Current Problem

CASE HOLDING IN TUBERCULOSIS PROGRAMME
EPIDEMIOLOGICAL PRIORITIES & OPERATIONAL ALTERNATIVES

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Introduction

The District Tuberculosis Programme (DTP) seeks to address itself to the problem of tuberculosis in the community, through finding as many of the cases as possible and offering them treatment near to their homes. The services are rendered through the existing system of health care delivery, utilising the widespread network in a permanent manner. The case-finding in the programme is carried out from among the chest symptomatics reporting on their own to the various general health institutions. Once diagnosed, these cases are placed on treatment, requiring them to collect their drugs periodically for self consumption. In the case of intermittent therapy however, they are required to attend convenient centres for supervised administration of the drugs. There is provision for motivation on diagnosis and subsequently thereafter, for their retrieval on default.

Even as the programme is largely geared to satisfy the peoples' needs and demands, its effective implementation depends on the participation of the General Health Services in an ongoing manner. The activities, tuned as they are to the crucial social objectives of the programme, the level of awareness and motivation of both the beneficiaries as well as the health workers are important aspects to take into account. However, at the same time, the programme should be able to meet the other objective of public health importance i.e., reduction of transmission. Operational studies were carried out at the National Tuberculosis Institute, Bangalore (NTI) to understand the dynamics of the DTP as well as its possible outcome. The potential of both the case-finding as well as treatment activities were studied, to quantify the maximum achievable if these were performed strictly, as provided for in the Manuals. The results of studies were interpreted to show that it was feasible to diagnose a number of cases more than the annual incidence in the district[1]. This was indeed a breakthrough. However, the potential on case-holding did not yield encouraging results[2]. It was observed "that the recommendations for management of patients in the tuberculosis programme in India, will have to be revised and intensified to obtain better treatment completion"[2]. Not much substantial change in the strategy was however brought about, following the above finding, ostensibly on grounds of availability of resources[2]. This was in spite of the scientific opinion not being comfortable with the phenomenon of diagnosed cases left inadequately treated under a programme in the developing countries[3]. In due course, with the introduction of Short Course Chemotherapy (SCC), a kind of euphoria pervaded the scene, with the hope that cases found by the system would be adequately neutralised in its wake.

The present report reviews the programme in its ability to meet the potential in case-finding and treatment (CFT), and bring about a reduction in the problem. Outcome at the current levels of efficiency of activities as well as following hypothetical changes in them are studied, in the light of an earlier model on the issue[4]. Further, it identifies the areas for carrying out studies on structural changes to be introduced in the programme, so as to obtain higher results in terms of epidemiologically perceptible gain.

Present Situation

The flow chart shows the dynamics of a DTP, under a given set of hypothesis which has been used in constructing the present model. An average Indian district as per 1991 census is considered to have a population of 1.9 million (a). At a prevalence rate of bacillary cases of 4.0 per thousand in the age group five years and over, an annual incidence of 34.0% of prevalence, and 40% of the cases in the community smear positive, the tuberculosis problem in a district can be expressed as follows: 6460 smear and culture positive patients (cases) in all at any time (b), 2196 newly occurring cases every year i.e., incidence (b.2), 2584 of the prevalence cases are smear positive (b.1), 879 of the latter being the annual incidence (b.3).
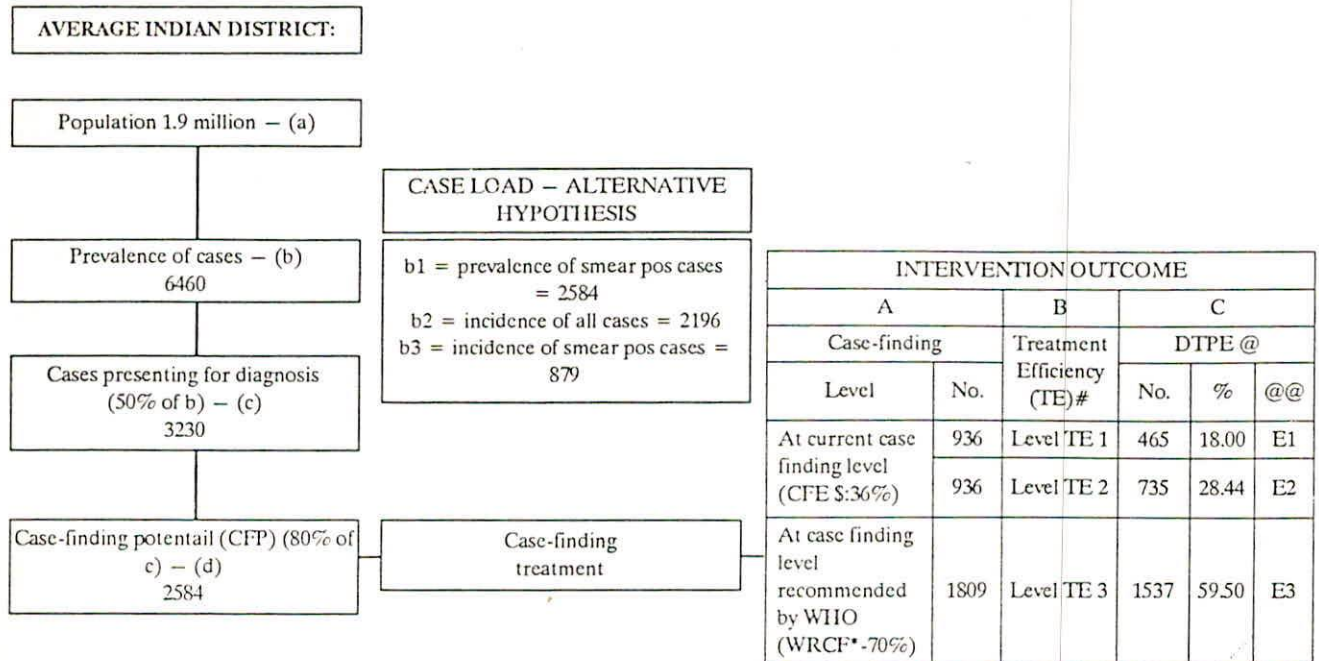
Of the prevalence cases who present themselves for diagnosis (50%), 2584 can be diagnosed if all the available

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FLOW CHART
Model on DTP efficiency as at present Vs. WHO recommendation

AVERAGE INDIAN DISTRICT:

Population 1.9 million — (a)

Prevalence of cases — (b)
6460

Cases presenting for diagnosis
(50% of b) — (c)
3230

Case-finding potentail (CFP) (80% of c) — (d)
2584

CASE LOAD — ALTERNATIVE HYPOTHESIS

b1 = prevalence of smear pos cases = 2584
b2 = incidence of all cases = 2196
b3 = incidence of smear pos cases = 879

Case-finding treatment

INTERVENTION OUTCOME					
A		B	C		
Case-finding		Treatment Efficiency (TE)#	DTPE @		
Level	No.		No.	%	@@
At current case finding level (CFE $:36%)	936	Level TE 1	465	18.00	E1
	936	Level TE 2	735	28.44	E2
At case finding level recommended by WHO (WRCF*-70%)	1809	Level TE 3	1537	59.50	E3

HYPOTHESES USED

(a) Population of an average Indian District
= 1.9 million
(b) Prevalence of all cases 5 + age
= 4/1000 population
  b1) Prevalence of smear positive cases
  = 40% of b
  b2) Incidence of all cases
  = 34% of b
  b3) Incidence of smear positive cases
  = 34% of b1
(c) Cases presenting at health institutions for diagnosis = 50% of b
(d) Sensitivity of diagnostic tool at health institutions = 80%

LEGENDS

Case: Bacteriologically positive patient of tuberculosis.

CFP: Case-finding Potential–proportion of cases diagnosed among those presenting themselves at health institutions (80% of c or 40% of b) = (d)

CFE $: Case–Finding Efficiency = $\dfrac{performance}{CFP} \times 100$

* WRCF: WHO recommended case-finding level:70% of b1 (2584)

#TE: Treatment Efficiency-sputum negativity achieved in cases found

TE.1: Cases on SR-compliance 45% at level 4; TE-50%

TE.2: Cases on SCC-compliance 56% at level 4; TE-79%

TE.3: TE = 85% as recommended by WHO (Compliance level & Regimens not stated)

@ DTPE: DTP Efficiency:Sputum negativity achieved out of cases presenting themselves for diagnosis ie.,CFP (d) CFP (d)

@@ E1-E3: DTP Efficiency under various options of case holding including WRCF

health institutions participate in the programme as per the Manual(d). This is called the case-finding potential (CFP). The case-finding efficiency (CFE) is expressed as a proportion of the cases being diagnosed by a DTP (current average for DTP as per information available from the periodic monitoring report prepared by the NTI being 936, the CFE is calculated at 36% of CFP: see under Column 'A' of the flow chart). The results of treatment at the current treatment efficiency (TE) is shown in Column 'B': TE.1 for the cases on standard regimen (SR) and TE.2 for those on SCC. Column 'C' gives the proportion of cases which could be cured with the respective TE, calculated out of the CFP (DTP efficiency – DTPE)[4]. DTPE under SR is shown as 18.0 (E.1) and on SCC 28.4 (E.2).

Table 1 calculates the epidemiological impact of CFT while taking into consideration the natural dynamics of tuberculosis[5]. Part 'A' of the Table shows the natural dynamics without intervention[6]. For calculation of dynamics of intervention in Part 'B' I, the natural dynamics has been applied to the proportion of prevalence cases which is not being diagnosed in the programme. In Part 'B' II (a) the dynamics of the programme where the cases are diagnosed and treated with SR under the current efficiency is applied[2]. In Part 'B' II (b), the same under treatment of cases with SCC regimen is imputed[7]. The cure (CT) and death (DT) among treated cases ('B' II a and 'B' II b) is added to the natural cure (CN) and deaths (DN), among those uncovered by the CFT activities of the DTP (Part 'B' I). These add up to constitute the number of cases excluded from the initial prevalence (EX.T1 = CT + DT + CN + DN). The remaining number is shown in column 5 (T.1 – EX.T1), to be 4264 under no-intervention situation, 3964 under intervention with SR and 3842 with SCC. The annual incidence cases (Column 6) are added to these numbers to give the prevalence at the end of the year (T.2).

Table 1 shows that without a programme, the tuberculosis situation in terms of case prevalence would have remained unchanged (Part 'A', Column 8). With all the treated cases on SR, the programme appears to show a reduction of 4.6% annually (Part 'B' total I + II a) and

Table 1

Estimated load of sputum positive cases in a district at the end of a year:
Natural dynamics vs intervention through district tuberculosis programme

Intervention Situation		T1 Prevalence (Number of cases initially)	Fate of cases in a year			Incidence of cases in a year (I)	T2 prevalence (Number of cases at the end of a year (Col 5 + 6)	Difference $\frac{T1-T2}{T1} \times 100$ (%)
			Excluded from Prevalence (Ex.T1)		Remaining as cases (T1–ExT1)			
			Death	Cure				
1		2	3	4	5	6	7	8
A		6460	904*	1292**	4264	2196	6460	0
B	I	5524	773*	1105**	3646			
	II(a)	936†	150¶	468 +	318			
	II(b)	936†	0¶¶	739 + +	197			
Total: I + II(a)		6460	923	1573	3964	2196	6160	4.6
I + II(b)		6460	773	1844	3842	2196	6039	6.5

Given : Population of a district = 1.9 million.. Total cases = (T1 prevalence = 6460;
Incidence of cases in a year = 34% of prevalence

A - Natural dynamics
* Case fatality rate = 14%
** Cure rate = 20%

B - Dynamics of intervention (DTP): I - Not diagnosed under DTP
II - Diagnosed under DTP:
(a) treatment with SR
(b) treatment with SCC
† - Current case-finding efficiency (CFE) - 36.22% of CFP
CFP - Case-finding potential - 2584
Case fatality rate : ¶ - all cases on SR = 16%; ¶¶ all cases on SCC = 0%
Cure rate : + - all cases on SR = 50%; + + - all cases on SCC = 79%.

Table 2

Prevalence of cases after a year under some intervention alternatives with varying compliance levels in a district tuberculosis programme

Intervention alternatives	Case finding Effiency (CFE)†	Cure on treatment (CT)#	Excluded from T1* (Ex.T1)##	Prevalence at the end of a year T2**	Problem reduction (%)	Additional decline compared to alternative I (%)	Relative benefit †† (%)
1	2	3	4	5	6	7	8
I	936	468	2496	6160	4.6	0.0	0.0
II	936	599	2627	6029	6.7	2.1	45.7
III	936	655	2683	5973	7.5	3.0	65..2
IV	936	739	2618	6038	6.5	2.0	43.5
V	936	777	2655	6001	7.1	2.6	56.5
VI	936	796	2674	5982	7.4	2.9	63.0
VII	1809	501	3083	5573	13.7	9.5	206.5

Abbreviations used : † CFE = Case-finding Efficiency (Proportion diagnosed out of potential 2584) : (for I to VI at 36.22% = 936; for intervention VII at 70% 1809)

  # CT = Cure with treatment = CFE ×Treatment Efficiency (TE))

  TE calculated as follows by respective complicance at level IV;

Intervention alternatives	CFE (%)	Regimen compliance (%)	TE (%)
I	36	SR 45	50
II	36	SR 70	64
III	36	SR 90	70
IV	36	SCC 56	79
V	36	SCC 70	83
VI	36	SCC 90	85
VII	70	SCC 70	83

  * T1 = Initial prevalence (6460);

  ## Calculated from the formula : Excluded = Ex.T1 = CT + DT + CN + DN

  DT = Dead on treatment in a year : (CFE × Case fatality rate); case fatality rate on SR = 16% (on intervention I-III = 150); on SCC Nil (0 on intervention VII)

  CN = Natural cure (T1 - CFE) × 20%.

  DN = Dead with Natural Dynamics : (T1-CFE) × 14%); under Intervention I-VI = 773; under intervention VII = 651

  ** T2 = Prevalence at the end of one year (T1-Col 4 + 1)

  I = Incidence in a year = (34% × 6460 = 2196)

†† Relative benefit (columun B) = $\dfrac{\text{Additional Decline from alternative in question}}{\text{Decline on Intervention alternative at I}}$ × 100

on SCC 6.5% (Part 'B' total I + II b). The latter shows a benefit of 41% over the former, besides causing prevention of deaths at the end of treatment (none on SCC and 150 with SR).

Intervention Alternatives with Fixed CFE

It could be observed from the flow chart that at the current efficiency, 936 cases are found: of these, only 465 on SR and 735 on SCC could be cured. It could be taken as a failure of case-holding, calling for corrective actions in order to improve the epidemiological impact of the programme.

In Table 2, various intervention alternatives stand presented along with the extent of likely reduction of the problem under current CFT efficiency and all cases on SR (alternative I), taken as the baseline. With the CFE pegged at the current level (36%), effects of raising the treatment compliance for level 4 on SR from 45% to two higher levels of 70% and 90% are studied. They give a problem reduction of 6.7% and 7.5% respectively i.e., an additional decline of 2.1% and 3.0% compared to alternative I taken as baseline (rows II and III at Column 7). On SCC regimen with current compliance of 56% (alternative IV), a problem reduction similar to that on SR with improved treatment compliance to 70% (alternative II) is observed: around 2% additional decline with both. It could be concluded that in a situation where SCC is not available, gain equivalent to SCC in epidemiological terms could accrue by raising the compliance on SR for level 4 from the current 45% to 70%. On the other hand, raising the compliance for level 4 of patients on SCC from current 56% to 70%, the additional decline is only marginally different (2.0% Vs 2.6%). However, raising the level 4 compliance, whether on SR or SCC to 90%, would not result in much difference (3.0 on intervention III Vs 2.9 on intervention VI). Further, the question of raising the compliance for level 4 on either regimens may pose to be too ambitious a task operationally, besides not yielding commensurate epidemiological gain.

Intervention Alternatives Recommended by WHO

From the above, it appears reasonable to expect almost similar possible benefit by raising the compliance for level 4 to about 70%, SCC having a marginal advantage over SR in its ability to prevent deaths. For higher epidemiological gains, it is obvious that CFE also needs to be raised.

The WHO, in several of its reports, recommends a global target of 70% case detection (WRCF), an 85% cure rate (TE) of all sputum positive cases[8,9,10,11]. However, the target on case-finding, as expressed, is amenable to be variously interpreted. In two documents, it mentions the target to be "70% case detection" interpreted to be out of the total prevalence[8,9]. In respect of this target, the result of treatment at 85% TE, expressed as DTPE will be 148.76%(see Appendix Table). Since no methodology exists to diagnose all prevalent cases in the community, this intervention alternative is not feasible.

In a third document issued by the WHO[10], the target is given differently as "70% of the detection of all new cases" TE being the same. Since there is no method of detection of culture positive new cases in the DTP, the target can be interpreted as all newly occurring smear positive cases. At 70%, the WRCF works out to be 615 with DTPE being 19.8% (Appendix Table). At the current CFE (36%), it appears that the performance in case-finding (936 average per DTP), is ahead of the WRCF of 615. However, because of a low TE, the impact of curing a number of cases more than the incidence of smear positive cases (b.3 = 879), is not obtained.

In the fourth document of the WHO[11], the target of CFE is mentioned as 70% out of all smear positive cases (WRCF:1809), TE being 85%. When the efficiency of this WRCF is compared with the current CFE of 936 cases, the latter is nearly half of the former. The DTPE for this alternative at 59.5% is very high indeed (See flow chart). The epidemiological impact as given in the Table 2 for this alternative is 13.7% annually, with additional decline of 9.5% over alternative I, representing a benefit of 206.5% over the current CFT efficiency. Since CFP is similar to the prevalence of smear positive cases (b.1 = d), this alternative appears feasible on the face of it. However, it must be understood that the coverage of implementation of general health institutions as well as high treatment compliance are to be ensured for such achievements.

From the above, it appears that raising CFE to a level of WRCF 70% and TE to 85% remains an attractive DTP objective to attain in the long run, however unrealistic it may presently seem. We may work for this. At the same time, we have to consider other alternatives which may not appear as imposing.

Examining the alternatives given in Table 2, it has already been observed that between 2% and 2.6% additional decline is possible to achieve by keeping the CFE at the present level, but raising the compliance to 70%, whether on SR or SCC. The system could be geared to achieve this, as it would result in a TE of 83% (alternative V). Besides ensuring uninterrupted drug supplies, improvement in treatment compliance to this level would call for a revised action plan on case-holding. It is possible that corrective measures at higher case-holding may have an indirect consequence of a higher CFE as well. The possible inputs to raise the

achievements in respect of case-holding requires to be examined.

Operational Alternatives on Improving Treatment Compliance

Some of the areas of concern in an anti tuberculosis treatment programme are to see that patients are treated free and they get supply of drugs regularly as near to their homes as possible. Further, it may even be desirable to give supervised treatment, especially in the initial intensive phase. The question is how to achieve these under the available health services. Fortunately, the development of infrastructural facilities in health in India makes it possible today to consider alternatives to ensure the supply of drugs close to patients' residence and monitor treatment compliance more effectively than hitherto possible. Availability of treatment facility till recently was restricted upto the level of Primary Health Centres and dispensaries (Peripheral Health Institutions — PHI), catering to nearly 100,000 population in the villages on the average. Today there is likely to be one PHC for every 30,000 population. Besides there are sub centres one for 3000 to 5000 persons. Beyond the level of sub centres, even though there may not be institutional facilities from the Government, alternatives exist in the Non-Governmental sector. Thus, there is the provision for one community health volunteer (Health Guide — CHV) for every village. CHV is selected by the community leaders to render elementary and general health care at the village level. Over and above this facility, workers oriented to special health problems are also available in the villages today viz., traditional birth attenders or 'Dais' (TBA) and Anganwadi workers (under the integrated child development scheme — ICDS workers). There could also be private medical practitioners of various systems working in the villages.

Table 3 depicts the health functionaries below the level of PHI and the possibility of involving them in some or other manner in tuberculosis treatment activity under a programme.

Governmental Agencies

There are two categories of health personnel available with the agencies under direct Govt. control viz., health worker (male & female) and the Anganwadi worker (ICDS).

Health Workers:

The health workers are stationed at sub centres to visit villages on previously appointed days (as per beat schedule). From the nature of their schedules they cannot visit a village out of turn either to make a drug supply or for defaulter retrieval action. Moreover, they may not be present on the day a patient chooses to visit the sub centre for drug collection. Therefore, they may not be utilised for drug distribution routinely at the centre also. Secondly, the State Governments have not been able to provide, as yet, residential accommodation to all the health workers at the villages not even to the female health workers. In some places the clinic accommodation of the sub centre itself may not be there. The health workers however, can be utilised to motivate the patients in the respective villages, while visiting them as part of their fixed programme. Patients' general welfare can be one of the major concerns of the health workers. They can render valuable service by advising/referring the patients. They may also collect data concerning patients and forward the same to the PHI (e.g. death, hospitalisation, serious set back in condition, etc). More importantly, these workers can supervise, at the village level, the activities of the Anganwadi workers/CHV/Dai working in the respective villages as peripheral drug distributor for tuberculosis. Since a Health Worker as a rule visits a PHC once a month, he can collect the monthly quota of drugs required for the drug distributors in his area and maintain the routine peripheral supply on a regular manner.

Anganwadi Workers:

Each village with more than 1000 population may have an Anganwadi worker under the integrated child development scheme. She functions from the ICDS centres called Balwadis, attended by pre-school children. These workers can be utilised for the motivation of TB patients or to render daily supervised administration of treatment to the patients in the villages. They can in any case carry out periodic drug distribution. Being educated, they can maintain proper records and make adequate reports to the supervisors. Motivation rendered by them could be very effective. They may not take part in defaulter retrieval action or make drug collections from the PHIs for the patients under their charge. This is because of their unipurpose nature of work related to the ICDS scheme. They are also not expected to treat side effects to chemotherapy.

Non-Governmental Agency

Under the voluntary/Non-governmental agencies working in the villages, the CHVs, private practitioners and 'Dais' are likely to be found in every village. Their

Table 3
Availability of health personnel in field and suitability of involvement in a tuberculosis programme

Category of Worker	Additional Activities Under DTPs	
	Suitable	Not Suitable
Governmental Agency		
I. Health Worker (Male/Female)	* Motivation * Collection of information about patient's general welfare * Collection of drugs from PHI and supply to the drug distributor * Supervision of peripheral drug distributor	– Routine drug distribution – Defaulter retrieval action – Treat side effects
II Anganwadi Worker (ICDS)	* Motivation * Drug distribution * Recording and reporting	– Defaulter retrieval – Collection of drugs from the PHI – Treat side effects
Voluntary Non-Governmental Agency		
I Dai (Traditional Birth Attender)	* Motivation * Drug distribution * Supervised administration of treatment * Defaulter retrieval * Minimal recording and reporting	– Collection of drugs from the PHI – Elaborate recording and reporting – Treat side effects
II Community Health Volunteer(Scheme not uniformly acceptable & may be on the wane)	* Motivation * Collection and distribution of drugs * Supervised administration of treatment * Defaulter retrieval * Minimal recording and reporting	– Elaborate recording and reporting – Treat side effects
III Private Parctitioner	* Motivation * Distribution of drugs * Treat side effects	– Defaulter retrieval action – Collection of drugs from the PHI

likely role in tuberculosis treatment programme is discussed as under:

CHV

The CHVs are capable of making periodic drug distribution, supervise treatment administration, carry out motivation, defaulter retrieval, recording & reporting. On the face of it, they look ideal for all the activities under the tuberculosis treatment programme. Even though they are not able to collect drugs from the PHI, treat the side effects or make elaborate recording and reporting, they could be otherwise very helpful. Since the collection of drugs as well as reports can be carried out by the health supervisors or health workers of the PHIs, the latter category may serve as a vital link between the system (PHI) and the village level drug distributors. Patients with side effects can be referred by the CHVs to the PHIs.

Private Practitioners:

Private practitioners, by the nature of their profess-ional involvement in patient care in the villages, are capable of treating patients of tuberculosis including side effects. They are also capable of maintaining the elaborate records and carry out reporting. Though they may not be making home visits for retrieval of defaulting patients they may still be successful in ensuring this through local influence. However, it may be realised that the interest of the private practitioners may not necessarily converge with the programme policies. Their economic interest in the patients may often be so overriding as to prevent them in conflicting situation vis-a-vis the programme.

Dais:

Every village in India from the times of yore has been served by the Traditional Birth Attenders or Dais. They render assistance in carrying out home deliveries. In recent times, the Govt. of India has implemented a plan to impart elementary training and orientation to them, so that the services rendered by them are carried out in a scientific manner with maximum safety to the mother and the child. They may thus be in a position today to appreciate the importance of the procedures in the scientific context, by being linked to the health care delivery system. There is a provision to train one Dai for a village of 500 persons on the average. Presently, this scheme appears to be accepted widely throughout the country and functioning. It is possible to visualise the Dais as capable of participating in the tuberculosis treatment programme. However, the activity they are supposed to perform in the programme should, in the first place, be acceptable to them. Further, the modalities should be worked out to impart to them the minimum training in drug distribution, defaulter retrieval, as well as identification and referral of patients with side effects. It should however be understood that they may not be expected to keep elaborate records and carry out sophisticated reporting. However, the fact remains that they are experienced enough in rendering responsible service in the health sector at the door steps of the people. It will be good sense to employ them usefully in the tuberculosis treatment programme supported by adequate training, supervision and guidance.

Conclusions

The following alternative action plans utilising the peripheral level functionaries could be investigated:

1. At the sub centre level drugs may be collected by the patient from the health workers (male or female) on appointed days. This will obviate the need of patients to travel a longer distance in order to make drug collections. Moreover their visits should be so adjusted, as to fall on days of the week, when the health worker is supposed to be available at the sub centre.

2. The drugs can be supplied to Anganwadi workers on diagnosis of a patient at the PHI. Supply could be carried out by the supervisor, under whose jurisdiction the village falls. Patients could collect the drugs on due date from the Balwadis. The working time of the Balwadis should be kept in mind and the patients to be advised to attend them accordingly. Balwadi being available in every village, the working hour may not pose much problem to the patients. The Anganwadi workers can also render supervised treatment daily or twice a week. However, daily attendance of sputum positive patients to Balwadis, devoted to child welfare activities, may not be welcome to some. This may pose a problem in the supervised administration of treatment.

3. Both Dais and the CHV may be utilised as peripheral drug distribution agencies as well as for supervised administration of treatment. In this case also, drugs need to be supplied to the distributors by health supervisor as and when the patient is diagnosed at the PHI. Since the Dais or CHV may find it difficult to advise on individual dosages of drugs, it may be worthwhile to supply a day's dosage of all the drugs in a blister pack or pouch, thereby simplifying the process of identification of individual drugs and their dosages. As these workers are available in the villages at all times, the prospect of success of the supervised treatment through the involvement of these workers appears reasonable. There is a problem of acceptability of 'dais' to the community as well as the services rendered by them for tuberculosis treatment. Even sometimes the 'Dais' themselves may not accept the responsibility in this regard.

Thus, the action plans given above need to be studied from the angle of acceptance of the proposed services by the community, by patients in particular as well as by workers themselves. The feasibility and linkage to the health system needs to be worked out in detail. The question of involving the peripheral health workers in the tuberculosis treatment programme is indeed a priority area of research today!

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Appendix Table

DTP efficiency with various WHO recommended case-finding targets

Target pool in an Indian district		Results of intervention*		
		WRCF	TE	DTPE**
Prevalence of all cases	= 6460	4522	3844	148.76
Incidence of all cases	= 2196	1537	1307	50.58
Incidence of smear positive cases	= 879	615	523	20.24
# Prevalence of smear positive cases	= 2584	1809	1537	59.48

* At WHO recommended case-finding efficiency (WRCF) — 70% and treatment efficiency (TE) — 85%

** Proportion cured out of smear positive cases presenting for diagnosis at all the health facilities (i.e., case-finding potential — 2584)

$$\text{DTPE} = \frac{\text{TE}}{\text{CFP}} \times 100$$

\# The alternative used in the flow chart.