measured.

Fortunately, at the same time in Europe, Karel Styblo and others developed a technique for converting information on the prevalence of tuberculous infection at various ages in a number of calendar years into a smooth series of annual risks of tuberculous infection (ARI) and the incidence of smear positive TB. He calculated a constant ratio between ARI and the incidence of smear positive TB by analysing the data from various countries including data from longitudinal study of NTI and found that 1% of the ARI corresponds to about 50 smear positive cases of pulmonary TB per 100,000 population[95].

ARI is the average probability of acquiring new TB infection over a period of one year. The difference between incidence of infection and ARI is that the ARI is an estimated rate while incidence is calculated by carrying out the actual field work.

The NTI tested Styblo's hypothesis and developed the necessary

First Batch of TB Surveillence Team April to June 1984

SITTING (L to R)	:	J. Veerabhadraiah, S. S. Balasundaram, M.S. Krishnamurthy, Dr. J. Chakravarty T.B. Specialist, Dr. G.V.J. Baily, Director. Dr. P. Chandraseker, Epidemiologist A.N. Shasidhara,Dr. A.G. Kurthkoti, Medical Officer, K. Parthasarathy.
STANDING (L to R) 1st Row	:	J. Ramakrishna Rao, C. Maran, P.K. Nair, S. Ghouse Mohiddin, V. Lakshmaiah, H.Govindaraju, D. Dastagiri, M. Joghee, V. Muniyappa
STANDING (L to R) 2nd Row	:	R. Jayaraman, P. Chockalingam, G. Subban

expertise in carrying out tuberculin surveys by doing tuberculin testing among children in 0-9 years of age. It also developed a method of analysis based on the study of infection rates. Since our country is large, it was not operationally feasible for the NTI to carry out surveys in different regions or states. It would be best to leave that work to the respective states. NTI could provide the necessary technical advice, train key personnel needed and leave the survey work to be carried out by the GHS personnel of respective states. A feasibility study was carried out in 1991 wherein two teams comprising 13 health personnel drawn from Andhra Pradesh and Tamil Nadu states were trained successfully to carry out tuberculin surveys. The work showed that with persuasion and proper liaison, the GHS could

be guided to organise and conduct tuberculin surveys in the community. They were asked to send the data to NTI for analysis and estimation of ARI in the initial stages. Subsequently, NTI trained the health workers of Nagaland, Maharashtra and an NGO, Urmul of Rajasthan state. Unfortunately, the state government did not utilise the expertise imparted. Only Urmul conducted a tuberculin survey in Rajasthan in consultation with NTI to estimate the ARI and case load for the region. The paper was published in 1996. Late Dr Sanjay Ghose (killed by ULFA) incharge of the Urmul project at that time was the man behind this achievement in this joint venture. The findings revealed that with an ARI of 1.52%, 22-23 new smear positive cases would arise annually for the entire 30,000 population of the project area[96].

In 1992, Chakraborty and others presented an important paper *Tuberculous infection in a rural population of south India: 23 year trend.* Utilising the prevalence of infection data of the longitudinal survey and of another survey conducted at Bangalore district during 1984-86, they showed that the ARI of 1.1% observed in 1961

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declined to 0.61% in 1985, representing a decline of approximately 37% in nearly 23 years. This amounted to an *annual decline* of 3.2% per annum over the period, a trend normally representing the natural dynamics. Studying various aspects, Chakraborty reports: *Organised intervention may in all likelihood have modified it to an extent. From a hypothetically constructed mathematical iteration of TB situation for the area over a 50-year period, it could be suggested that the aforementioned trend in risk appeared consistent with a programme efficiency of around 30% only*[87] .

However, the above idea was not without problems. In fact, an acute technical problem has been foreseen. Tuberculin surveys are best done among unvaccinated children. Since BCG vaccination is currently being carried out under the UIP, vaccination coverages were quite high. In fact, in some states BCG coverages were reported to be as high as 90%. In such a situation, to get the required number of unvaccinated children in the selected areas to carry out tuberculin surveys to represent the communities under scrutiny posed a serious challenge. The NTI began to work in right earnest to overcome this seemingly unsurmountable problem. There arose a second problem: carrying out tuberculin surveys in huge metropolises like Chennai, Delhi, Calcutta etc. Working on this problem area, NTI has developed a method applicable to Bangalore city. The method is still under field trial.

4.3. Era of short course chemotherapy

Chemotherapy of TB has undergone revolutionary changes in the seventies owing to the availability of two well tolerated oral bactericidal drugs – rifampicin and pyrazinamide. Short Course Chemotherapy (SCC) implies a new rationale of chemotherapy and not merely administering formally accepted regimens for short periods. By using these regimens it has now not only become possible to simplify treatment and reduce its duration, but it is also possible to improve the efficacy of treatment. Discovery of rifampicin in 1967 is