

# Sputum conversion rate at 2<sup>nd</sup>, 5<sup>th</sup> and 7<sup>th</sup> months of the anti-TB treatment among sputum smear positive TB patients at nineteen health centers in Addis Ababa, Ethiopia: A Cross-Sectional Study.

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**Abstract: Background:** Microbial Tuberculosis (TB) produces a chronic or acute bacterial infection that primarily attacks the lungs, but which may also affect the kidneys, bones, lymph nodes, and brain. TB is among the three greatest causes of death among women aged 15-44. There were 9.4 million new TB cases in 2009 including 1.1 million cases among people with HIV. In 2007, according to WHO report, DOTS coverage reached 95 percent of the population. Sub-Saharan Africa carried the greatest proportion of new cases per population with over 260 cases per 100,000 populations in 2011. The objective of this study was to assess sputum conversion rate at 2<sup>nd</sup>, 5<sup>th</sup> and 7<sup>th</sup> months at nineteen health centers for five years on smear positive tuberculosis patients who were taking anti TB treatment.

**Method:** A cross-sectional study was conducted at nineteen health centers in order to collect a five year data (Jan 2007-Sep 2011). Smear conversion rate is determined at 2<sup>nd</sup>, 5<sup>th</sup> and 7<sup>th</sup> months follow up of smear positive patients. For available data HIV status and smear conversion rate was determined. Data was analyzed using SPSS version 17 software.

**Result:** There were 8,946 sputum smear positive patients in the nineteen health centers of which 4902 (54.8%) were male and 4039 (45.1%) were female and the rest 5 (1%) did not have their sex registered. Only 6035 patients gave sputum until 7<sup>th</sup> month. The conversion rate at 2<sup>nd</sup> month was 93.85%, at the 5<sup>th</sup> month the conversion rate was 5.59%, and at the 7<sup>th</sup> month it was 0.57%. There was HIV status only for 3646 out of 8946 smear positive patients who attended the nineteen health centers, the available result showed that the sputum conversion rate was high for HIV positive TB patients at 2<sup>nd</sup> and 7<sup>th</sup> month. 134 (1.45%) died for any reason for the course of treatment. 929 (10.4%) defaulted and for 107 (1.19%) the treatment failed.

**Conclusion:** Even if there were few patients who showed failure on the treatment, the smear conversion rate calculated in this thesis was hopeful. But also considerable number of patients failed to follow up on the treatment which requires further strengthening and follow through of the DOT strategy.

**Key words:** TB, DOTS, Sputum conversion rate, Ethiopia



## Background

Tuberculosis (TB) is a chronic or acute bacterial infection that primarily attacks the lungs, but which may also affect the kidneys, bones, lymph nodes, and brain. The disease is caused by *Mycobacterium tuberculosis*, *Mycobacterium africanum*, *Mycobacterium canetti*; are primarily pathogens in humans. *Mycobacterium bovis* and *Mycobacterium microti* are causative agents of TB in animals and can be transmitted to humans (1). The ziehl Neelsen technique is used to stain mycobacterium species. When stained by this method *M. tuberculosis* is acid fast and stains red. This is due to mycolic acid in the cell wall which forms a complex with carbol fuschin and cannot be removed by the acid in the decolorizing reagent. The organism may appear beaded. To be detected microscopically, sputum smears need to contain 5000-10000 AFB/ml which may be found in samples from patients with cavity lesions (2).

DOT is a critical control strategy in TB treatment for reducing the emergence the drug resistance and for avoiding the transmission of resistant organisms (3). Globally WHO estimated that TB incidence rate fell to 137 cases per 100,000 populations in 2009 after peaking in 2004 at 142 cases per 100000. The rate is still falling but too slowly. The percentage of people successfully treated reached the highest level at 86% in 2008. Since 1995, 41 million people have been treated and up to 6 million people lives saved through DOTS and stop TB strategy. 508 million Tb cases were notified through DOTS programs in 2009 (4).

According to WHO report in 2007, DOTS coverage reached 95 percent of the population. However, while treatment is integrated into general health services and DOTS geographical coverage is 95 percent, due to the limited health infrastructure in the country, only approximately 60 to 70 percent of the population has access to DOTS services. The DOTS detection rate remains low, at 28 percent, compared with WHO's target of 70 percent detection. (5).

This study aimed to show the sputum smear conversion rate of patients who had been positive for TB and the strength of DOT strategy and TB control program in Addis Ababa, Ethiopia.

## Materials and Methods

A retrospective cross-sectional study was conducted in which a five year old data (Jan 2007-Sep 2011) was collected from the registration log book of the nineteen health centers in Addis Ababa, Ethiopia. The study population was all smear positive pulmonary tuberculosis patients who were taking anti-TB treatment for seven months, that is, those who gave sputum for the diagnosis of mycobacterium species at 2<sup>nd</sup>, 5<sup>th</sup>, 7<sup>th</sup> months of anti-TB treatment. Data collected using data collection format which contains laboratory serial number, age, sex, HIV status and laboratory Result. Descriptive statistics were employed using SPSS version 17 software system. Graphs and tables are used for depiction of the data accordingly.

The study was approved after it was reviewed by the department research and ethical committee at the department of medical laboratory science, College of health Science, Addis Ababa University. Addis Ababa city administration health bureau as well as the nineteen health centers had given verbal consent. Data collected was guarded in password protected computer in order to maintain confidentiality.

## Result

### **sputum conversion rate at 2<sup>nd</sup>, 5<sup>th</sup> and 7<sup>th</sup> month of TB patients**

There were 8946 sputum smear positive patients in the nineteen health centers of which 4902 (54.8%) were male and 4039(45.1%) were female and the rest 5 (1%) did not have their sex registered. Out of the total subjects 282 (3.2%) were transferred out to other facilities.134 (1.45%) died due to different reasons during the course of treatment. 929 (10.4%) defaulted and for 107 (1.19%) the treatment failed. Only 6035 patients gave sputum until 7<sup>th</sup> month. The conversion rate at 2<sup>nd</sup> month was 93.85%, at the 5<sup>th</sup> month the conversion rate was 5.59%, it was 0.57% and at the 7<sup>th</sup> month.

### **Sputum conversion rate among male and female**

Sputum conversion rates for male patients are 94.08% and those for female are 93.62% at the second month. At the fifth month, the conversion rate was 5.36% for the male and 5.84 % for the female. 0.59% and 0.53% conversion rate was determined at the seventh month for male and female patients respectively.

### **Sputum conversion rate among HIV positive and negative patients**

There was HIV status only for 3646 out of 8946 smear positive patients, the available result showed that the sputum conversion rate is 93.59% and 93.56% for HIV positive TB patients at 2<sup>nd</sup> month for HIV positive and negative patients respectively.

## Discussion

Although the data collected indicates, 8946 patients came to the nineteen health centers with positive sputum smear for tuberculosis only 6036 had complete data of their sputum conversion rate. Out of the total number of patients, the result shows number of male patients is greater than the number of female patients as a result the analysis shows more successful sputum smear conversion rate in male than in female. But another study conducted by Abebe A et al. shows that sputum smear conversion rate was higher in female than in male which contradict our findings (3).

Of the total patients who showed sputum conversion rate, 5647 (93.85%) showed sputum conversion rate at the 2<sup>nd</sup> month, 336 (5.59%) showed sputum smear conversion rate at the 5<sup>th</sup> month, 34(0.57%) showed sputum smear conversion rate and 19 (0.3%) showed no sputum smear conversion rate. This shows the medication provided was successful for 93.85% of the patients with in two month, 5.59% of the patients showed improvement after the 5<sup>th</sup> month and 0.57% showed improvement at the 7<sup>th</sup> month. The same study conducted at two health centers by Abebe et al also showed 93.67% conversion rate at the 2<sup>nd</sup> month. Failure of treatment is observed for 0.3% of patients who attended the nineteen health centers (3). Though HIV status for 5284 patients is available, only 3646 had complete data of the sputum conversion rate. Sputum smear conversion rate shows high for HIV positive TB patients at 2<sup>nd</sup> and 7<sup>th</sup> month and the conversion rate at the 5<sup>th</sup> month is high for HIV negative patients. The study conducted in

Tanzania by Senkoro et al. support our finding in such a way that both studies showed higher sputum conversion rate at the 2<sup>nd</sup> month for HIV positive patients than HIV negative patients (6). Our study showed sputum smear conversion rate among different age groups but failed to determine the association of each conversion rate among the age groups. Study conducted in Nigeria by Bello S.I. showed age had no significant relationship with patient's drug adherence (7).

## **Conclusion**

The DOT strategy in Addis Ababa has been proved to being successful. This strategy not only has been proven successful for the general patients but also it has been proved successful for HIV positive patients. HIV positive patients are successfully treated of tuberculosis. Both sexes have been proven to use the DOT strategy and get successful result. All ranges of ages have been a victim of tuberculosis but the DOT strategy worked for most of the patients.

## **Recommendation**

Even if there were few patients who showed failure on the treatment, the smear conversion rate calculated in this thesis is hopeful and indicates the success of the DOT strategy in our country. But also considerable number of patients failed to follow up on the treatment; as a result we recommend further strengthening of the DOT strategy. We also recommend further studies to be conducted to strengthen the DOT strategy and quality of laboratory diagnosis method by using this research study as a baseline. It was observed that, at the two of health centers the registration log book for two years had been lost. At few of the health centers the pages of the registration log books are torn out and significant data such age, sex or HIV status is missed. We recommend that the health centers keep their registration log books safe from certain damages and keep them from getting lost.

### **List Of Abbreviations**

AFB	Acid Fast Bacilli
DOT	Directly Observed Therapy
HIV	Human Immunodeficiency Virus
MDG	Millennium Development Goal
SPSS	Statistical Package for the Social Sciences
TB	Tuberculosis
USAID	United States Agency International Development
WHO	World Health Organization

### **Competing Interest**

The authors declare that there is no competing interest.

## Authors Contribution

All the authors were equally involved in the conception of the study design, data collection, data analysis, and result interpretation, write up of the thesis and preparation of the manuscript.

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All the authors are academic staff of Addis Ababa university , College of Health Science. MwT, RA and KD are at the department of Medical Laboratory Science. DN is at the department of Pathology and SW is at the department of Dermatology.

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