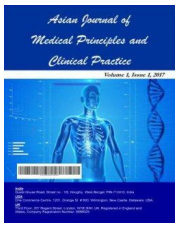

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Tuberculosis Situation in El-Minia Governorate (1997-2010) before and after Direct Observed Therapy Short Course Strategy (DOTS)

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim of the Work: Was to study the tuberculosis situation in El-Minia governorate before and after applications of the direct observed therapy short course strategy (DOTS).
Subjects and Methods: A retrospective study that was carried out at El-Minia chest hospitals and dispensaries to include all the cases of tuberculosis from January 1997 till December 2010. The materials in this study were collected from TB registration units in El-Minia governorate. DOTS Strategy in chest hospitals and dispensaries started since 2002. Collection and analysis of data included (demographic data, diagnosis of disease, sputum smear results, previous treatment history, and treatment outcome, Measurement of indicators for every year and Comparison of indicators. A descriptive analysis of data was performed using SAS software. Data were described in absolute numbers and percentages. Statistical significance was set at P values less than 0.05.
Results: The total number of recorded TB cases was 7860 (3838 before DOTS and 4022 after

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DOTS).The highest incidence occurred in the age group of 15 to less than 30 years (30.69% before and 31.15% after DOTS), males constituted 53.35 % while females constitute 46.65%, Rural cases (68.28%) were significantly higher than urban cases (31.72%) during all years of the study. total number of extrapulmonary tuberculous cases was 2440, the highest incidence was in tuberculous lymphadenitis.(36.8%).Conversion rate was improved after DOTS from 33.05% to 60.94%. There was an improvement in cure rate, treatment completion rate, and treatment success rate after DOTS.

Conclusion: Tuberculosis is still a health care problem in El-Minia governorate the burden of the productive age group of 15–45 years. The implementation of DOTS in El-Minia governorate had led to significant increase in treatment success rate (93.87%) and decrease in default and failure rates.

Keywords: Tuberculosis; DOTS; El-Minia Governorate; Egypt.

1. INTRODUCTION

Tuberculosis (TB) is one of the major cause of illness and death worldwide, especially in Asia and Africa. Overall, one-third of the world's population is currently infected with the TB bacillus. 5-10% of people who are infected with TB bacilli (but who are not infected with HIV) become sick or infectious at some time during their life. People with HIV and TB infection are much more likely to develop TB [1].

In 2008, the number of new cases arising each year is increasing globally in the WHO regions of Africa, the Eastern Mediterranean and South-East Asia [2]. An estimated by WHO [3].

The five principles of the WHO recommended DOTS strategy, are:

1. Political and administrative commitment.
2. Case detection, primarily by microscopic examination of sputum of patients presenting to health facilities.
3. Standardised short course chemotherapy given under direct observation.
4. Adequate supply of good quality drugs.
5. Systematic monitoring and accountability for every diagnosed patient [4].

By 2005, 187 countries were implementing DOTS, with 4.9 million cases of tuberculosis treated under the strategy in that year alone [5].

1.1 Aim of the Work

Was to study the tuberculosis situation in El-Minia governorate before and after application of the direct observed therapy short course strategy in order to evaluate the National Tuberculosis Control Program in El-Minia governorate as a representative part of Egypt.

2. MATERIALS AND METHODS

This is a retrospective study that was carried out at El-Minia chest hospitals and dispensaries (which included 10 units) to include all the cases of tuberculosis from January 1997 till December 2010. The materials in this study were collected from TB registration units in El-Minia governorate. DOTS Strategy in chest hospitals and dispensaries started since 2002.

2.1 Collection and Analysis of Data

Comprehensive collection of data about all TB cases registered in El-Minia governorate (7 central hospitals +3 chest hospitals+3 fever hospitals+ 6 chest units (dispensaries) + 361 primary health care units) for about 14 years from 1997 – 2010. The following data were collected for each year:

1. TB registration code: patient number in tuberculosis registry.
2. Age group.
3. Sex.
4. Residence.
5. Type of the patient: based on history of previous treatment.
6. Diagnosis: according to the site of the lesion.
7. Culture result: the total number of cases examined yearly by culture and the result of it.
8. Regimen of treatment: the total number of cases treated yearly by all categories of treatment.
9. Sputum examination: at 0 months, 2 months, at the end of initial phase of treatment (sometimes gastric lavage was done if child cannot bring sputum).
10. Treatment outcome: - for all cases at the end of treatment.

2.2 Measurement of Indicators: For Every Year Alone

These indicators were designed by World Health Organization to determine NTP quality and effectiveness. These indicators are:

1. Incidence rate (case notification rate): for new cases, new and relapse cases, all cases and new smear positive pulmonary cases.
2. New pulmonary TB cases with no smear result.
3. New adult smear positive cases.
4. Re-treatment 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.

2.3 Statistical Analysis

Re-treatment failure rate (chronic TB rate).

2.4 Comparison of Indicators

For all years before and after DOTS [6,7,8].

A descriptive analysis of data was performed. 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 Chi square (X2) which used to compare between more than two percentages; the SPSS statistical program was used. Statistical significance was set at $p < 0.05$. The analysis was performed using SAS software (SAS Institute, Cary, SC, USA) version 9.1 for Windows, test of proportion (Z test) which used to compare between two percentages (P1 & P2) [9].

3. RESULTS

Table 1. Demographic data of the studied cases (N = 7860)

Total number	Before DOTS (N= 3838)		After DOTS (N= 4022)		Total (before& after DOTS) (N= 7860)	
	No.	%	No.	%	No.	%
Age group						
<15 years	478	(12.45)	406	(10.1)	884	(11.25)
15 to < 30	1178	(30.69)	1253	(31.15)	2431	(30.92)
30 to < 45	1062	(27.67)	1086	(27)	2148	(27.33)
45 to < 60	839	(21.86)	931	(23.15)	1770	(22.52)
> 60	281	(7.33)	346	(8.6)	627	(7.98)
Sex						
Male	2163	(56.36)	2030	(50.47)	4193	(53.35)
Female	1675	(43.64)	1992	(49.53)	3667	(46.65)
Residence						
Urban	1387	(36)	1106	(27.50)	2493	(31.72)
Rural	2461	(64)	2906	(72.50)	5367	(68.28)
Total	3848	(100)	4012	(100)	7860	(100)

Table 2. Distribution of total tuberculous cases according to the type of patient based on history of previous treatment before and after DOTS

	Before DOTS		After DOTS		P value	Statistical significance
	No.	%	No.	%		
New	3298	85.93	3706	92.14	0.003	Highly significant
Failure	87	2.26	39	0.96	0.03	Significant
Relapse	105	2.73	87	2.16	0.3	Non significant
Others	201	5.26	128	3.21	0.1	Non significant
Transfer in	3.75	0.07	2	0.04	0.4	Non significant
Default	144	3.75	60	1.49	0.1	Non significant
Total	3838	100	4022	100	0.5	Non significant

Table 3. Results of sputum smear for pulmonary cases (No= 5420) during the period of the study and statistical analysis between sputum positive cases and sputum negative cases before and after DOTS

	Before DOTS	After DOTS	Total	P value	Statistical significance
Sputum positive	1495	1801	3296 (60.8%)	0.03	Significant
Sputum negative	1234	890	2124 (39.2%)	0.03	Significant

Table 4. Sites of extrapulmonary tuberculosis (no =2440) before and after DOTS

Site	Before DOTS	After DOTS	Total	
			No.	%
Pleural	213	223	436	17.9%
Bone and joints	141	395	536	21.96
Lymph node	215	683	898	36.8%
Urinary tract	20	19	39	1.6
GIT	22	19	41	1.68
Skin	85	96	181	7.4
Other	105	204	309	12.66

4. DISCUSSION

This is a retrospective, descriptive, and analytic study that was carried out at El-Minia chest hospitals and dispensaries to include all registered cases of tuberculosis from January 1997 till December 2010. The DOTS implementation started in 2002. In the present study, the demographic data of the studied cases (Table 1) revealed, the total number of recorded TB cases was 7860 (3838 before DOTS and 4022 after DOTS). The highest incidence occurred in the age group of 15 to less than 30 years was 30.92%,followed by the age group from 30 to less than 45 years was 27.33% then from 45 to < 60 years was 22.52% while the lowest incidence occurred in extremes of age below 15 years the incidence was 11.2% and > 60 years was 7.98%. In study done in Benha chest hospital (2002-2006), the lowest percentage of tuberculous patients (4.2%) was in the age group < 15 year and the lowest percentage of this age group (1.7%) was in the year 2004 (which is not significantly lower than in other years) [10]. In study done in Menoufia governorate (1992-2008), The highest incidence occurred in the age group 15-29 years (34.72%) and the lowest incidence occurred in the extremes of age, the age group below 15 years (8.5%) and over 60 years (8.38%) [11]. 75% of people with tuberculosis are within the economically productive age group of 15- 54 years , with the greatest burden in sub Saharan Africa and South East Asia [12,13].

The sex distribution of total tuberculous cases was in males 53.35% while females was 46.65%. Near results were obtained In Benha chest hospital (2002-2006) by Hindi, 2009, male cases (54.1%) were significantly higher than female cases (45.9%) and the highest percentage of male cases (59.8%) was in the year 2006. Also similar results were obtained in Menoufia governorate (1992-2008). Tuberculosis was commoner between men (64.79%) than women (35.21%) [11]. 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 [14].

The distribution of total tuberculous cases in rural cases (68.28%) were significantly higher than urban areas (31.72%). in Benha chest hospital (2002-2006), rural areas (76.2%) were highly significant when compared with urban cases (23.8%) [10]. In Menoufia governorate (1997-2010) rural cases (80.05%) were significantly higher than urban cases (19.95%), during all years of the study with the highest percentage of rural cases (86.4%) was observed in the year 2001 [11]. This finding was probably due to

Table 5. Results of sputum examination at the end of the second month for positive pulmonary cases

Year	No. of +ve sputum cases at the diagnosis		No. of -ve sputum cases at the end of second month		No. of +ve sputum cases at the end of second month		No. of cases not examined at the end of the second month	
	No.	%	No.	%	No.	%	No.	%
Before DOTS (1997-2001)	1495	100	897	60.00	121	8.09	477	31.90
After DOTS (2002-2010)	1801	100	1372	76.17	169	9.38	256	14.21
P value			0.003		0.001		0.006	
Statistical significance			Highly significant		Highly significant		Highly significant	

Table 6. Results of sputum examination at the end of the 3rd month for positive pulmonary cases

Year	No. of +ve sputum cases at the diagnosis		No. of -ve sputum cases at the 3rd month		No. of +ve sputum cases at the end of 3rd month		No. of cases not examined at the end of the 3rd month	
	No.	%	No.	%	No.	%	No.	%
Before DOTS (1997-2001)	121	100	40	33.05	56	46.28	25	20.66
After DOTS (2002-2010)	169	100	103	60.94	51	30.17	15	8.87
P value			0.003		0.001		0.006	
Statistical significance			Highly significant		Highly significant		Highly significant	

Table 7. Sputum conversion before and after DOTS

Sputum conversion	No. of +ve sputum cases at the diagnosis	At the end of 2nd month	At the end of 5th month	At the end of treatment
Before DOTS	1495	888(59.4%)	545(36.45%)	999(66.82%)
After DOTS	1801	1316(73%)	786(43.64%)	1365(75.79%)
Total	3269	2264(69.26%)	1331(40.7%)	2364(72.32%)

Table 8. Comparison and statistical analysis for indicators before and after DOTS

	Indicator / Mean	Mean before DOTS	Mean after DOTS	P value	Statistical significance
1	Incidence rate (new cases)	18.42	9.74	0.005	Highly significant
2	Incidence rate (new and relapse cases)	19.00	9.96	0.006	Highly significant
3	Incidence rate (all cases)	21.46	10.54	0.006	Highly significant
4	Incidence rate (new smear positive pulmonary TB cases)	6.44	4.11	0.002	Highly significant
5	New pulmonary TB cases with no smear result	3.23	1.59	0.009	Highly significant
6	New adult smear positive cases	75.08	85.58	0.005	Highly significant
7	Retreatment TB cases	13.54	7.75	0.003	Highly significant
8	New extrapulmonary TB cases	27.75	37.09	0.001	Highly significant
9	New TB cases with no smear conversion result	3.93	5.72	0.003	Highly significant
10	Sputum conversion rate at the end of initial phase of treatment	64.93	82.86	0.001	Highly significant
11	Cure rate	67.22	75.86	0.002	Highly significant
12	Treatment completion rate	8.71	8.56	0.5	Non significant
13	Treatment success rate	75.95	93.87	0.001	Highly significant
14	Death rate	5.53	4.84	0.01	Significant
15	Treatment failure rate	4.97	3.69	0.01	Significant
16	Default rate	10.57	4.88	0.005	Highly Significant
17	Transfer out rate	2.93	2.15	0.5	Non Significant
18	Retreatment failure rate (chronic TB rate)	15.00	13.77	0.01	Significant

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. Also, agricultural workers may acquire the disease; by inhaling cough spray from infected cattle and by close physical contacts between them and potentially infected animals. Also, increased notification of tuberculous cases in rural areas has been attributed to improve access to health care: through decentralisation of the services and improved patient follow up, with an introduction of DOTS [15].

This study revealed that: new cases before DOTS were 85.93%, and after DOTS were 92.14%; relapse cases before DOTS were 2.73%; and after DOTS were 2.16%; failure cases before DOTS were 2.26%; and after DOTS were 0.96%; transfer in cases before DOTS were 0.07%, and after DOTS were 0.04%; and default cases before DOTS were 3.75%; and after DOTS were 1.49%.and the statistical analysis between new cases before and after DOTS was highly significant so also was it significant between failure cases before and after DOTS was significant but not significant for relapse cases before and after DOTS and also for transfer in and default cases. In Benha chest hospital (2002-2006), it was found that new cases (92.2%) represented the highest percentage of cases that were treated (with highest percentage of these cases (93.6%) was in the year (2003) [10,11]. In the present study, (Table 4), showed that the total number of extrapulmonary tuberculous cases was 2440, distributed as follow, [898] (36.8%) were tuberculous lymphadenitis; [436] (17.9%) were pleural tuberculosis; 309 (12.7%) cases in other sites as, CNS, eye, and larynx; 536 (21.96%) were tuberculosis of bones and joints; 41 (1.68%) were tuberculosis of gastrointestinal tract; 309 (12.66%) were tuberculosis of the skin; 39 (1.6%) were tuberculosis of urinary tract. The highest percentage, of lymph nodes among extrapulmonary types, could be explained by the

fact that lymphatics represent the first station of the facing tubercle bacilli after being inhaled, And within 2 weeks they are transported through the lymphatics to establish secondary sites .In a study done in Benha chest hospital (2002-2006), lymph node cases (31.9%) represented the highest number of extrapulmonary cases, followed by pleural cases (30.9%) then bone cases (17%) [10]. In a study done in Menoufia governorate (1992-2008), pleural tuberculosis cases (44.46%) represented the highest number of extrapulmonary cases followed by tuberculous lymphadenitis (22.73%), then tuberculosis of bones and joints (13.8%), and only (7.19%) cases in other sites such as CNS, eye, and larynx [11].

In the present study, Table 5 showed that out of 1495 cases that were diagnosed as positive sputum pulmonary tuberculosis before DOTS, 897 cases (60.00%) eventually became sputum smear negative, 121 cases (8.09%) were still positive, and the remaining 477 cases (31.90%) were not examined at the end of the second month.

Out of 1801 cases were diagnosed as sputum positive pulmonary tuberculosis after DOTS, 1372 of them (76.17%) became sputum negative at the end of second month of treatment, 169 cases (9.38%) were still positive, and 256 cases (14.21%) were not examined at the end of the second month.The statistical analysis of conversion rate between before and after DOTS was highly significant. So the conversion rate increased from 60.00%, before DOTS at the end of the second month, to 76.17% after DOTS. This might be due to new regimens of treatment with Rifampicin for six months, also direct observation of cases under treatment.

In (Table 6), out of 121 cases that were diagnosed as sputum positive pulmonary tuberculosis before DOTS, 40 of these cases (33.05%) became negative, 56 of them(46.28%) remain positive, while 25 cases (20.66%)were not examined at the end of the third month, Out of the 169 cases that were diagnosed as sputum positive pulmonary tuberculosis after DOTS, 103 of them (60.94%) became negative, 15 cases (30.17%) were still positive, while 15 cases (8.87%) were not examined at the end of the third month. The statistical analysis of conversion rate between before and after DOTS was highly significant. So the conversion rate increased from 33.05%, before DOTS at the end of the third month, to 60.94% after DOTS. This might be due to new regimens of treatment with Rifampicin for six months, also direct observation of cases under treatment.

Our study revealed that the percentage of cases that became sputum negative at the end of 2nd month of treatment was 69.26%. The percentage of cases that became sputum negative at 5 months of treatment was 40.7% .The percentage of cases that became sputum negative at the end of treatment was 72.32% (Table 7). In study done in Menoufia governorate (1992-2008), cases that became sputum negative were (65.11%), (70.9%) and (59.27%) at two months, five months and at the end of treatment [11].

High conversion rate can be attributed to: competency of the health care workers with regular supervision, mobilisation of health care services, stable supply of anti-tuberculous drugs and better patient adherence to treatment. The present study revealed, statistical analysis for indicators before and after DOTS (Table 8) was as follow:

- **Incidence rate for new cases and new smear positive pulmonary TB cases**

The mean incidence rate of new cases before DOTS was 18.42, while the mean incidence rate of new cases after DOTS was 9.74 which were highly significant. So there was significant decrease in the incidence rate and this could indicate a decrease the burden of tuberculosis, the annual risk of infection and incidence of tuberculosis in Egypt. The indicator provides information on the burden of disease, number of cases to be treated, and resources required. However, the number of cases reported can be compared with incidence estimates to detect deficiencies in case detection and registration [16].

- **New pulmonary TB cases with no smear result**

In El-Minia governorate before DOTS, the incidence rate of new pulmonary TB cases with no smear result was 3.23%.After DOTS, the incidence rate of new pulmonary TB cases with no smear result was 1.59% which revealed highly significant difference before than after DOTS. It denotes improvement in laboratory diagnosis because more laboratory technicians are not better qualified. The laboratory equipments are more recent, there is improved relation between the laboratory technicians and

the physicians This is indicator of quality of the program and diagnostic procedures. It reflects medical diagnostic practices (use of radiological diagnosis without use of sputum microscopy) [15].

- **New adult smear positive cases**

In the present study, the incidence rate of new adult smear positive cases was 75.08%, before DOTS and 85.58% After DOTS, which reflect a high statistical significant difference. It reflects the development of screening program of TB suspects, as well as the relative weight of medical diagnosis of pulmonary TB without microscopy examination or with negative smears [15].

- **Retreatment TB cases**

The incidence rate of retreatment TB cases in the present study was 13.54%, before and 7.75% after DOTS, which is a highly statistically significant. This indicate the effectiveness of the national tuberculosis program (NTP) in treatment and follows up of new cases under direct observed therapy, with efficient drug supply and high efficient regimen of treatment.

This indicator indirectly reveals the effectiveness of the NTP, since under a well functioning TB control program, retreatment cases should make up a smaller proportion of total cases when compared with the new cases [15].

- **New extrapulmonary TB cases**

This study revealed incidence rate of new extrapulmonary TB cases was 27.75% before and 37.09% after DOTS, denoting a high statistically significant difference which indicate improvement of diagnosis method.

- **New TB cases with no smear conversion result**

This study revealed the rate of new TB cases with no smear conversion result was 3.93%.This indicator also has treatment implications in some countries, patients whose sputum smear has not converted, from positive to negative, at the end of two months of treatment should extend the initial phase of therapy for more than one month. Lack of evaluation of the bacteriological (microscopy) status at 2 months impedes the decision to extend the initial phase of treatment; lack of evaluation at 2 or 3 months indicates poor staff compliance with the guidelines and/or loss of patients (through default, transfer, or death) during the initial phase [15].

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

The present study shows that the sputum conversion rate at the end of the initial phase of treatment was 64.93% before DOTS and 82.86% after DOTS reflecting a high statistically significant difference and indicated effective initial therapy and regimen and it also indicates an improvement in the follow up of the cases especially by laboratory methods. In the study done by Singla et al. [17]. Sputum conversion rates among patients graded as 3+ and rest of the patients (combined graded sputum 1+ and 2+) at the end of two months were 62.2% and 76.8% respectively ($p<0.0001$), and at the end of three months were 81.3% and 89.5% respectively ($P<0.0001$). They concluded that smear positive patients with heavy bacillary load showed statistically significant poor sputum conversion rates at two and three months and higher failure rates as compared to patient with lesser bacillary load.

- **Cure rate**

In the present study it was 67.22% before DOTS and 75.86% after DOTS, revealed a high statistically significant difference. The treatment completion rate was 8.71% before DOTS and 8.56% after DOTS revealing no significant difference. The treatment success rate was 75.95%. Before DOTS and 93.87% after DOTS, which is a highly significant difference. In study done in Menoufia governorate (1992-2008): the cure rate before DOTS was 57.60% and after DOTS was 71.85%, the treatment completion rate before DOTS was 19.41% and after DOTS was 9.81%., the treatment success rate before DOTS was 77.01% and after DOTS was 81.66% [11]. There was an improvement in the 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 regimen of treatment (short course chemotherapy) with Rifampicin for 6 months. This improves the outcome of patients.

- **Death rate**

In the present study, the death rate was 5.53% before DOTS and 4.84% after DOTS, which is statistically significant. Death during treatment of tuberculosis as in most instance is associated

with other diseases- rather than tuberculosis itself-such as diabetes which can affect both the development of tuberculosis and mortality. Alcohol and drug abuse may be the cause of non adherence to treatment and defaulting of treatment. Also death may be caused by drug resistant tuberculosis. Possibly, tuberculosis fatality is increased if the disease duration has been sufficient for causing extensive disease. In a study in Cairo and Giza, Egypt, it was found out that percentage of cases that die while under DOTS strategy was just 2% [18].

- **The treatment failure rate**

In the present study it was 4.97% before DOTS and 3.69% after DOTS revealed significant difference.

- **The default rate**

The default rate was 10.57% before DOTS and 4.88% after DOTS which is a highly significant difference. The most important causes of defaulting were; treatment prevents the patients from going to work place, the patients's feeling of improvement, the long duration of treatment, some patients traveled abroad, some patients suffered from other diseases, conflicts between the patients and the staff, and the patient was not aware of the importance of continuing treatment. So there should be financial support especially for those who lost their income, NTP should find way to deliver the treatment to the patient in his/her home, increase awareness of the patients about the disease, availability of drugs in chest facilities, and use of more effective treatment regimens [3].

- **Transfer out rate**

In the present study the was 2.93%before DOTS and 2.15% after DOTS, revealed non significant difference.

- **Retreatment failure rate (chronic TB rate)**

It was 15.00% before DOTS and 13.77% after DOTS which is significantly different. In study done in Menoufia governate (1992-2008), the death rate before DOTS was 3.59% and after DOTS was 4.97, the treatment failure rate before DOTS was 2.23%and after DOTS was 3.54%, the default rate before DOTS was 7.45%, after DOTS was 8.35%, the transfer out rate before DOTS was 9.71%, after DOTS was 1.45%, the retreatment failure rate (chronic TB rate) before DOTS was 19.56%, after DOTS was 13.73% [11]. Retreatment failure is an important indicator of possible drug resistant strains in the community, which should be confirmed by the drug resistance surveillance. This indicator measures one of the possible outcome indicators for patients. Patients who are still sputum smear positive at the end of the retreatment regimen are designated as "chronics" and are noted as "treatment failure" in the TB register and in the quarterly report on treatment outcomes. The indicator is useful for program decisions regarding the adoption of treatment with second line drugs. Treatment failure may be due to inappropriate treatment regimens underlying primary or secondary resistance, inadequate retreatment regimens, or misclassification of chronic patients [15].

5. CONCLUSIONS

- Tuberculosis is still a health care problem in El-Minia governorate.
- Case detection and notification are still a problem in chest care centers in El-Minia governorate due to lack in laboratory services.
- The implementation of DOTS in El-Minia governorate had led to significant increase in treatment success rate (93.87%) and decrease in default and failure rates.

6. RECOMMENDATIONS

- More efforts are needed as the city government must open items for additional health personnel, especially for medical technologists, in order to achieve success of TB-DOTS.
- Permanent addresses, mobile numbers of the patients and family must be recorded to track them anytime they are needed to decrease loss.
- Another study must be conducted to monitor progress of TB-DOTS for the coming year.
- Many studies are needed to cover all country governorates.

CONSENT

It is not applicable.

ETHICAL APPROVAL

As per international standard or university standard ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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