Incidence of tuberculosis before and after DOTS (direct observed therapy short course strategy) implementation in El-Behira Governorate, Egypt

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Aim The aim of this work was to study the incidence of tuberculosis (TB) in El-Behira Governorate before and after application of DOTS (direct observed therapy short course strategy) to evaluate the National Tuberculosis Control Program in El-Behira Governorate as a representative part of Egypt.

Patients and methods This work was a retrospective, descriptive, analytical study of the TB situation before and after DOTS, carried out at Chest Hospital, El-Behira Governorate, Egypt, and related dispensaries. All available data on registered TB cases from January 1996 until December 2010 (15-year duration) were collected, including demographic data, diagnosis of disease, sputum smear results, previous treatment history, and treatment outcome. A descriptive analysis of the data was performed using the SPSS statistical program. Data were described in absolute numbers and percentages. Statistical significance was set at P values less than 0.05.

Results The incidence of TB (n = 10 035) was higher in age groups 15–29 and 30–45 years [n = 3829 (38.2%) and n = 2827 (28.1%), respectively], and in male patients [n = 6511 (64.8%)] compared with female patients [n = 3524 (35.2%)]. Pulmonary cases (78.8%) were more than extrapulmonary cases (21.2%). There was improvement in cure rate, treatment completion rate, treatment success rate, number of retreatment cases, and default rate after DOTS application (46–61.1, 16.1–18.6, 62.1–79.7, 29.1–12.4, and 20.4–6.8%, respectively).

Conclusion TB is a burden of the productive age group of 15–45 years, with a higher incidence in men than in women, and DOTS is an effective tool for controlling TB in El-Behira Governorate. The implementation of this tool has led to significant increase in treatment success and decrease in default and failure rates. *Egypt J Broncho* 2015 9:101–108

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Introduction

The WHO's stop tuberculosis (TB) strategy, which is recommended for implementation by all countries and partners, aims to markedly reduce TB through public and private actions at national and local levels, such as [1]:

(1) Pursue high-quality DOTS (direct observed therapy short course strategy) expansion and enhancement. DOTS is a five-point package to:
  (a) Secure political commitment, with adequate and sustained financing.
  (b) Ensure early case detection and diagnosis through quality-assured bacteriology.
  (c) Provide standardized treatment with supervision and patient support.
  (d) Ensure effective drug supply and management.
  (e) Monitor and evaluate performance and impact.
(2) Address TB-HIV, multi-drug resistant (MDR)-TB, and the needs of poor and vulnerable populations.
(3) Contribute to health system strengthening based on primary healthcare.
(4) Engage all care providers.
(5) Empower people with TB, and communities through partnership.
(6) Enable and promote research.

Aim

The aim of this work was to study the TB situation in El-Behira Governorate before and after application of DOTS to evaluate the National Tuberculosis Control Program in El-Behira Governorate as a representative part of Egypt.

Patients and methods

This study was a retrospective, descriptive, and analytic study carried out at El-Behira Chest Hospital and dispensaries and included all registered cases of TB from January 1996 until December 2010.

Collection of data

The collected data included TB registration code, patient number in the TB registry, name, age, sex, residence, history of previous treatment, diagnosis, culture results, regimen of treatment given, results of sputum examination (at 0, 2, 3 months, at the end of the initial phase, and at the end of treatment), and treatment outcome at the end of treatment.

Measurement of indicators

These indicators were designed by the WHO to determine National Tuberculosis Program quality and effectiveness and are the following [2]:

(1) Incidence rate (case notification rate): for new cases, new and relapsed cases, all cases and new smear-positive pulmonary cases.
(2) New pulmonary cases with no smear result.
(3) New adult smear-positive cases.
(4) Retreatment TB cases.
(5) New extrapulmonary TB cases.
(6) New TB cases with no smear conversion result.
(7) Sputum conversion rate at the end of the initial phase of treatment.
(8) Cure rate.
(9) Treatment completion rate.
(10) Death rate.
(11) Treatment failure rate.
(12) Default rate.
(13) Transfer-out rate.
(14) Retreatment failure rate (chronic TB rate).

Comparison of indicators

Comparison of indicators was made before and after DOTS.

Statistical analysis

A descriptive analysis of data was carried out. The unpaired Student *t*-test was used for comparison of independent data that followed a normal distribution. The Student *t*-test for repeated measurements was used for paired data if they followed a normal distribution. Otherwise, the Wilcoxon rank-sum test was applied, and the χ^2-test was used to compare between more than two percentages; all analyses were carried out using the SPSS (version 14, SPSS Inc., Chicago, Illinois, USA) statistical program. Statistical significance was set at P values less than 0.05. The analysis was performed using SAS software (version 9.1; SAS Institute, Cary, North Carolina, USA) for Windows. The test of proportion (Z-test) was used to compare between two percentages (P_1 and P_2) (Knapp *et al.*, 1992) [3].

Level of significance

P value more than 0.05 was considered nonsignificant; P value less than 0.05 was considered significant; and P value less than 0.001 was considered highly significant.

Results and discussion

This study was a retrospective, descriptive, and analytic study carried out at El-Behira Chest Hospital and dispensaries and included all registered cases of TB from January 1996 until December 2010. The DOTS implementation started in 1999.

Difficulties met during the study included lack of a computerized system for patient records and follow-up and the wide area of the governorate to be covered. The records were lacking important data — for example, some of the smear-positive patients had no follow-up sputum, associated comorbidities were not recorded, socioeconomic status was not recorded, and in case of patient death the cause of death was not recorded.

The total number of recorded TB cases from January 1996 until December 2010 was 10035 (3404 before DOTS and 6631 after DOTS). Graph 1 shows the number of recorded cases with a noticeable decline in the number of recorded cases after DOTS.

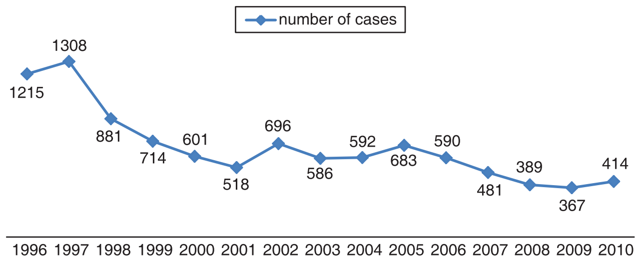
Demographic data

Age groups

The highest incidence occurred in the age group of 15 to less than 30 years (38.2%), followed by the age group 30 to less than 45 years (28.1%), then 45 to less than 60 years (19.6%), and then over 60 years. The lowest incidence occurred in the lowest and highest extremes of age: below 15 years the incidence was 4.4% and over 60 years it was 9.7% (Table 1).

Others studies showed similar results: in the study by Hindi [4], 35.3% were in the age group of 15 to less than 30 years; in the study by Abdel-Rahman [5], 56% of patients out of 625 were in the age group of 20–40 years; in the study by Abdelghany [6], 34.72% were in the age group of 15 to less than 30 years; in the study by George [7], 30.92% of patients were in the age group of 15 to less than 30 years; in the study by El-Zeheiry [8], 32.3% were in the age group of 15 to less than 30 years; in the study by Al-Aarag [9],

Graph. 1



Number of tuberculosis cases notified during the period of study (1996–2010).

Table 1 Demographic data of the studied cases (*N* = 10 035)

Demographic data	*N* (%)		
	Before DOTS (1996–1998)	After DOTS (1999–2010)	Overall (1996–2010)
Total number	3404	6631	10 035 (100)
Age groups			
<15	185 (5.4)	254 (4)	439 (4.4)
15 to <30	1268 (37.3)	2561 (38.6)	3829 (38.2)
30 to <45	1007 (29.5)	1820 (27.5)	2827 (28.1)
45 to <60	592 (17.4)	1373 (20.4)	1965 (19.6)
>60	352 (10.4)	623 (9.5)	975 (9.7)
Sex			
Male	2189 (33.5)	4322 (66.5)	6511 (64.8)
Female	1215 (34.5)	2309 (65.5)	3524 (35.2)
Residence			
Urban	910	1854	2764 (27.5)
Rural	2494	4777	7271 (72.5)
Total	3404	6631	10035 (100)

DOTS, direct observed therapy short course strategy.

31.25% were in the age group of 20–29 years; and in the study by Chengsorn *et al.* [10], 51.8% of patients were in the age group of 15–44 years. In Nigeria, Bello and Itiola [11] found that about 82% of TB patients were between 16 and 45 years.

In developing countries the majority of cases infected with TB are younger than 50 years, and about half of them may be younger than 15 years. In developed countries of Western Europe (having an aging population) the majority of cases are older than 50 years [12].

These findings could also be explained by the increased incidence of smoking in this active age group. Poverty, malnutrition, and physical, mental, and occupational stress are well known to be associated with this age group.

Sex

Male patients (64.9%) were more than female patients (35.1%). Many female patients do not seek medical advice because of factors such as illiteracy and the socioeconomic traditions prevailing in the society, which may prohibit them from going out and seeking medical advice. Higher TB notification rates in men may partly indicate differences in exposure due to more frequent social contacts, risk of infection, and progression from infection to disease caused by sex differences in association with other risk factors for TB such as cigarette and shisha smoking (Table 1).

Similar results were obtained by El-Zeheiry [8] (65.6% male and 34.4% female patients) and Chengsorn *et al.* [10] (66.5% male and 33.5% female), and lower results were obtained by George [7] (53.34% male and 46.65% female) and Shargie and Lindtjørn [13] (55.8% male and 44.2% female).

Higher results were obtained by Hossam [14] (76% male and 24% female patients), Fouad [15] (72.5% male and 27.5% female), and Floyd *et al.* [16] (80.2% male and 19.8% female).

In contrast, a study in South India found that 57% of patient notifications were from female patients. This finding was attributed to the fact that women were unemployed and thus were more likely than men to access health services and be notified under DOTS and to adhere to treatment, whereas men cannot leave their work and attend health services [17].

Residence

Rural cases (72.5%) were significantly higher than urban cases (27.5%) (Table 1).

Other studies [4,6–8] conducted in different Egyptian Governorates found similar results. The result of this study was higher than that of Wondimu *et al.* [18] in Ethiopia, who found in a cross-sectional study that 106 (53.8%) of 198 patients resided in rural areas.

Increased TB cases in rural areas could be explained by poverty, close interaction within the community, as well as a low level of water supply and sanitation; it may also be caused by drinking or handling contaminated milk; agricultural workers may acquire the disease by inhaling cough spray from infected cattle and by close physical contact with potentially infected animals [19]. This finding can also be because most of the patients in this study and in studies with similar findings lived in rural areas.

Type of patient according to history of previous treatment

Comparison of the type of patient according to history of previous treatment before and after DOTS revealed the following: the proportion of new cases before DOTS was 89.6% and that after DOTS was 91.2% (statistically significant increase); failure cases before DOTS was 2.1% and that after DOTS was 1.9% (statistically significant decrease); the proportion of relapse cases before DOTS was 4.2% and that after DOTS was 4.1%; transfer-in cases before DOTS was 1.7% and that after DOTS was 1.5%; and default cases before DOTS was 1.5% and that after DOTS was 1.1%. The proportion of other cases before DOTS was 0.9% and after DOTS was 0.2% (Table 2).

Other studies gave similar results [4–8] regarding the high and increasing percentage of new cases.

Sputum smear results in pulmonary tuberculosis cases on diagnosis

The percentage of smear-positive cases (60.6%) was significantly higher than the percentage of smear-negative cases (39.4%). There was an obvious decline in the percentage of diagnosed smear-negative pulmonary TB cases after DOTS. Similar results were obtained by other studies [4,6,8]. Anuwatnonthakate *et al.* [20] in Thailand found that 63% of pulmonary cases were sputum smear positive and 37% were sputum smear negative (Table 3).

Laboratory diagnosis of tuberculosis by culture

Laboratory diagnosis of TB on the basis of culture was very limited in chest units of El-Behira Governorate. Culture examination was done for only 0.7% (67 cases) of cases. However, from the 67 cases, 22 (32.8%) cases were positive, whereas 45 (67.2%) cases were negative. Similar results were obtained by other studies [6,8].

The limited use of culture and sensitivity tests in all chest units in El-Behira Governorate is still attributed to the lack of sufficient laboratory resources in most chest units.

Extrapulmonary tuberculosis and its sites

In the present study, the total number of extrapulmonary TB cases was 2132 (21.2% of all TB cases) (Table 4).

Table 2 Comparison of the study cases according to history of previous treatment before and after DOTS (*N* = 10 035)

Types	*N* (%)		*P* value	Statistical significance
	Before DOTS	After DOTS		
New	3049 (89.6)	6048 (91.2)	<0.05	Significant
Failure	71 (2.1)	125 (1.9)	<0.05	Significant
Relapse	142 (4.2)	269 (4.1)	>0.05	Nonsignificant
Other	31 (0.9)	16 (0.2)	>0.05	Nonsignificant
Transfer-in	59 (1.7)	98 (1.5)	>0.05	Nonsignificant
Default	52 (1.5)	75 (1.1)	>0.05	Nonsignificant
Total	3404 (100)	6631 (100)	<0.0006	Highly significant

DOTS, direct observed therapy short course strategy.

This result was similar to that of Abdelghany [6] in Menoufia who found that 70% of cases were pulmonary TB and 30% (1209) were extrapulmonary TB. Our results were also in accordance with those of El-Zeheiry [8] in Dakahlia who found that 66.9% were pulmonary TB and 33.1% were extrapulmonary TB cases.

This result was higher compared with the result of George [7] in El-Minia who found 66.4% of pulmonary cases and 33.58% of extrapulmonary cases.

The high proportion of pulmonary cases compared with extrapulmonary ones could be explained by the fact that TB occurs almost exclusively from inhalation of droplet nuclei containing *Mycobacterium tuberculosis*.

In contrast, a study of Somalian TB patients in Minnesota showed a higher incidence of extrapulmonary TB than pulmonary TB, which may be due to impaired immunity caused by factors such as vitamin D deficiency, dietary changes, and restricted social conditions, which may cause reaction in extrapulmonary sites [21].

The most common extrapulmonary TB in this study was pleural TB (62.8%), followed by tuberculous lymphadenitis (20%).

The high incidence of pleural TB in El-Behira Governorate could be due to the efficient diagnosis of pleural effusion by physicians, as pleural effusion due to other causes of TB such as hepatic, cardiac, and renal was common in this governorate. The facility for pleural aspiration and other laboratory services used for pleural effusion diagnosis are available in El-Behira Governorate.

The current study matched the results of Abdelghany [6] in Menoufia who found that the

Table 3 Pulmonary smear result on diagnosis and extrapulmonary cases

Relation to DOTS	Pulmonary cases sputum result on diagnosis [*N* (%)]			Extrapulmonary cases [*N* (%)]	Total [*N* (%)]
	Positive	Negative	Total		
Before DOTS	1234 (44.4)	1541 (55.6)	2775 (81.5)	629 (18.5)	3404 (100)
After DOTS	3557 (69.4)	1571 (30.6)	5128 (77.3)	1503 (22.7)	6631 (100)
Total	4791 (60.6)	3112 (39.4)	7903 (78.8)	2132 (21.2)	10035 (100)

DOTS, direct observed therapy short course strategy.

Table 4 Extrapulmonary tuberculosis case distribution by site of disease

Relation to DOTS	*N* (%)							
	Pleural	Bone	Lymph node	Renal	Genital	Intestinal	Other[a]	Total
Before DOTS	467	51	73	2	11	3	22	629
After DOTS	874	111	354	32	59	24	49	1503
Total	1341 (62.8)	162 (7.6)	427 (20)	34 (1.6)	70 (3.3)	27 (1.3)	71 (3.4)	2132 (100)

DOTS, direct observed therapy short course strategy; [a]Cases with tuberculosis in other sites such as the central nervous system, eye, and larynx.

most common type of extrapulmonary TB was pleural TB. Our results also matched those of El-Zeheiry [8] in Dakahlia who found that pleural cases (50.9%) represented the highest number of extrapulmonary cases.

Other studies found that lymph node TB is the most common type of extrapulmonary TB [7,22,23].

Conversion in smear-positive pulmonary tuberculosis

The conversion rate increased from 59, 59.8, 77.2, and 79% (at 2, 3, 5 months, and at the end of treatment, respectively) before DOTS to 72.2, 73.4, 85.3, and 91.5% (at 2, 3, 5 months, and at the end of treatment, respectively) after DOTS (Tables 5–7).

The high conversion rate can be attributed to the competency of healthcare workers with regular supervision, mobilization of healthcare services, stable supply of antituberculous drugs, and better patient adherence to treatment.

In Menoufia Governorate the conversion rate increased from 39.95% before DOTS at the end of the second month to 66.44% after DOTS [6].

Higher results were reported by Mohan *et al.* [24] in a study in Baghdad: cases that converted to sputum negative were 85, 90, and 92.9% at 2, 5 months, and at the end of treatment, respectively. Abassi and Mansourian [25] found in a study in Gorgan, Iran, that 98.3% of smear-positive cases became sputum negative at the end of 5 months of treatment.

Indicators

Incidence rate for new cases and new smear-positive pulmonary tuberculosis cases

In El-Behira Governorate before DOTS (1996–1998), the incidence rate of new cases was 24.7 in 100 000 and the incidence rate for new smear-positive pulmonary TB cases was 10.0 in 100 000. After DOTS (1999–2010), the incidence rate of new cases was 10.9 in 100 000 and the incidence rate for new smear-positive pulmonary TB cases was 6.4 in 100 000 (Table 8).

There was high statistically significant difference in the incidence rate for new cases, which was significantly higher before DOTS than after DOTS; thus, the incidence rate decreased, which indicates a decrease in the burden of TB because the annual risk of infection and the incidence rate decreased.

Pulmonary tuberculosis cases with no smear result

In this study, before DOTS the incidence rate of new pulmonary TB cases with no smear result was 54.8% and that after DOTS was 29.2%.

New adult smear-positive cases

In this study, before DOTS the incidence rate of new adult smear-positive cases was 82.6% and that after DOTS was 83% (the change was not statistically significant). The change was minimal before and after DOTS and the role and efficacy of radiological and laboratory diagnosis was the same in this study.

In El-Minia Governorate, the incidence rate of new adult smear-positive cases was 75.08 and 85.58% (before DOTS and after DOTS, respectively) [7].

Table 5 Results of sputum examination for acid fast bacilli at the end of the second month for positive pulmonary cases

Years	*N* (%)			
	Number of positive sputum cases at diagnosis	Number of negative sputum cases at the end of 2nd month	Number of positive sputum cases at the end of 2nd month	Number of cases not examined at the end of 2nd month
Before DOTS (1996–1998)	1234 (100)	729 (59.0)	299 (24.2)	206 (16.7)
After DOTS (1999–2010)	3557 (100)	2569 (72.2)	467 (13.1)	521 (14.6)
P value	<0.0001	<0.0001	<0.000001	<0.000001
Statistical significance	Highly significant	Highly significant	Highly significant	Highly significant

N = 4791; DOTS, direct observed therapy short course strategy.

Table 6 Results of sputum examination for acid fast bacilli at the end of the third month for positive pulmonary tuberculosis cases

Years	*N* (%)			
	Positive sputum cases at diagnosis	Negative sputum cases at the end of the 3rd month	Positive sputum cases at the end of the 3rd month	Cases not examined at the end of the 3rd month
Before DOTS (1996–1998)	1234 (100)	738 (59.8)	196 (15.9)	300 (24.3)
After DOTS (1999–2010)	3557 (100)	2610 (73.4)	270 (7.6)	677 (19)
P value	<0.0001	<0.0001	<0.000001	<0.0001
Statistical significance	Highly significant	Highly significant	Highly significant	Highly significant

N = 4791; DOTS, direct observed therapy short course strategy.

Retreatment tuberculosis cases

In this study, before DOTS the incidence rate of retreatment TB cases was 29.1% and that after DOTS was 12.4% (highly significant decrease). The decrease after DOTS indicates the effectiveness of the National Tuberculosis Program in the treatment and follow-up of new cases under direct observed therapy with efficient drug supply and highly efficient treatment regimen.

In Menoufia Governorate, before DOTS the incidence rate of retreatment TB cases was 13.29%. After DOTS, the incidence rate of retreatment TB cases was 6.72% [6].

New extrapulmonary tuberculosis cases

In the present study, before DOTS the incidence rate of new extrapulmonary TB cases was 18.6% and that after DOTS was 22.9% (statistically significant increase). This increase may be due to improved methods of extrapulmonary TB diagnosis and/or increases in risk factors that may increase the risk of reactivation of extrapulmonary focus (e.g. diabetes), which is not known because of lack of these data in the records of the studied cases (comorbidity and other data).

Table 7 Sputum conversion rate before and after DOTS

Relation to DOTS	*N* (%)		
	At the end of 2nd month	At the end of 5th month	At the end of treatment
Before DOTS (*N* = 1234)[a]	729 (59)	953 (77.2)	976 (79)
After DOTS (*N* = 3557)[a]	2569 (72.2)	3134 (88.1)	3253 (91.5)
Total (*N* = 4791)	3298 (68.8)	4087 (85.3)	4229 (88.3)

DOTS, direct observed therapy short course strategy; [a]Number of smear-positive cases at diagnosis.

Al-Aarag [9] found that the average incidence of extrapulmonary TB was 6.13%, which means that the incidence was lower compared with our study; this may be due to less efficient diagnostic methods 30 years ago, which have improved now with a better reporting system.

Higher increase was found in El-Minia Governorate (before DOTS the incidence rate of new extrapulmonary TB cases was 27.75% and that after DOTS was 37.9%) [7].

New tuberculosis cases with no smear conversion result

In this study, before DOTS the rate of new TB cases with no smear conversion result was 11.0% and that after DOTS was 8.3% (statistically significant reduction).

In Menoufia Governorate, before DOTS the rate of new TB cases with no smear conversion result was 24.41% and that after DOTS was 18.89% [6].

Sputum conversion rate at the end of the initial phase of treatment

In this study, before DOTS the sputum conversion rate at the end of the initial phase of treatment was 60.9% and that after DOTS was 75.4% (highly significant increase).

This finding indicates effective initial therapy and improvement in the follow-up of cases after DOTS.

Table 8 Comparison between indicators before and after DOTS (and statistical analysis)

Serial N	Indicator	Mean before DOTS (%)	Mean after DOTS (%)	*P* value	Statistical significance
1	Incidence rate: new cases (per 100 000 population)	24.7	10.9	0.0001	Highly significant
2	Incidence rate: new and relapsed cases (per 100 000 population)	25.8	11.5	0.0001	Highly significant
3	Incidence rate: all cases (per 100 000 population)	27.6	12.0	0.0001	Highly significant
4	Incidence rate: new smear-positive pulmonary TB cases (per 100 000 population)	10.0	6.4	0.001	Significant
5	New pulmonary TB cases with no smear result	54.8	29.2	0.0001	Highly significant
6	New adult smear-positive cases	82.6	83	0.554	Nonsignificant
7	Retreatment TB cases	29.1	12.4	0.0001	Highly significant
8	New extrapulmonary TB cases	18.6	22.9	0.037	Significant
9	New TB cases with no smear conversion result	11.0	8.3	0.018	Significant
10	Sputum conversion rate at the end of the initial phase of treatment	59.8	73.4	0.0001	Highly significant
11	Cure rate	46	61.1	0.0001	Highly significant
12	Treatment completion rate	16.1	18.6	0.057	Significant
13	Treatment success rate	62.1	79.7	0.0001	Highly significant
14	Death rate	2.8	3.8	0.158	Nonsignificant
15	Treatment failure rate	4.6	2.7	0.04	Significant
16	Default rate	20.4	6.8	0.0001	Highly significant
17	Transfer-out rate	6.0	3.7	0.096	Nonsignificant
18	Retreatment failure rate (chronic TB rate)	4.0	2.9	0.303	Nonsignificant

DOTS, direct observed therapy short course strategy; TB, tuberculosis.

A similar increase was found in the sputum conversion rate at the end of the initial phase of treatment in Menoufia Governorate (before DOTS the rate was 69.72% and after DOTS it was 76.64%) [6].

Treatment outcome

In this study, before DOTS the cure rate was 46.0% and after DOTS it was 61.1% (there was a highly significant increase).

Higher results were obtained in El-Minia Governorate (before DOTS the cure rate was 27.62%, and after DOTS it was 75.86%) [7].

In this study, before DOTS the treatment completion rate was 16.1% and that after DOTS was 18.6% (there was a statistically significant increase).

In Menoufia Governorate, before DOTS the treatment completion rate was 19.41% and that after DOTS was 19.81% [6].

In this study, before DOTS the treatment success rate was 62.1% and that after DOTS was 79.7% (the increase was statistically significant).

There was improvement in cure rate, treatment completion rate, and treatment success rate after DOTS. This improvement was most probably due to improvement in follow-up of cases by direct observation, and new treatment regimen (short course chemotherapy), which improved the outcome of patients.

In Menoufia Governorate, before DOTS the treatment success rate was 77.01% and after DOTS it was 81.66% [6].

In this study, before DOTS the treatment failure rate was 4.6% and after DOTS it was 2.7% (the decrease was statistically significant).

In Menoufia Governorate, before DOTS the treatment failure rate was 2.23% and after DOTS the treatment failure rate was 3.54% [6].

In the present study, before DOTS the default rate was 20.4% and after DOTS it was 6.8% (the decrease was highly significant).

In Minia Governorate, before DOTS the default rate was 10.57% and after DOTS it was 4.88% [7].

In this study, before DOTS the death rate was 2.8% and after DOTS it was 3.8% (the difference was not statistically significant).

The increase in death rate in El-Behira Governorate after DOTS may be due to better reporting system compared with before implementing DOTS.

In Minia Governorate, before DOTS the death rate was 5.53% and after DOTS it was 4.84% [7].

In this study, before DOTS the transfer-out rate was 6.0% and after DOTS it was 3.7% (the difference was not statistically significant). However, the decrease in the transfer-out rate after DOTS may be due to better follow-up with short treatment duration and improved accessibility to public healthcare facilities.

Retreatment failure rate (chronic tuberculosis rate)

In this study, before DOTS the retreatment failure rate (chronic TB rate) was 4.0% and after DOTS it was 2.9% (the difference was not statistically significant). However, this decreased retreatment failure rate after DOTS may be due to better follow-up with short treatment duration after DOTS, which satisfied the patients and improved accessibility to public healthcare facilities.

In El-Minia Governorate, before DOTS the retreatment failure rate was 15% and after DOTS it was 13.77% [7].

Conclusion

TB is a burden of the productive age group 15–45 years, with a higher incidence in the male population than in the female population.

The introduction of DOTS in El-Behira Governorate has led to significant increase in treatment success and decrease in default and failure rates.

DOTS is an effective tool for controlling TB.

There are problems in case notification, laboratory services, and recording of cases in chest care centers in El-Behira Governorate.

Recommendations

Improvements are needed in case notification, laboratory services, and recording of cases (including computerization of medical records) in chest care centers in El-Behira Governorate.

A more strict application of the DOTS is needed to eliminate the problem of nonadherence to therapy.

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Conflicts of interest

None declared.

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