

Theme Papers

The DOTS strategy in China: results and lessons after 10 years

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Objective To analyse the five-point tuberculosis (TB) strategy, DOTS, 10 years after its implementation in one-half of China's population, and to suggest lessons for future implementation of the DOTS strategy.

Methods We analysed trends in case-finding and treatment outcome over time following implementation of the DOTS strategy in each county, using routine reporting data from the Infectious and Endemic Disease Control (IEDC) project (1991–2000). We also determined the proportion of counties with different levels of case-finding for the fifth and sixth years of DOTS implementation.

Findings From 1991 to 1995, DOTS expanded rapidly to cover more than 90% of target population and counties. By 2000, 8 million TB suspects had received free diagnostic evaluation: 1.8 million TB cases were diagnosed, free treatment was provided to 1.3 million smear-positive cases, and more than 90% were cured. During DOTS implementation, the percentage of previously treated cases decreased among all smear-positive cases and treatment outcomes improved. Despite these achievements, the detection rate for new smear-positive cases in the project was estimated to be only 54% in 1998, and 41.2% of the counties had a below average or low level of case-finding (with substantial variation between provinces).

Conclusions The IEDC project demonstrated that it is feasible to rapidly expand DOTS on a large scale. The global target of an 85% cure rate was quickly achieved, and the level of drug-resistance was probably reduced by this project. However, case-detection did not reach the 70% global target, and more research is needed on how to enhance this.

Keywords Tuberculosis, Pulmonary/drug therapy; National health programs/organization and administration; Disease notification; Treatment outcome; Program evaluation; China (*source: MeSH, NLM*).

Mots clés Tuberculose pulmonaire/chimiothérapie; Programme national santé/organisation et administration; Notification maladie; Evaluation résultats traitement; Evaluation programme; Chine (*source: MeSH, INSERM*).

Palabras clave Tuberculosis pulmonar/quimioterapia; Programas nacionales de salud/organización y administración; Notificación de enfermedad; Resultado del tratamiento; Evaluación de programas; China (*fuentes: DeCS, BIREME*).

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Voir page 435 le résumé en français. En la página 436 figura un resumen en español.

Introduction

In 1991, the Government of China introduced a TB control project using the WHO-recommended, five-point strategy called DOTS. The project, entitled the Infectious and Endemic Disease Control (IEDC) project, was assisted by a World Bank loan and was implemented in 12 provinces with a population of 573 million, roughly one-half of China's population in 1991. An earlier report of this project reported that the programme expanded rapidly over the first four years (1991–94) to cover 80% of the target population (7). Over 200 000 smear-positive TB cases were diagnosed and, more importantly, nearly 90% of new smear-positive cases were identified. Over 80% of previously treated cases were cured. The initial successes of

the IEDC project showed that it was feasible to implement the DOTS strategy on a large-scale.

In June 2002, the IEDC project will end. It has been the largest TB control project in the world to use the DOTS strategy, and in this article we summarize the main results of the project and discuss key lessons. This 10-year experience has important implications for China, as it seeks to sustain and further expand DOTS. The results and lessons may also be of interest to other countries as they scale up their implementation of DOTS.

Methods

The project began in April 1991 with five pilot counties in Hebei province, expanded in April 1992 to 65 pilot counties in all

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12 provinces, and thereafter to other counties. Ultimately, the project involved 12 provinces with 1208 counties and a population of 573 million people (1991 population data). Project counties served as demonstration areas and in general they had pre-existing capacity to carry out DOTS. In 1996, Sichuan province split off a municipality called Chongqing. Thereafter, there were 12 provinces and one municipality in the project. To simplify the presentation of data, however, we have reported project results using the old undivided province of Sichuan.

The technical approaches of the project have been described elsewhere (1, 2). Briefly, a standardized diagnostic evaluation was provided free of charge to patients presenting to the county or district TB dispensary. Patients meeting symptom criteria were examined by chest fluoroscopy; those with suspicious fluoroscopy findings submitted three sputum samples for smear examination, and chest X-ray examination was performed if indicated. Patients with smear-positive pulmonary TB received standardized intermittent treatment using streptomycin, isoniazid, pyrazinamide, and rifampin; for retreatment cases, ethambutol was added. Sputum specimens were collected at standardized intervals to document sputum conversion and cure. A health care worker, usually the village doctor (also known as a barefoot doctor), was given a case management fee to directly observe the ingestion of drugs.

Quarterly reports on case-finding, treatment outcome, and other programme activities were submitted from the county to the prefecture, and subsequently to the province and central level. This reporting system permitted the project to be monitored continually. Supervision and quality control activities, conducted from higher to lower administrative levels, maintained the quality of the programme. An extensive training programme was put into place for health care workers involved in the project, from provincial staff to the village doctors.

For each county involved in the project, all data from 1991 to 2000 were analysed by year over the course of DOTS implementation. Time zero was set as the calendar date when each county started implementing DOTS. However, the DOTS implementation data were not analysed by calendar date, since the implementation dates varied between counties. For example, some counties started DOTS in 1992, others in 1993 or 1994. Instead, data collected from each of the counties during the first year they implemented DOTS were referred to as data from the first year of DOTS implementation, and subsequent annual data were numbered consecutively.

To assess the effectiveness of case-finding in each province, we first ranked the counties in each province according to their notification of new smear-positive cases during the fifth and sixth year of DOTS implementation (when case notification was highest and nearly all counties had implemented DOTS). We then divided the average case notification rate for the top 10% of the counties into four, to form four quartiles corresponding to $\leq 25\%$, 26–50%, 51–75% and $>75\%$ of the top case notification rate. For example, if the average rate in the top-performing counties was 60 cases per 100 000 people, the rates in the four quartiles would be ≤ 15 , 16–30, 31–45 and >45 . Finally, for each province, we determined the proportion of its counties in each quartile of case-finding.

Results

DOTS expansion and coverage

The number of counties implementing the DOTS strategy and the population covered in these counties expanded rapidly from

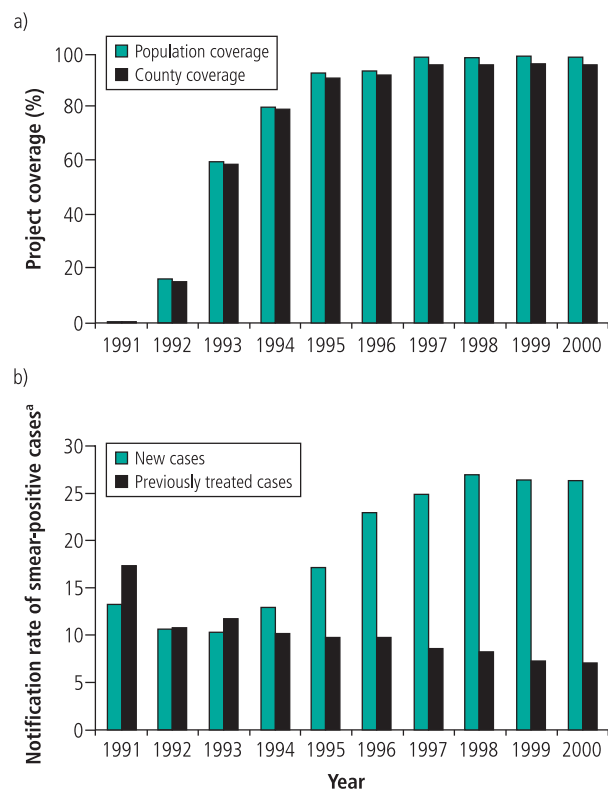
five pilot counties in 1991 to more than 90% of the target coverage (by county and by population) by the end of 1995 (Fig. 1). Nine of the 12 provinces reached 90% DOTS coverage by the end of 1994, and 10 of 12 provinces reached 100% DOTS coverage by the end of 1995. Only one province, Sichuan, never achieved 100% DOTS coverage. Eventually, DOTS was made available to 98.9% of the 573 million target population (1991 population data) and 96.1% of the 1208 target counties.

Because counties started implementing DOTS at different times, the duration of DOTS implementation for each county also varied. By the end of 2000, 1132 (96.1%) and 1105 (91.6%) counties had implemented DOTS for at least five and six years, respectively. However, only 910 (75.5%) and 581 (48.2%) counties had implemented DOTS for at least seven and eight years, respectively. The mean and median duration of project implementation (up to the end of 2000) was 6.9 and 7.25 years, respectively (range: 0.00–9.75 years; 25–75% interquartile range: 6.50–7.75 years).

Case-finding, 1991–2000

Between 1991 and 2000, 7.99 million patients with suspected TB were evaluated in TB dispensaries; 7.68 million (96.0% of all suspects) received fluoroscopic examination; of these, 3.53 million (45.9%) had suspicious findings on fluoroscopy, and sputum samples were collected and examined for acid-fast bacilli. Overall, 1 299 610 smear-positive pulmonary TB cases and 507 660 smear-negative pulmonary TB cases were diagnosed; 71.7% of pulmonary TB cases were smear-positive. Among the smear-positive pulmonary cases, 908 973 (70.8%) were new cases; 92 277 (7.2%) were relapse cases; and 281 713 (22.0%) were other retreatment cases, which primarily

Fig. 1. Project coverage (a) and rates of smear-positive TB cases (b), 1991–2000



^a Number of cases per 100 000 people.

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consisted of patients who were treated after defaulting from prior treatment.

Although DOTS coverage expanded rapidly, the rate of case-finding increased more slowly (Fig. 1). The notification rate of new smear-positive cases gradually increased by 163%, from 10.3 cases per 100 000 people in 1992, to 27.1 cases per 100 000 in 1998. Over the same period, the notification rate of previously treated cases (relapse and other retreatment) decreased by 39%, from 11.7 to 7.1 cases per 100 000 people. WHO estimated the incidence of new smear-positive cases in China to be 50.7 cases per 100 000 people in 1998 (3). Applying this figure to project areas, the estimated case-detection rate under DOTS for new smear-positive cases (i.e. DOTS detection rate) was 53.5% in 1998. The case-detection rate is the number of notified cases divided by the estimated number of cases in the population of interest.

Case-finding following DOTS implementation

From the first to the fifth project year of DOTS implementation, the notification rate of new smear-positive cases steadily increased, reaching nearly twice the initial rate (from 13.6 to 26.0 cases per 100 000 people); thereafter, there was little further increase (Fig. 2). The notification rate of previously treated smear-positive cases declined rapidly between the first and second years of DOTS implementation (from 15.1 to 9.4 cases per 100 000 people); thereafter, the decline was more gradual.

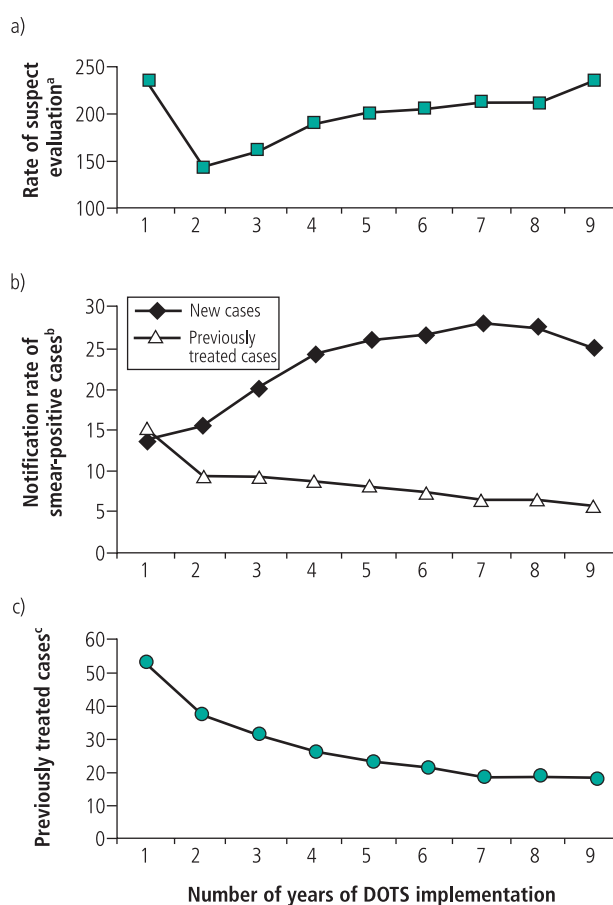
As a result of a steady increase in the notification rate of new smear-positive cases, and a more gradual decrease in the notification rate of previously treated cases, the percentage of previously treated cases among all smear-positive cases decreased over time until it levelled off at approximately 20% in the seventh year of DOTS implementation (Fig. 2). The decline was greatest from the first to the second year of DOTS implementation, from 52.4% to 37.6%, primarily because of a large decrease in the notification rate of previously treated cases.

Finally, the notification rate of smear-positive cases correlated with the rate of TB suspect evaluation. The rate of TB suspect evaluation was high in the first year of DOTS implementation and this was accompanied by a high notification rate of smear-positive cases, including a high notification rate of previously treated cases. When the rate of TB suspect evaluation dropped in the second year of DOTS, the notification rate of smear-positive cases also dropped, but this was entirely due to a decrease in the notification of previously treated cases. After the second year of implementing DOTS, the rate of TB suspect evaluation increased and then levelled off, as did the notification rate of smear-positive cases.

Treatment outcome following DOTS implementation

Following the implementation of DOTS, treatment outcomes were excellent and improved over time. Overall, the cure rate was 95% and 90% for new and previously treated (relapse and other retreatment) cases, respectively (Table 1). From the first to the sixth year of DOTS implementation, the cure rate for both new and previously treated cases improved, while the treatment failure rate and death rate both decreased. Roughly two-thirds of the eventual improvement in treatment outcomes took place between the first and second year of DOTS implementation. For example, the percentage of treatment failure among new cases declined from 2.8% to 0.5% over the first six to eight years

Fig. 2. Rate of suspect evaluation (a), notification rate of new and previously treated smear-positive cases (b), and percentage of previously treated cases among all smear-positive cases (c), by number of years of DOTS implementation



^a Number of suspects evaluated per 100 000 people.

^b Number of notified cases per 100 000 people.

^c Percentage of previously treated cases among all smear-positive cases.

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of DOTS implementation, but this percentage declined from 2.8% to 1.2% during the first year alone.

Variation in case-finding effectiveness between provinces

During the fifth and sixth year of DOTS implementation, which corresponded roughly to the peak of project implementation, there were substantial differences between provinces in case-detection (Table 2). The rate of TB suspect evaluation varied by more than fourfold and the ratio of suspects to smear-positive cases varied by nearly sevenfold. Although the overall percentage of previously treated cases levelled off at approximately 20% following DOTS implementation (Fig. 2), this percentage varied by twofold between provinces.

Dividing the notification rate of new smear-positive cases in each province by the notification rate for the top 10%-ranked counties, gave a percentage measure of how the province was actually progressing in case-finding, compared to the achievement of the best-performing counties in the province. During the fifth and sixth year of DOTS implementation, this percentage varied from 37.3% to 73.3% between the provinces (Table 2).

Table 1. Treatment outcomes for smear-positive TB cases, by year of DOTS implementation

Year of DOTS implementation	Registered <i>n</i>	Cured <i>n</i>	Completed treatment <i>n</i>	Died <i>n</i>	Failed <i>n</i>	Defaulted <i>n</i>	Transferred <i>n</i>	Other <i>n</i>
New smear-positive cases								
1	77 369	69 461 (89.3) ^a	1994 (2.6)	1638 (2.1)	2127 (2.7)	1246 (1.6)	265 (0.3)	638 (0.8)
2	88 181	83 013 (94.1)	1320 (1.5)	1340 (1.5)	1081 (1.2)	793 (0.9)	241 (0.3)	393 (0.4)
3	114 362	109 241 (95.5)	1252 (1.1)	1546 (1.4)	925 (0.8)	876 (0.8)	203 (0.2)	319 (0.3)
4	134 877	129 361 (95.9)	1527 (1.1)	1703 (1.3)	888 (0.7)	794 (0.6)	254 (0.2)	350 (0.3)
5	138 883	133 846 (96.4)	1543 (1.1)	1489 (1.1)	792 (0.6)	735 (0.5)	223 (0.2)	255 (0.2)
6	118 914	115 008 (96.7)	1060 (0.9)	1222 (1.0)	584 (0.5)	619 (0.5)	188 (0.2)	233 (0.2)
7	73 547	71 116 (96.7)	678 (0.9)	768 (1.0)	373 (0.5)	357 (0.5)	114 (0.2)	141 (0.2)
8	12 855	124 485 (97.1)	95 (0.7)	118 (0.9)	66 (0.5)	64 (0.5)	7 (0.1)	20 (0.2)
9	556	554 (99.6)	0 (0.0)	2 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
All years	759 544	724 085 (95.3)	9469 (1.2)	9826 (1.3)	6836 (0.9)	5484 (0.7)	1495 (0.2)	2349 (0.3)
Smear-positive relapse cases								
1	18 773	15 415 (82.1)	670 (3.6)	641 (3.4)	1419 (7.6)	319 (1.7)	94 (0.5)	215 (1.1)
2	10 839	9731 (89.8)	277 (2.6)	217 (2.0)	361 (3.3)	126 (1.2)	46 (0.4)	81 (0.7)
3	10 874	9971 (91.7)	232 (2.1)	251 (2.3)	254 (2.3)	98 (0.9)	30 (0.3)	38 (0.3)
4	11 688	10 830 (92.7)	232 (2.0)	237 (2.0)	218 (1.9)	83 (0.7)	27 (0.2)	61 (0.5)
5	11 186	10 444 (93.4)	197 (1.8)	234 (2.1)	203 (1.8)	51 (0.5)	24 (0.2)	33 (0.3)
6	9212	8620 (93.6)	126 (1.4)	196 (2.1)	157 (1.7)	60 (0.7)	14 (0.2)	39 (0.4)
7	5624	5301 (94.3)	62 (1.1)	101 (1.8)	106 (1.9)	30 (0.5)	4 (0.1)	20 (0.4)
8	855	802 (93.8)	12 (1.4)	20 (2.3)	13 (1.5)	3 (0.4)	3 (0.4)	2 (0.2)
9	60	59 (98.3)	0 (0.0)	1 (1.7)	0 (0.00)	0 (00.0)	0 (0.0)	0 (0.0)
All years	79 111	71 173 (90.0)	1808 (2.3)	1898 (2.4)	2731 (3.5)	770 (1.0)	242 (0.3)	489 (0.6)
Other retreatment smear-positive cases								
1	67 154	55 224 (82.2)	2323 (3.5)	2348 (3.5)	4728 (7.0)	1440 (2.1)	174 (0.3)	919 (1.4)
2	42 385	38 499 (90.8)	905 (2.1)	946 (2.2)	1131 (2.7)	567 (1.3)	97 (0.2)	240 (0.6)
3	41 900	38 952 (93.0)	731 (1.7)	835 (2.0)	763 (1.8)	403 (1.0)	70 (0.2)	146 (0.3)
4	36 986	34 467 (93.2)	690 (1.9)	661 (1.8)	666 (1.8)	299 (0.8)	69 (0.2)	134 (0.4)
5	32 125	30 098 (93.7)	626 (1.9)	507 (1.6)	493 (1.5)	215 (0.7)	62 (0.2)	124 (0.4)
6	22 260	20 914 (94.0)	398 (1.8)	339 (1.5)	327 (1.5)	160 (0.7)	33 (0.1)	89 (0.4)
7	10 530	9840 (93.4)	185 (1.8)	168 (1.6)	197 (1.9)	94 (0.9)	21 (0.2)	25 (0.2)
8	1720	1619 (94.1)	19 (1.1)	23 (1.3)	43 (2.5)	15 (0.9)	1 (0.1)	0 (0.0)
9	37	35 (94.6)	0 (0.0)	1 (2.7)	0 (0)	0 (0.0)	1 (2.7)	0 (0.0)
All years	255 097	229 648 (90.0)	5877 (2.3)	5828 (2.3)	8348 (3.3)	3193 (1.3)	528 (0.2)	1677 (0.7)

Source: IEDC project.

^a Figures in parentheses are percentages.

For each province, we determined the proportion of counties in four quartiles of case-finding (Fig. 3). Overall, 19.9%, 39.2%, 29.3%, and 11.6% of the counties had respectively >75%, 51%–75%, 26%–50%, and ≤25% of the case notification rate in the top-performing counties. The percentage of counties in the upper two quartiles of case notification rate ranged from 23.1% to 95.4%. The percentage of counties in the lower two quartiles of case notification rate ranged from 4.6% to 76.9%. Five of the 12 provinces had more than 40% of their counties in the lower two quartiles of case-finding.

Discussion

Rapid DOTS expansion is feasible

A number of lessons for future efforts to control TB in China and other countries can be derived from the results of 10-years' experience in DOTS expansion and implementation. One is that rapid expansion of DOTS coverage can be achieved: in less than five years, DOTS coverage expanded from zero to

more than 90% of target areas and population. Although China was the first large country to successfully expand DOTS coverage rapidly, there are now other examples of this, including the programme in India, where DOTS coverage has expanded rapidly in the past few years (4, 5). WHO recently released the Global DOTS Expansion Plan, which aims to dramatically scale up the implementation of DOTS worldwide by 2005 (6). The expansion that took place in China suggests that rapid global expansion is feasible.

Although many factors contributed to the rapid expansion of DOTS in China, we believe two were critical. First, there was political commitment by government leaders to expand DOTS. To oversee the project, project-leading groups (usually led by the Vice-Governor or Vice-Mayor) were formed at every level of government down to the county. The political commitment led to financial commitment, as finance bureaux committed to borrow and repay the project loan and provide the necessary counterpart funds. The second factor was the system of TB institutions, from central

Table 2. Case-finding during the fifth and sixth years of DOTS implementation, by province

Province	Suspect evaluation		Notification of new smear-positive cases		Notification of previously treated smear-positive cases		Ratio of no. of suspects evaluated to no. of smear-positive cases	Notification rate of new smear-positive cases in top 10% counties ^b	Retreatment %
	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a	<i>n</i>	Rate ^a			
Hebei	68 377	109.5	15 396	24.6	4566	7.3	3.4:1	41.8	22.9
Liaoning	186 656	476.5	6 503	16.6	1569	4.0	23:1	37.6	19.4
Heilongjiang	83 651	237.2	14 295	40.5	2943	8.3	4.9:1	62.5	17.1
Shandong	176 097	203.5	13 479	15.6	4979	5.8	9.5:1	26.4	27.0
Hubei	82 974	149.4	17 540	31.6	6678	12.0	3.4:1	57.8	27.6
Hunan	92 644	145.7	15 763	24.8	6483	10.2	4.2:1	45.1	29.1
Guangdong	135 431	202.4	22 079	33.0	3640	5.4	5.3:1	45.0	14.2
Hainan	21 367	299.5	2559	35.9	457	6.4	7.1:1	60.4	15.2
Sichuan ^c	159 080	185.7	22 413	26.2	6612	7.7	5.5:1	63.5	22.8
Gansu	50 862	215.8	6211	26.3	1879	8.0	6.3:1	70.5	23.2
Ningxia	9977	193.9	935	18.2	256	5.0	8.4:1	26.8	21.5
Xinjiang	48 727	303.5	7260	45.2	2743	17.1	4.9:1	118.6	27.4
All provinces	1 115 843	204.0	144 433	26.4	42 805	7.8	6.0:1	–	22.9

Source: IEDC project

^a Number per 100 000 people.

^b Average notification rate in counties ranked among the top 10% according to the notification rate of new smear-positive cases during the fifth and sixth years of DOTS implementation.

^c Includes data from Chongqing municipality.

level down to the county level, which permitted the rapid dissemination and implementation of a single set of technical guidelines for TB control. The same system also permitted a flow of information and resources between administrative levels. Regular reports flowed from lower to upper administrative levels, while project supervision, monitoring, training, and drug distribution flowed from upper to lower administrative levels.

High cure rate can be quickly achieved

The second lesson from the China project is that a high cure rate can be achieved and maintained during rapid DOTS expansion. As a programme rapidly increases both geographical coverage and the number of patients, it can be difficult to maintain high-quality treatment and case management that result in high cure rates. Low cure rates and increasing drug resistance can develop unless the programme maintains the essential training, supervision, and quality control activities. In China, the quality of treatment was not compromised as the project expanded and the cure rate actually increased and the treatment failure rate decreased.

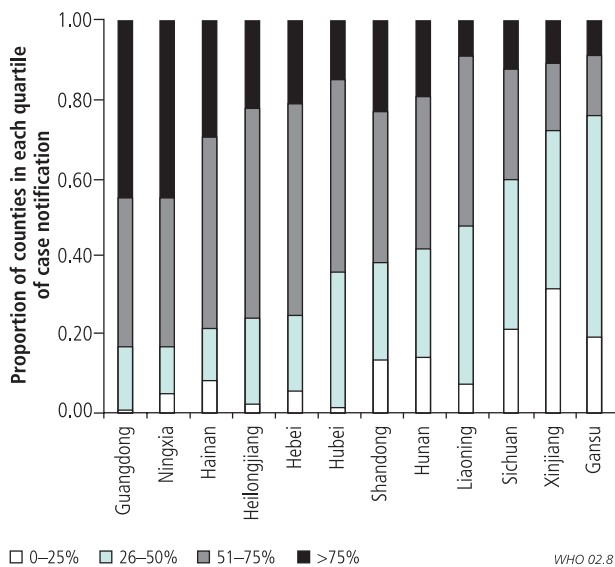
We believe the project maintained a high cure rate because DOTS was implemented as a full package. The political and financial commitment permitted everyone with infectious TB, regardless of financial status, to access high-quality TB treatment free of charge in the TB dispensaries. In addition, the reporting system tracked the availability of drugs in every county so that a stable drug supply was ensured. The recording and reporting system also permitted the continual monitoring of treatment in each county and for each patient. Health care workers were trained in proper case management methods, including how to provide directly observed therapy. Although the use of directly observed therapy was important to ensure a high cure rate, other elements of DOTS were equally important.

Difficulty in achieving global case-detection target

The third lesson is that a high case-detection rate is more difficult to achieve than either the expansion of DOTS or a high cure rate. In spite of the successful expansion of DOTS, the project did not achieve the global case-detection target of 70%. Although the detection of new smear-positive cases gradually increased over time, the case detection rate reached only about 54% at the peak of project implementation, and we suggest that certain issues should be examined as potential constraints to a high case-detection rate. One issue is why 40% of the counties implementing DOTS were below-average or poor performers in case-finding. Was this due to poor programme management, inadequate human resources, poor staff motivation, financial constraints, poor primary health care infrastructure, lack of community involvement, or other problems? More research, including social assessment and operational research, is needed to determine the reasons for poor case-finding and to identify possible interventions. If targeted interventions can be provided to the more problematic counties and they improve their case-finding, this would lead to an improvement in the overall case-detection rate.

Another potential constraint to case-finding was the inadequate referral of TB suspects and cases from the hospital system to the TB dispensary (public health) system. According to the 2000 National TB Prevalence Survey, only 12% of TB patients in China received their diagnosis of TB from a TB dispensary (7). The vast majority of TB cases were diagnosed in the hospital system. Most received some treatment in the hospitals but then failed to complete a full course of treatment. Many eventually reached the TB dispensaries, were classified as previously treated cases and retreated. Therefore, the high percentage of previously treated cases among all cases was a rough indicator of the extent to which hospitals failed to refer new TB patients, and failed to cure those patients they chose to keep and treat.

Fig. 3. Proportion of counties in each quartile of new smear-positive case notification rate, by province



□ 0-25% □ 26-50% ■ 51-75% ■ >75%

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According to health regulations in China, hospitals are supposed to refer TB suspects and patients to the TB dispensary after they are identified. But there is an economic incentive for the hospitals to keep and treat TB suspects and patients, because they could charge patients for their TB-related diagnosis and treatment. The patients may also prefer to be treated by the hospitals, which are frequently perceived to have more clinical expertise than the TB dispensaries. Therefore, in spite of a regulation to refer patients, and that providers were paid a TB case-referral fee by the project, the degree of case referral was inadequate in most provinces.

If TB patients were properly referred to the dispensary for treatment, the percentage of previously treated cases should be low. In Hong Kong, where DOTS is used and around 80% of all TB patients receive their treatment in the system of TB clinics, the percentage of previously treated cases is less than 10% (8). More research is needed to identify the incentives, approaches, or institutional arrangements that can best ensure that all TB patients are treated by a DOTS programme, regardless of where they are diagnosed.

Probable reduction in level of drug-resistance

The fourth lesson from this project is that DOTS can effectively reduce the number of previously treated cases in the community. Because a high percentage of these cases were chronically infectious and harboured drug-resistant organisms (9), reducing the community burden of these cases

would have significant public health benefits. The notification rate of previously treated cases was high at the start of DOTS implementation, but decreased rapidly with the implementation of DOTS. This was probably due to a reduction in the number of inadequately treated cases. The availability of free diagnosis and treatment in the DOTS programme reduced the proportion of patients treated by the hospital system and thus reduced the number of inadequately treated cases generated by the hospital system. At the same time, a high cure rate among new smear-positive cases in the DOTS programme reduced the number of treatment failures or defaulters, which again reduced the number of inadequately treated cases.

The rapid decline in the notification rate of retreatment cases between the first and second year of DOTS implementation suggested that there may have been a high prevalence of inadequately treated and chronic infectious cases in the community prior to the start of DOTS. Fortunately, the DOTS programme in China cured more than 80% of these cases. By reducing the number of prevalent or incident cases that are inadequately treated, the level of drug-resistant TB in the community can be reduced. This lesson is important for China as it seeks to control the problem of drug-resistant TB. In recently published reports, China had the highest number of multidrug-resistant (MDR) TB cases in the world and two provinces not involved in this DOTS project — Henan and Zhejiang — had some of the highest rates of MDR-TB in the world (9, 10). However, provinces involved in this project had lower rates of MDR-TB (9). These results further support our belief that DOTS can reduce the level of drug-resistant TB in the community. Even in areas where MDR-TB is endemic, DOTS may be able to reduce its incidence (11). Therefore, DOTS should be rapidly expanded to all areas in China as a matter of highest priority.

Conclusion

This 10-year experience with one-half of China's population demonstrated the feasibility of rapid and large-scale DOTS expansion. Although the global target of an 85% cure rate for smear-positive cases was quickly achieved, the global target of a 70% case-detection rate was not achieved in the project due to many limitations. This points to the challenge that China and many other countries will face, or are already facing, as DOTS programmes are scaled up globally. Nevertheless, the benefits of large-scale DOTS expansion for the individual patient and for society at large are obvious, as many thousands of patients were cured, deaths averted, and drug-resistance probably reduced because of this project (12). ■

Conflicts of interest: none declared.

Résumé

La stratégie DOTS en Chine : résultats et leçons de dix ans d'expérience

Objectif Analyser la stratégie en cinq points de lutte contre la tuberculose (DOTS) dix ans après sa mise en œuvre dans la moitié de la population chinoise, et indiquer les leçons à tirer de cette expérience en vue de futures applications.

Méthodes Nous avons analysé les tendances de la détection des cas et de l'issue du traitement après la mise en œuvre de la stratégie DOTS dans chaque district, en utilisant les données de notification

du projet IEDC de lutte contre les maladies infectieuses et endémiques (1991-2000). Nous avons également déterminé la proportion de districts possédant différents niveaux de détection des cas pour les cinquième et sixième années de mise en œuvre du DOTS.

Résultats De 1991 à 1995, le DOTS a rapidement été étendu jusqu'à couvrir plus de 90 % de la population et des districts cibles.

En 2000, 8 millions de cas suspects ont bénéficié d'un diagnostic gratuit: 1,8 million de cas de tuberculose ont été trouvés, un traitement gratuit a été fourni à 1,3 million de patients à frottis positif et plus de 90 % d'entre eux ont été guéris. Pendant la période d'application du DOTS, le pourcentage de cas chez des sujets ayant déjà été traités a diminué parmi les cas à frottis positif et l'issue du traitement s'est améliorée. Malgré ces résultats, le taux de détection des nouveaux cas à frottis positif n'a été que de 54 % en 1998, et dans 41,2 % des districts le taux de détection des cas

était faible ou inférieur à la moyenne (avec d'importantes variations d'une province à l'autre).

Conclusion Le projet IEDC a démontré qu'il est possible d'étendre rapidement le DOTS à grande échelle. La cible globale consistant en un taux de guérison de 85 % a rapidement été atteinte, et le projet a probablement réduit le taux de pharmacorésistance. Toutefois, le taux de détection des cas n'a pas atteint la cible globale de 70 %, et il faudra poursuivre les recherches en vue d'améliorer ce résultat.

Resumen

La estrategia DOTS en China: resultados y lecciones al cabo de 10 años

Objetivo Analizar la estrategia de lucha contra la tuberculosis en cinco puntos, la denominada DOTS, 10 años después de empezar a aplicarla en la mitad de la población de China, y apuntar lecciones para la futura aplicación de dicha estrategia.

Métodos Analizamos las tendencias de la detección de casos y los resultados terapéuticos a lo largo del tiempo tras la aplicación de la estrategia DOTS en cada distrito, empleando al efecto datos de notificación sistemática procedentes del proyecto IEDC de Control de las Enfermedades Infecciosas y Endémicas (1991–2000). Determinamos asimismo la proporción de distritos con distintos niveles de detección de casos para los años quinto y sexto de aplicación de la DOTS.

Resultados Entre 1991 y 1995 la DOTS amplió rápidamente su radio de acción hasta abarcar a más del 90% de la población y los distritos destinatarios. En 2000, 8 millones de casos sospechosos de tuberculosis habían sido objeto de una evaluación diagnóstica gratuita, cuyo resultado fue la identificación de 1,8 millones de

casos de la enfermedad, el suministro de tratamiento gratuito a 1,3 millones de casos con frotis positivo, y una tasa de curación de más del 90%. Durante la aplicación de la DOTS, el porcentaje de casos tratados anteriormente disminuyó entre todos los casos con frotis positivo, y los resultados terapéuticos mejoraron. Pese a esos logros, se estimó que la tasa de detección de casos nuevos con frotis positivo en el marco del proyecto fue de sólo un 54% en 1998, y el 41,2% de los distritos presentaban un nivel de detección de casos bajo o inferior a la media (con diferencias sustanciales entre provincias).

Conclusión El proyecto IEDC puso de manifiesto que es posible ampliar rápidamente la DOTS a gran escala. Se alcanzó rápidamente la meta mundial de una tasa de curación del 85%, y el nivel de farmacorresistencia disminuyó probablemente gracias a este proyecto. No obstante, la detección de casos no alcanzó la meta mundial del 70%, lo que obliga a realizar nuevas investigaciones para avanzar en ese sentido.

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