

# Assessment of Tuberculosis treatment in Mosul Iraq 2011-2014

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## ABSTRACT

**Background:** Tuberculosis (TB) remains to be a major global health problem .It causes ill-health among millions of people each year. Direct observed therapy short course (DOTS) is a strategy in which a trained health care worker or a designated individual provides the prescribed anti tuberculous drugs and watches the patient to ensure the patient is taking each dose.

**Aim:** The objective of this work was to study tuberculosis situation in Mosul Governorate from (January 2011 to December 2014) after application of DOTS.

**Methodology:** This was a retrospective clinical cohort study carried out at Mosul Governorate. From the registered data about all TB cases over a period of (January 2011– December 2014)

**Results:** There was 1905 patients (631 pulmonary patients (33.1%) smear positive, 554 (29.1%) smear negative, and 658(34.5%) extra pulmonary. Percentages of cure and complete treatment were (31.4%, 64.7%) respectively. The incidence of failure, death, default, and transfer out decreased after DOTS (0.37%, 1.88% , 1.1%, 0.52% respectively).

**Conclusion:** The introduction of DOTS in the Mosul has led to a treatment success rate of 96.1% (better than the WHO target of ' 85%')

**Recommendation:** Poor patient knowledge regarding tuberculosis may be a significant predictor of treatment failure, so strengthening health education in the DOTS strategy is therefore recommended. patients with tuberculosis need more and more social and psychological support to decrease defaulters and treatment failure .

**Keywords:** Mosul Governorate, DOTS, Tuberculosis, Pulmonary, Extra pulmonary, Success rate.

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## 1. INTRODUCTION

Tuberculosis (TB) is a bacterial disease, caused by Mycobacterium tuberculosis (MTB), which is part of complex of organisms including M.bovis (reservoir cattle) and M. africanum (reservoir human). The impact of TB on world health is significant for adults, Mycobacterium tuberculosis is spread by inhalation of aerosolised droplet nuclei from other infected patients during cough and sneezing with sputum smear positive that it is highly contagious; Once the mycobacterium lodge in the alveoli and initiate the recruitment of macro phages and lymphocyte. Macro phages undergo transformation in to epithelioid and langhans cell which aggregate with the lymphocytes to form the classical tuberculous granuloma. Numerous granuloma aggregate to form a primary lesion or (Ghon focus) a pale yellow, caseous nodule, usually a few mm to 1-2 cm in diameter. M. bovis infection arises from drinking non sterilized milk from infected cows. The symptoms of pulmonary (TB) cough, fever, night sweat, loss of appetite, loss of weight,chest pain,sputum my contain blood. (1).

The World Health Organization observing upward trend of global burden of TB, in the Assembly of 1991, announced tuberculosis as a global emergency. Then provided the background for controlling the disease and achieving to these objectives relatively, by introducing DOTS strategy. The availability of free diagnostic and treatment services, detection through sputum smear microscopy experiments at all levels of nation's health care were the main pillar of the implementation of this strategy. Circular of merging control of control programs and care of TB in the network system in 1990 issued by the General Office of the fight against disease and was communicated to all provinces. Then,

Ministry of Health and Medical Education in 2002, according to international recommendations and the proposed National Technical Committee, forced all medical universities to implement it. Studies in different parts of the world suggest that the implementation of the DOTS treatment increases treatment success rate of 90-95% and even greater .

### **Global Tuberculosis reports**

Tuberculosis (TB) remains one of the world's deadliest communicable diseases. In 2011, there were an estimated 8.7 millions new cases of TB (13% co-infected with HIV), and 1.4 million people died from TB, 430,000 of whom were HIV-positive (2). In 2012, an estimated 8.6 million people developed TB and 1.3 million died from the disease (including 320,000 deaths among HIV-positive people). (3). In 2013, an estimated 9.0 million people developed TB and 1.5 million died from the disease, 360,000 of whom were HIV-positive. TB is slowly declining each year and it is estimated that 37 million lives were saved between 2000 and 2013 through effective diagnosis and treatment. However, given that most deaths from TB are preventable, the death toll from the disease is still unacceptably high and efforts to combat it must be accelerated if 2015 global targets, set within the context of the Millennium Development Goals (MDGs), are to be met. TB is present in all regions of the world and the Global Tuberculosis Report 2014 includes data compiled from 202 countries and territories. This year's report shows higher global totals for new TB cases and deaths in 2013 than previously, reflecting use of increased and improved national data. A special supplement to the 2014 report highlights the progress that has been made in surveillance of drug-resistant TB over the last two decades, and the response at global and national levels in recent years. Worldwide, the proportion of new cases with multi-drug resistant TB (MDR-TB) was 3.5% in 2013 and has not changed compared with recent years. However, much higher levels of resistance and poor treatment outcomes are of major concern in some parts of the world. The supplement,

**Drug Resistant TB:** Surveillance and Response, defines priority actions needed, from prevention to cure (4). Of the estimated 9 million people who developed TB in 2013, more than half (56%) were in the South-East Asia and Western Pacific Regions. A further one quarter were in the African Region, which also had the highest rates of cases and deaths relative to population. India and China alone accounted for 24% and 11% of total cases, respectively.

The successful roll out of new diagnostics is ensuring more TB cases are correctly diagnosed and treated. "Laboratory confirmation of TB and drug correctly diagnosed and treated. In 2013, 58% of the 4.9 million pulmonary TB patients notified globally were bacteriologically confirmed via a WHO-resistance is key to ensuring that individuals with TB signs and symptoms are recommended test, including rapid tests such as Xpert MTB/RIF." "By June 2014, 108 countries with access to Xpert MTB/RIF at concessional prices had started to use the technology, and more than one million test cartridges were being procured each quarter. "In late 2013, WHO expanded its recommendations on the use of Xpert MTB/RIF to include the diagnosis of TB in children and some forms of extra pulmonary TB. The first key intervention for reducing the burden of HIV-associated TB is HIV testing for TB patients. The most important intervention to reduce mortality among HIV-positive TB patients is anti-retroviral therapy (ART). In 2013, 70% of TB patients known to be HIV-positive were on ART (4).

Many new diagnostic technologies are under development or are available on the market, but the funding required to rapidly evaluate whether these tests are accurate and ready for implementation is far from adequate. "There are 10 new or repurposed anti-TB drugs currently in the late phases of clinical development and, in the last two years, two new drugs have been approved for the treatment of MDR-TB under specific conditions: bedaquiline and delamanid. Trials of four-month treatment regimens for drug-susceptible TB found that they were inferior to the six-month standard of care regimen currently recommended by WHO. However, a series of new combination regimens are currently being tested and show encouraging prospects for treatment of both drug-susceptible and drug-resistant TB." "There are currently 15 vaccine candidates in clinical trials (5,6,7)..

**Aims of the work:** The objective of this work was to study tuberculosis situation in Mosul Governorate from January 2011 to December 2014 after application of DOTS.

**Methodology:** This was a retrospective clinical cohort study carried out at Mosul Governorate. From the registered data about all TB cases over a period of (2011–2014)

The Collected data included:

- (1) TB registration code and the year.
- (2) Socio demographic data which included name, age, sex and residence.
- (3) Forms of tuberculosis; Either: Pulmonary (either smear positive or smear negative) or extra pulmonary.
- (4) History of previous treatment if present (category of patients or type of the patient); either new, relapse, treatment after failure, treatment after default, transfer in or others.
- (5) Schedule of treatment (recommended standardized treatment regimen) according to NTP.
- (6) The recorded follow up for smear-positive pulmonary tuberculosis included sputum smear microscopic examination for acid fast bacilli, at the end of 2nd month, at end of 5th month and at the end of treatment .

(7)Outcome; cure, treatment completed, treatment failure, died, default and transfer out.

### Statistical analysis

The collected data were tabulated and analyzed using SAS version 9 software (by SAS Institute Inc., Cary, NC, USA.). Data were presented as number and percentages,. The  $\chi^2$ -test, Fisher's exact test was used , P value less than 0.05 and 0.01 was considered significant.

### Statistical analysis

The collected data were tabulated and analyzed using SPSS version 16 software, categorical data were presented as number and percentages while continuous variables were presented as mean and standard deviation. Chi square test, Fisher's exact test and Student "t" test were used. Microstate software was used to calculate "Z" test for 2 proportions of 2 independent groups.  $P < 0.05$  was considered significant.

## RESULT

The total population of Mosul in 2011 was 3335200. (Table 1), the total cases of TB diagnosed between January 2011-December 2014 was 1905. (Table 1) show TB cases according to locality. The results of this study showed that the number of cases diagnosed decreased over time with the lowest number being reported in 2014 (Table 2).

The highest incidence of TB occurred in age groups (15-34) and (35-54) years and the lowest incidence occurred in those under 15 years of age and those over 65 years of age (Table 2), with statistically highly significant difference as regard age groups.

Gender: Male cases 50.2%, while female 49.8% (Table 3). Pulmonary TB form 65.5% extra pulmonary 34.5%. In (Table 4) shows that the highest number of pulmonary and extra pulmonary cases was seen during 2011 and 2012 respectively, and the lowest of pulmonary and extra pulmonary was seen during 2013 and 2014, respectively. Statistical analysis was highly significant between pulmonary and extra pulmonary groups all over years of study period.

The most common of patient were new pulmonary cases (sputum positive 33.1%, sputum negative 29.1%), followed by relapse cases 3%, and after default 0.1% (Table 5). Statistical analysis regards these groups throughout the years of the study was highly significant.

In (Table 6) show case detecting rate indicate decrease of incidence of TB cases in 2013, 2014. In (Table 7) there was very good sputum conversion from positive to negative (98.89% at end of 5<sup>th</sup> month, 94.85% at the end of 2<sup>nd</sup> month, only 1.11% fail to treatment). There was very good treatment outcome with increase in success rate 96.1% (cure rate 31.4% and complete rate 64.7%) (Tables 8 & 9). The highest cure and complete rate were observed in 2013 & 2014.

Table ( 1 ) TB Cases According to Districts Locality (2011-2014)		
Name	Population	Discovered
Alayman	748641	494
Alaysar	786847	399
Al chekan	39152	20
Tallafar	475427	183
Senjar	323874	223
Talkef	186717	64
Alhamdanea	186048	168
Albaag	160003	104
Algaara	197831	188
Makhmoor	177891	40
Alhadar	52769	22
Total	3335200	1905

Alhadar mean: name of district in mosul

**Table (2 )Distribution of Tuberculosis cases over different age group in years of study**

Year	0-14	15-24	25-34	35-44	45-54	55-64	65+	Total	P value	significance
2011	45 8%	135 23.5%	97 17.1%	71 12.5%	70 12.4%	74 13.1%	74 13.1%	566 29.7%	≤0.01	HS
2012	67 12%	100 18.3%	88 16.1%	68 12.4%	67 12.3%	80 14.6%	77 14.1%	547 28.7%	≤0.05	S
2013	37 8%	88 18.3%	78 16.2%	72 15%	63 13.1%	64 13.3%	79 16.4%	481 25.3%	≤0.01	HS
2014	19 6.1%	69 22.2%	60 19.3%	38 12.2%	33 10.6%	55 17.7%	37 11.9%	311 16.3%	≤0.01	HS
total	168 8.9%	392 20.6%	323 17%	249 13.8%	233 12.2%	273 14.3%	267 14%	1905 100%	≤0.01	HS

**Table ( 3 )Distribution of Tuberculosis Cases According Sex**

Year	M	F	Total
2011	294 52%	272 48%	566 29.7%
2012	267 49%	280 51%	547 28.7%
2013	246 51%	235 49%	481 25.3%
2014	149 48%	162 52%	311 16.3%
Total	956 50.2%	949 49.8%	1905 100%

**Table ( 4 ) Pulmonary And Extra pulmonary Tuberculosis Cases over the Years of the study**

Year	PTB	EP	Total	P value	significance
2011	374 ( 66%)	192 (34%)	566 (29.7%)	≤0.01	HS
2012	369 (67.5%)	178 (32.5%)	547 (28.7%)	≤0.01	HS
2013	308 (64%)	173 (36%)	481 (25.3%)	≤0.01	HS
2014	196 (63%)	115 (37%)	311 (16.3%)	≤0.01	HS
total	1247 (65.5%)	658 (34.5%)	1905 100%	≤0.01	HS

**Table ( 5 ) Notification Data Of Pulmonary And Extra Pulmonary TB over years of study**

Year	N(SS+)	New S(N.ND)	after Default	Relapse	(R.S-) (R.ND)	N(EP)	Total	P value	significance
2011	152 27%	207 36%		15 3%		192 34%	566 29.7%	≤0.01	HS
2012	175 32%	173 31.6%	2 0.37%	19 3.5%		178 32.5%	547 28.7%	≤ 0.01	HS
2013	187 38.9%	104 21.6%		17 3.5%		173 36%	481	≤0.01	HS
2014	117 37.6%	70 22.5%		7 2.25%	2 0.64%	115 37%	311 16.3%	≤0.01	HS
total	631 33.1%	554 29.1%	2 0.1%	58 3%	2 0.1%	658 34.5%	1905 100%	≤0.01	HS

Tabl (6) Case Detecting Rate		
Year	Discovered	CDR
2011	566	37.7%
2012	547	36.4%
2013	481	32.04%
2014	311	20.7%
Total	1905	31.73223

(Table 7) Sputum Conversion						
Years	N(SS+)	2 nd. month	3r d. month	5th month	failed	Total
2011	152 27%	139 91.5%	8	2	3	152
2012	175 32%	171 97.7%	1		3	175
2014	117 37.6%	105 90%	11	1		117
Total	631 33.1%	598 94.8%	23 3.64%	3 0.47%	7 1.11%	631

Table ( 8 ) Notification Data of Pulmonary and Extra Pulmonary TB over years of study								
Year	Successful rate	Death	Default	Fail	TO	Total	P value	significance
2011	94.8%	12 2.12%	7 1.23%	3 0.53%	7 1.23%	566	≤0.13	NS
2012	95.6%	12 2.9%	7 1.27%	3 0.548%	2 0.37%	547	≤0.01	HS
2013	97.9%	7 1.45%	2 0.42	1 0.21		481	≤0.01	HS
2014	96.4%	5 1.6%	5 1.6%		1 0.32%	311	≤0.01	HS
Total	96.1%	36 1.88%	21 1.1%	7 0.37%	10 0.52%	1905	≤0.01	HS

Table ( 9 ) Outcome Of Treating TB Cases					
year	Complete	Cure	Successful rate	P value	Significance
2011	398 70.3%	139 24.6%	94.8%	≤0.01	HS
2012	352 64.35%	171 31.26%	95.6%	≤0.01	HS
2013	288 59.9%	183 38%	97.9%	≤0.01	HS
2014	195	105	96.4%	≤0.01	HS
total	1233 64.7%	598 31.4%	96.1%	≤0.01	HS

## **DISCUSSION**

This study investigated the situation of TB in Mosul government from January 2011 until December 2014, the total number of recorded TB cases was 1905. As regards age, the highest prevalence of TB was among individuals between (15-24 year) (20.6%) , then (25-34 year) (17%) in Mosul government. And lowest prevalence was among those younger than 15 years (8.9% ,10.1%) and those older than 65 years (14%,9.9%) respectively (Table 2 ).

This could be attributed to physical, mental occupational stress and greater exposure to infection. Moreover, poverty and malnutrition, smoking. The result of this study is similar to other studies like ( Baghdad Iraq 2012-2016) (9), in (Aswan Egypt 2011-2015)(11), in (Cairo Egypt 2006-2012)( 12).and in (Ismailia Egypt 2002-2012)(13).

As regard gender (50.2%) were males ,(49.8%) were females, this result similar to other studies like (Baghdad Iraq 2012-2016 males 49.8% ,females 50.2% ) (9), in Shangla, Khyber-Pakhtunkhwa, Pakistan (2011-2012 Males 52.5% ,Females 47.5% ) (15).While in Kerbala Iraq (2005-2017) male form 60.3%, female 39.7%(8) .In (Aswan Egypt 2011-2015 male 58.2% ,female 41.8%)(11), in (Ismailia Egypt 2002-2012 male 68% female 32%)(13) In E l-Behira Governor ate ,Egypt (1996-2010 male 64.8% female 35.2%)(14).

Pulmonary TB form 65.5% while Extra pulmonary 34.5% in Mosul, in Kerbala Iraq (2005-2017 pulmonary 62%, extra pulmonary 38%)(8). in ( Baghdad Iraq 2012-2016 pulmonary form 61.2% ,extra pulmonary 38.8%)( 9). In Babylon Province -Iraq 2012 pulmonary form 66.67%, extra pulmonary 33.33%)( 10)..In (Aswan Egypt 2011-2015 Pulmonary TB form 62.7%,extra pulmonary 37.3% )(11),in(Cairo Egypt 2006-2012 Pulmonary TB form 72.8%,extra pulmonary 27.2% )( 12).E l-Behira Governor ate ,Egypt (1996-2010Pulmonary TB form 78.8 % ,extra pulmonary 21.2 %)(14). in Shangla, Khyber-Pakhtunkhwa, Pakistan (Pulmonary TB form 77.3%,extra pulmonary 22.7% )(15).

Table 5 show that 96.7% TB was new (621 sputum positive 33.1%, 554 sputum negative 29.1%), 3% relapse. While in (Baghdad Iraq 2012-2016 new TB cases 94%, relapse 4.6%)( 9). in Shangla, Khyber-Pakhtunkhwa, Pakistan (new TB form 93.5 % ,relapse 4.1% )( 15).

Table (6):there was decline in the total number of cases across the studied period, also pulmonary TB cases show decline from 66% in 2011 to 63% in 2014,while extra pulmonary TB cases show increase from 34% 2011 to 37% in 2014 ( Table 4). This result similar to ( Baghdad Iraq 2012-2016 ) (9). and in (Aswan Egypt 2011-2015)(11). (Table 7 ) there was very good sputum conversion from positive to negative ( 98.89% at end of 5<sup>th</sup> month , 94.85% at the end of 2<sup>nd</sup> month ,only 1.11% fail to treatment).Our result was better than in (Cairo Egypt 2006-2012 was 81-85%)(12), in (Ismailia Egypt 2002-2012 was 92,5%)( 13) In E l-Behira Governor ate, Egypt (1996-2010 was 73.4 - 91.5 %)(14).inShangla, Khyber-Pakhtunkhwa, Pakistan ( was 94.7% )( 15).

Treatment outcome with increase in success rate 96.1% (cure rate 31.4%and complete rate 64.7%)( tables 8 & 9) . The highest cure and complete rate were observed in 2012, 2014 .Death, rate 1.88% ,fail 0.37 % ,default 1.1%,Our result better than success rate in (Cairo Egypt 2006-2012 was 82%)( 12), in (Ismailia Egypt 2002-2012 was 881%)(13) In E l-Behira Governor ate ,Egypt (1996-2010 was 79.7 %)(14).inShangla, Khyber-Pakhtunkhwa, Pakistan (was 94.5%)( 15).

## **CONCLUSION**

The high treatment success rate was recorded and meets the WHO criteria. To sustain the effective implementation of DOTS in the area, effective management, and diagnosis should be stressed for. EPTB

## **RECOMMENDATION**

Poor patient knowledge regarding tuberculosis may be a significant predictor of treatment failure, so strengthening health education in the DOTS strategy is therefore recommended. patients with tuberculosis need more and more social and psychological support to decrease defaulters and treatment failure .

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