JIMMA UNIVERSITY

INSTITUTE OF HEALTH, FACULTY OF MEDICINE,

DEPARTMENT OF INTERNAL MEDICINE

ASSESSMENT OF TREATMENT OUTCOME AND ASSOCIATED FACTORS AMONG MDR-TB PATIENTS IN DIRE DAWA ADMINISTRATION DILCHORA HOSPITAL, EASTERN ETHIOPIA:

BY: ABDURAHMAN ABIBEKER (MD)

A THESIS SUBMITTED TO THE DEPARTMENT OF INTERNAL MEDICINE, INSTITUTE OF HEALTH, FACULTY OF MEDICINE, JIMMA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE CERTIFICATE OF SPECIALITY IN INTERNAL MEDICINE

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Acronyms and Abbreviations

AIDS- Acquired Immune Deficiency Syndrome

DD-Dire Dawa

RHB- regional health bureau

DOTS -Directly Observed Treatment, Short course

DR- Drug Resistant

DRC-Democratic Republic of Congo

DRS-drug resistant survey

DST -Drug Susceptibility Testing

EPTB-Extra pulmonary tuberculosis

HCW-health care worker

HIV- Human Immunodeficiency Virus

H/INH-Isoniazid

MTB-Mycobacterium Tuberculosis

MDR- Multi-Drug Resistant

PTB=pulmonary tuberculosis

R-Rifampicin

RR-MDR-TB-rifampicin resistance MDR-TB

SS^{+}-Sputum smear positive

SS^{-} -sputum smear negative

TB – Tuberculosis

TBL- tuberculosis and leprosy

WHO –World Health Organization

TIC-treatment initiation center

TFC-treatment follow up center

NGO-non-governmental organization

JUSH-Jima University specialized hospital

SUMMARY

Background: The emergence of drug resistance tuberculosis, particularly MDR-TB has become a major public health problem in a number of countries and an obstacle to the global TB control efforts. Information on treatment outcomes among patient with multi drug resistant tuberculosis (MDR-TB) were limited and the new outpatient program to manage MDR TB was introduced in Dire Dawa Ethiopia.

Objective: The study was carried out to assess the treatment outcome and associated factors of MDR-TB patients in Dire Dawa administration Dilchora Hospital Treatment Initiation Center.

Methods: The study design was descriptive retrospective one reviewing medical records, radiological reports and bacteriological reports of MDR-TB of 146 MDR-TB patients since January 2013 to December 2017. Frequency, mean and percentage were computed for descriptive analysis. Bivariate and multivariate analysis was conducted for inferential statics.

Result: Mean age of study participants was 30 years (30 ±12SD). Most of them (82%) had prior history of TB treatment, and 49 patients (33.6%) had history of drug interruption. 26 (17.8%) had HIV infection. Drug sensitivity test revealed 7 (4.8%) resistance to RIF,INH,EMB, and SM. Most common radiologic finding was cavitary lesion, but 25% of patients revealed normal finding. 97% of the patients received standardized regiment, and 130 patients experienced drug side effect. 128(87.7%) of the study participants had favorable outcome (cured /72.6%) and treatment completed /15.1%)). In logistic regression, HIV co- infection and those who had at least one social and/ or behavioral risk factors were associated with unfavorable treatment outcome.

Conclusion and recommendation:

The new outpatient program to manage MDR TB in Dire Dawa showed a favorable outcome. The outcome of MDR-TB treatment was poor in patients with HIV seropositive and those who had at least one social and/ or behavioral risk factor.

HIV screening should be reemphasized among TB patients for early initiation of ARTs. In order to prove the association between the outcome of MDR TB treatment and socio-behavioral risk factors, larger scaled researches may be needed.

Key words: MDR-TB, Treatment outcome, Eastern Ethiopia

1. Introduction

1.1 Background Information

Drug-resistant *Tuberculosis* (DR-TB) is a man-made problem, largely being the consequence of human error as a result of individual or combination of factors related to management of drug supply, patient management, prescription of chemotherapy, and patient adherence; although the genetic factors are believed to contribute to a certain extent. Poor infection control practice also has been identified as a major contributing factor for the spread of DR-TB **(1)**. DR-TB, like drug susceptible TB, is transmitted through inhalation of infected droplet nuclei; the clinical manifestations are also similar. More recently the emergence of Extensively Drug-Resistant TB (XDR-TB) has added to the complexity of TB care and treatment challenges.(1)

DR-TB can be mono-resistant which is resistant to any one of first line anti-tuberculosis drugs; poly-resistance TB that is resistant to more than one anti- tuberculosis drugs other than both isoniazid and rifampicin; multidrug-resistant TB(MDR-TB) is defined as mycobacterium tuberculosis that is resistant to at least isoniazid and rifampicin and; extensively drug-resistant TB(XDR-TB), which is defined as M. tuberculosis resistant to isoniazid, rifampicin, any one of fluoroquinolones and at least one of three injectable second-line drugs (capreomycin, kanamycin and amikacin).**(1,2)**

DR-TB is caused by either microbial, clinical and/or management program related factors. From a microbiological perspective, resistance is caused by a genetic mutation that makes a drug ineffective against the mutant bacilli. From a clinical and programmatic perspective, it is an inadequate or poorly administered treatment regimen that allows a drug-resistant strain to become the dominant strain in a patient infected with TB.**(4,6)**

MDR-TB results from either primary infection or may develop in the course of a patient's treatment. MDR-TB patients respond poorly to short course chemotherapy and need to be treated intensively for up to 24 months with a regimen based on reserve anti TB drugs. There are several reasons for emerging DR-TB in developing countries. These are lack of laboratory facilities for the diagnosis of MDR-TB and the clinical expertise and shortage of chemotherapeutic agents for

its management. Although effective second-line drugs are available; they are expensive and treatment takes 18-24 months with more adverse drug effects which pose challenges to the treatment of MDR-TB.[6] Hence, there has been a recent shift in the international attitude towards dealing with the MDR-TB burden.

The ultimate strategy to control drug-resistant tuberculosis is one that implements comprehensive approach incorporating treatment of drug-resistant tuberculosis based upon principles closely related to those of the general DOTS strategy for TB control: sustained political commitment; a rational case-finding strategy including accurate, timely diagnosis through quality assured culture and DST; appropriate treatment strategies that use second-line drugs under proper case management; uninterrupted supply of quality-assured anti-tuberculosis drugs; standardized recording and reporting system.[4]

1.2 Statement of the problem

The increasing prevalence of infection with drug-resistant mycobacterium tuberculosis represents a global public health emergency. The 2011 WHO Global TB Report estimated the presence of 650,000 cases of MDR-TB among the world's 12.0 million prevalent cases of TB. So far, the magnitude of the problem posed by MDR-TB has been estimated in about two thirds of all countries worldwide through disease surveillance and surveys. Each year, as more studies are conducted, new hot spots of MDR-TB are documented. Subsequently in WHO report; globally 5% of TB cases were estimated to have had MDR-TB in 2014. Drug resistance surveillance data show that an estimated 480,000 people developed MDR-TB and 190,000 people died as a result of MDR-TB in 2014. On average, an estimated 9.7% of people with MDR-TB have XDR-TB. If all notified TB patients (6.3 million) had been tested for drug resistance in 2014, an estimated 300,000 cases of MDR-TB would have been detected. In 2014, 123,000 patients with MDR-TB or rifampicin resistant tuberculosis (RRTB) were notified, of whom about 75% lived in the European Region, India, South Africa and China.[1,2,4]

The WHO estimates that only 48% of patients with MDR-TB who are diagnosed and treated in Africa are cured or successfully complete treatment. None of the 34 of 107 countries that have achieved the WHO target for treatment success of ≥75% are in Africa. Furthermore, sub-Saharan Africa has (1) the lowest coverage of drug susceptibility testing (DST) required for MDR-TB diagnosis, (2) the lowest proportion of notified MDR-TB cases starting therapy (51%) and (3) the highest mortality (17%) of any region among patients who receive therapy. For example, treatment success rates for South Africa range from 44% to 72%, and very low treatment success rates (40-62%) are reported for patients with MDR-TB treated elsewhere in Africa. These figures underscore the enormous gaps in treatment coverage and a public health crisis in Africa that require urgent intervention.

The additional challenges of HIV coinfection, severe malnutrition and extreme poverty in Africa, coupled with less robust lab infrastructure and high rates of loss to follow-up, demand innovative clinical and programmatic models. MDR-TB program response meeting these challenges could serve as a platform and model for additional scale-up to vulnerable populations in Africa and beyond.

Ethiopia is one of the 27 high MDR-TB burden countries; it is ranked 15th with more than 5000 estimated MDR-TB patients each year.[2] According to the 2013 WHO report, the prevalence of MDR-TB has been 2.8% in newly diagnosed patients and 21% in patients who have previously received anti-TB treatment.[1,6] Even though Published studies on MDR-TB are increasingly available worldwide; accurate data on drug-resistant TB in Ethiopia is limited.

In 2011, Ethiopia adopted the WHO ambulatory care model for MDR-TB management. Through this approach, MDR-TB patients are investigated as out-patients and treatment initiated as out-patients as long as the patients are stable and do not require admission. Studies have shown that management of MDR-TB patients imposes substantial operational challenges in resource-constrained settings; such as tracing patients lost to follow-up, treatment of severe drug side effects, the need to manage comorbidities and stigma surrounding MDR-TB care both in the society and among health care professionals.[6,10]

The Dire Dawa Administration has an estimated population of 396, 423 and 100% DOTS geographical coverage for sensitive TB. Before the MDR-TB service was initiated, the MDR-TB cases had been referred to St. peter TB specialized hospital for diagnosis and inpatient treatment. The Dire Dawa administration Health Bureau launched ambulatory care model for MDR-TB treatment by establishing one TIC and five TFCs in 2013 Gc and up to the end of 2016 Gc more than 160 confirmed MDR-TB patients were enrolled into the center; many of those completed treatment and their outcome was not supported by the study.

Therefore this study will assess and summarize the available evidence on MDR-TB treatment outcomes and associated factors in Dire Dawa Dilchora Hospital MDR-TB treatment initiation center.

1.3 Significance of the study

The finding from this study will first reveal the magnitude of favorable and unfavorable treatment outcome of MDR-TB patients and thereby fills the information gap and in addition identifying factors associated with unfavorable outcome will enable policy makers, program managers and service providers to improve MDR-TB treatment outcome to attain intended control of MDR-TB. It will also serve as baseline information to undertake further studies on similar setting in the future.

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1.4 Objectives of the Research

1.4.1 General objective

To assess the treatment outcome and associated factors of MDR-TB patients in Dire Dawa administration of Dil-Chora Hospital from January 2013 to December 2017

1.4.2 Specific objectives

1. To determine the magnitude of favorable and unfavorable treatment outcomes.
2. To assess factors that associated with unfavorable MDR-TB treatment outcome.

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2. Literature review

Study done in 2010, in Nepal revealed significant associations between history of prior TB treatment, smoking, social stigma, poor knowledge on TB and on DOTS Plus with the development of MDR-TB.[9] In Spain in 2006 study under taken on factors associated with drug resistance TB showed a significant associations between MDR-TB and history of previous TB treatment, alcohol abuse and age older than 45 years.[10]

Study done in 2007, Paris France revealed that most frequent causes associated with selection of resistance in the community and with the generation of MDR-TB under epidemic conditions includes non-implementation of the DOTS strategy, poor adherence and supervision of treatment, non-standardized treatments, shortages of drug supplies in the country and poor quality of anti-tuberculosis drugs. Countries where TB treatment is mainly performed in the private sector, poor hospital infection control, high prevalence of highly virulent strains of Mycobacterium tuberculosis, and HIV co-infection are also associated with development of MDR-TB.[11]

Findings in 2010 from studies done in Nigeria revealed that the risk of developing MDR-TB was strongly associated with previous TB treatment: (5% of new and 19% of previously treated patients) and with young adult age (63% of patients with MDR-TB were 25–34 years old). But there was no association of MDR-TB with HIV co infection and gender.[13]

According to study done in Turkey in 2012, there were no differences in age, sex, marital status and type of TB in acquiring the multidrug resistant TB when compared with the control group or susceptible TB. The study found a significantly increased risk of MDR-TB among those with poor socioeconomic status [7.17 times higher (2.61-19.67**)]**, those with previous history of TB, [5.61 times higher (2.10-15.07)], and in patients who had diabetes mellitus, [3.68 higher (1.15-11.79)] than the control group.[14]

Study done in North East Thailand identifies that the risk factors associated with MDR-TB includes irregular TB follow up in the past, DOT by self-administrative means when compared with those provided by health professionals, and presence of comorbidities.[15]

Study from Nepal reveal that drug resistant TB generally arises through the selection of mutant strains by inadequate therapy. The most powerful predictor of the presence of MDR-TB is a history of previous TB treatment, and the other associated factors were; shortage of drugs in

resource poor settings, increased cost of treatment, poor follow up and infrastructure. The association between MDR-TB and poverty was also found.[16].

Study done in Belarus in 2011 states; history of previous treatment for TB and imprisonment had a significantly increased risk of MDR-TB. Disability, alcohol abuse, smoking and HIV co-infection were strong independent risk factors for MDR-TB in Belarus. An age of ≥ 35 years at diagnosis was negatively associated with MDR-TB. Associations between MDR-TB and gender, place of birth, educational status and living conditions were not found to be statistically significant.[20]

From retrospective cohort study done in United Kingdom; Low drug resistance pattern, treatment regimen and treatment of adverse effect are associated with successful treatment outcome in patients diagnosed with multidrug-resistant tuberculosis. The proportion of MDR-TB cases notified between 2004 and 2007 completing treatment in the UK was 70.6 %.[23]

A retrospective cohort study was carried out to compare final treatment outcomes and adverse drug reactions among patients with MDR-TB who completed the intensive phase of treatment through inpatient care (2010) with those who completed the intensive phase on an ambulatory basis (2011) in Tashkent, Uzbekistan. Treatment outcomes were similar between the two groups, with a tendency to more favorable outcomes in those on ambulatory therapy (treatment success: 63%, ambulatory care; 53%, hospitalized care). Reported adverse reactions were significantly higher in those on hospitalized therapy (86%) compared with ambulatory therapy (55%).[22]

According to the study done in 2011 at St. peter hospital, Addis Ababa: Factors that were significantly associated with MDR-TB includes: drug side effects during first-line treatment; house hold contact, treatment not directly observed by a health worker, interruption of treatment for at least a day, duration of treatment between 2 and 7 months and retreatment with the Category II regimen.[24]

Study done in 2011 in Addis Ababa shown that among 376 culture positive for *M. tuberculosis* one hundred and two (27.1%) were susceptible to all of the four first line anti-TB drugs - Isoniazid, Rifampicin, Ethambutol & Streptomycin. While 274 (72.9%) were resistant to at least

one first line drugs. Resistance to STM (67.3%) was found to be the most common and the magnitude of MDR-TB was 46.3%.[24]

Study done in Addis Abeba at St. peter TB specialized Hospital, by Meresa D. et al, 2015,shows the highest MDR-TB treatment success outcomes(78.6%) so far achieved in Africa, in a setting with severe resource constraints and patients with advanced disease. Intensive treatment of adverse effects, nutritional supplementation, adherence interventions and NGO-MOH collaboration were key strategies contributing to success.[25]

Study published from India in 2017 concludes that; smoking, Pre-XDR-TB, Diabetes, were factors affecting the outcome of treatment independently, hence predictors of outcome in MDRTB. The emergence of pre-XDRTB as independent factor determining the outcome is significant emphasizing the earlier switch to XDRTB regimen.[32]

3. Methods and Material

3.1 Study area and period

The study was conducted in Dire Dawa city administration, DilChora Hospital treatment initiation center through retrospective review of medical records of all MDR-TB patients enrolled since 2013- 2017. Dire Dawa administration is one of the two city administrations in Ethiopia and located in eastern part of Ethiopia at the distance of 501 km from Addis Ababa, capital city of the country. According to 2007 Ethiopian census projection for 2012/13, the current total population of Dire Dawa administration is 396,423 (58% residing in urban where as 42% residing at rural). It has 9 urban Kebeles and 38 rural Kebeles and 100% geographic access with primary health care. In terms of distribution of health facilities by type in the administration, there are two governmental and 4 private hospital, 15 health centers, 5 private higher clinics, 12 private medium clinics, & 31 Health posts (governmental). Of which all hospitals (governmental and private), all health centers, 5 higher clinics, 2 medium clinics and 31 health posts are providing sensitive TB service. When coming to the MDR-TB service; two hospitals (one treatment initiating center and one treatment follow up center), and five health centers for treatment follow up are providing MDR-TB services. Dire Dawa established one of the ten MDR-TB treatment initiating centers as per plan of NTP in 2013. Since then more than 146 MDR-TB patients (by the end of 2017) are enrolled into treatment center.

3.2. Study Design

A retrospective study was carried out by enrolling all MDR-TB patients registered from January 2013 to December 2017. Medical records of 146 patients were scrutinized for necessary information on demographic, clinical parameters, socio-behavioral risk factors and previous TB treatment. Treatment outcomes to MDR-TB therapy, any interruptions in treatment, adverse drug reactions, culture conversion etc. were evaluated from the records

3.3. Population

3.3.1. Source population

All forms of MDR-TB cases in Dire Dawa administration Dilchora Hospital were included in the study.

3.3.2. Sample Population/study participants

All diagnosed MDR-TB patients; enrolled into Dilchora Hospital treatment initiation center from January 2013 to December 2017.

3.4. Sample size determination and Sampling technique

All individual laboratory confirmed MDR-TB record who started treatment in Dil-Chora referral hospital assumed to complete MDR-TB treatment for at least 24 months were reviewed from MDR-TB register format, laboratory MDR-TB register format and patient care card during January 2013 to December 2017 were included.

3.4.1. Sample size determination

In this study, sample size is calculated by considering the proportion of MDR-TB patients with unsuccessful treatment outcome as a predictor variable. Sample size determined using single population proportion formula. The following parameters are taken into account during calculation of sample size: based on study done at St. peter hospital in Addis Ababa (25) shown that proportion of favorable outcome (P) among MDR-TB patients were 78.6%, 95% confidence interval (Z) and a maximum discrepancy of (d) 5% between the sample and the underlying population.

$$n_i = \frac{(Z_{1-\alpha/2})^2 (P)(1-P)}{d^2}$$ where n_i=initial sample size

Based on this formula; the initial sample size(n_i) is equal to 258.

But since my study population is less than 10,000; by using the following correction formula the final sample size (n_f) =115.

$n_f = \frac{n_i}{1+\frac{n_i}{N}}$ where n_f =final sample size

N=total population (200); n_i =initial sample size

Sample size

All confirmed MDR-TB patients and started MDR-TB treatment since January 2013 up to December 2017 were taken as sample size.

3.5 Inclusion and exclusion criteria

Inclusion criteria

- All diagnosed MDR-TB patients (by phenotypic or genotypic means); who are older than 15 years; enrolled into Dilchora Hospital treatment initiation center from January 2013 to December 2017

Exclusion criteria

- MDR-TB patients who transferred out to the other treatment center.

3.6 Study variables

Independent variable

The independent variables include

1) Socio demographic variables (age, sex, ethnicity, religion, education, residence, occupation, income, marital status).
2) MDR-TB treatment category (new, retreatment).
3) Socio-behavioral risk factors (adherence, treatment supporter, homelessness, drug abuse, alcohol, smoking).
4) Comorbidities (HIV, DM, Heart failure, corpulmonale, hypertension, renal failure).

Dependent variable

MDR-TB treatment outcome (Favorable Vs Unfavorable).

3.7. Data Collection Instrument/tool

Record review check list developed by researcher were used to collect secondary data from unit MDR-TB register.

3.8. Data collection Procedure

Medical records of patients who enrolled since January 2013 to end of December 2017 were reviewed and all the necessary registration formats were checked; data was extracted from medical records, MDR-TB treatment charts, bacteriological laboratory reports, and radiological reports in Dilchora Hospital MDR-TB treatment initiation center during june 2019.

3.9. Data Quality control

The check list was adapted from the medical registration book of MDR-TB from different formats. The check list was modified according to the study variable included and specific context. Pretest was done on 10% of the total sample size and necessary corrections on the check list was made. During the data collection procedure double cleaning method was conducted by principal investigator. The data collectors and supervisor were trained before data collection.

3.10 Data Analysis

All the collected data were coded entered and cleaned using Epi- Data version 3.02. Statistical analysis was conducted using SPSS version 20. Descriptive statics such as frequency, percentage and cross tabulation was employed. For inferential statistics logistic regression was used to see the association between MDR-TB treatment outcome and its associated factors.

3.11 Operational Definition

First line Drugs: The drugs isoniazid (INH), Rifampicin (RIF), Pyrazinamide (PZA) and Ethambutol (ETH) are collectively called the first line drugs (FLD).

MDR-TB: TB caused by drug resistance to at least INH and RIF or mostly RIF resistance considered as MDR-TB.

Failure: Treatment was considered to be having failed if two or more of five cultures in the final 12 months of therapy are positive or if any one of the final three cultures is positive.

Lost to follow up: MDR-TB patient whose treatment was interrupted for two or more consecutive months for any reason without medical approval.

Relapse: a patient declared cured or treatment completed of any form TB in the past, but who reports backs to the health service and is now found to be AFB smear positive or culture positive

Sputum conversion: defined as two sets of consecutive negative smears and cultures taken 30 days apart.

Reversion(to positive): culture is considered to have reverted to positive when, after an initial conversion, two consecutive cultures, taken at least 30 days apart, are found to be positive. For the purpose of defining treatment failure, reversion is considered only when it occurs in the continuation phase.

Cured: MDR-TB patient who has completed treatment according to programmed protocol and has at least five consecutive negative cultures from samples collected at least 30 days apart in the final 12 months of treatments. If only one positive culture is reported during the time and there is no concomitant clinical evidence of deterioration, a patient may still be considered cured.

Treatment completed: MDR-TB patients who has completed treatment according to the national treatment protocol but does not meet the definition of cured because of lack of bacteriological results.

Mono-resistance: Resistance to one anti-tuberculosis drug

Poly-resistance: Resistance to more than one anti-tuberculosis drugs other than both isoniazid and Rifampicin.

Extensive Drug-resistance (XDR): Resistance to any Fluoroquinolone and at least one of the three injectable second line drugs (CM, KM, AM).

Transfer out: MDR-TB patient who has been transferred to another reporting or recording unit and for whom the treatment outcome is unknown.

Primary resistance- is resistance in cultures from patients with no history of previous TB treatment or patients who had received first line anti-TB drugs for less than one month.

New category IV:

Patients with no history of previous TB or M(X)DR-TB treatment.

Category IV previously treated with 1st line:

Patients with a history of previous TB treatment, ie with first-line TB drugs.

Category IV previously treated with 2nd line:

Patients with a history of previous M(X)DR-TB treatment, ie with second-line TB drugs.

Pulmonary M(X) DR-TB: refers to disease involving the lung parenchyma.

Extra-pulmonary M(X) DR-TB:

Refers to involvement of organs other than the lungs.

Standardized treatment:

Drug Resistance Survey (DRS) data from representative patient populations are used to base regimen design in the absence of individual DST. All patients in a defined group or category receive the same regimen.

Individualized Treatment:

Each regimen is adopted according to guidelines based on the patient's past history of TB treatment, individual 1^{st} line and 2^{nd} line-DST results and possible side-effects.

Empiric Treatment:

Each regimen is individually designed based on the patient's past history of TB treatment and with consideration of DRS data from the representative patient population. An empirical regimen is adjusted when DST on individual patient becomes available.

MDR-TB Treatment Regimens in Ethiopia

National TB program has standardized regimens by distinguishing 5 patient categories**:**

Group 1: patients with MDR-TB confirmation but no full DST results available yet**.**

Group 2: MDR-TB patients susceptible to both kanamycin and quinolone**.**

Group 3: MDR-TB patients susceptible to kanamycin but no quinolones**.**

Group 4: MDR-TB patients susceptible to quinolone but resistant to kanamycin.

Group 5: XDR-TB cases, ie MDR-TB plus resistant to both quinolone and kanamycin.

Regimen for Group 1 and 2: E-Z-Km(Am)-Lfx-Eto-Cs

Regimen for Group 3: E-Z-Km(Am)-Mfx-Eto-Cs-PAS

Regimen for Group 4: E-Z-Cm-Lfx-Eto-Cs

Regimen for Group 5: E-Z-Cm-Mfx-Eto-Cs-PAS

Severe adverse drug reaction: is severe (grade 3/4) drug side effect that lead to patient drug interruption

3.12 Ethical consideration

Institutional ethical clearance was first sought from Jimma University, collage of Health and Medical Science office of the Institutional Health Research Ethics Review Committee (IHRERC). Letter of permission was further sought from Dire Dawa Regional Health Bureau and Dil-Chora hospital for using the information in the medical records of the patients for research purposes. Confidentiality of patient's record chart and registration was kept.

3.13 Dissemination plan

Study result will be given to relevant bodies such as, Jimma University, Dire Dawa Administration, Federal Ministry of Health, Dire Dawa Health Bureau, and partners and regional sponsors of the project (if any). Finally, attempts will be made to present the results on scientific conferences and to publish the results of the study on journal.

4. RESULT

4.1. Socio -Demographic Characteristics of participants

A total of 176 medical records of MDR-TB patients who were enrolled to the treatment were reviewed for this study. The outcome was determined for 146 patients who had complete data records and were analyzed. Mean age of study participants was 30 years (30 ±12SD). 89(61%) of patients were found within the age group of 15-29 years and 33(22.6%) were 40 years and above. 87(59.6%) of study participants were male. Considering the marital status, majority 90(61.6%) were single, 35(24%) were married, 15(10.3%) were widowed and 6(4.1%) were divorced. Majority 55(37.7%) were Amhara and 48(32.9%) were Oromo in ethnicity. About half of the respondents 85(58.2%) were Muslim followers followed by orthodox Christians 61(41.8%). Regarding educational status of the study participants majority 42(28.8%) were attended high school and 19(13%) of them have attended diploma and above. Considering the residence of the study participants majority 130(89%) were from urban area. 75(51.4%) of the study participants were unemployed and 29(19.9%) were daily laborer. Seventy-nine (54.1%) of MDR-TB patients had no or monthly income less than 1000 ET birr and only 11(7.7%) had monthly income greater than 3000 ET birr (Table 1).

Table 1: **Socio demographic characteristics of MDR-TB patient who were on treatment in Dilchora Hospital, Dire Dawa city administration, Eastern Ethiopia (n=146)**

Variables		Frequency	Percentage%
Age in years	15 -29	89	**61.0**
	30-39	**24**	**16.4**
	>40	33	**22.6**
Sex	Male	87	**59.6**
	Female	59	**40.4**
Marital status	Single	90	**61.6**
	Married	35	**24.0**
	Widowed	15	**10.3**
	Divorce	6	**4.1**

Ethnicity Oromo	48	**32.9**
Amara	55	**37.7**
Somali	33	**22.6**
Others	10	**6.8**
Religion Muslim	85	**58.2**
Orthodox Christian	61	**41.8**
Educational status		
unable to read and write	28	**19.2**
Read and write only	29	**19.9**
1-8 grade	28	**19.2**
High school	42	**28.8**
Diploma	14	**9.6**
Degree and above	5	**3.4**
Residence		
urban	130	**89.0**
Rural	16	**11.0**
Occupations		
Government employee	18	**12.3**
private sector employee	17	**11.6**
daily laborer	29	**19.9**
housemaid/servant	2	**1.4**
merchant	5	**3.4**
unemployed	75	**51.4**
Monthly income < 1000 birr	79	**55.2**
1000-3000 birr	53	**37.1**
> 3000 birr	11	**7.7**

4.2. Treatment outcomes of MDR-TB patients at Dilchora hospital (n=146), 2013-2017

As displayed in the table 2 below, 128(87.7%) had favorable outcome (nearly three-fourth 106/72.6% of the study participants were cured, 22/15.1% were treatment completed), and 18(12.3%) had unfavorable outcome (12/8.2% were died and 6/4.1% were treatment failed) among patients who enrolled to treatments during the study period.

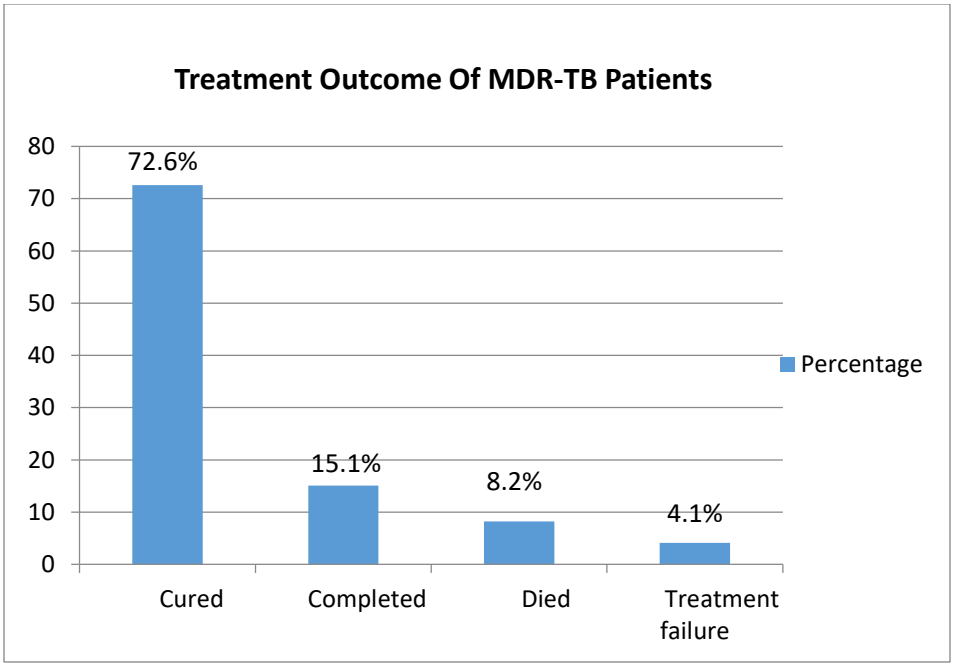

Figure 1: Magnitude of treatment outcome of MDR-TB patients who were on treatment in Dilchora Hospital, Dire Dawa city administration, Eastern Ethiopia (n=146), 2013-2017

4.2.1 Clinical characteristics of MDR-TB patients

The mean delays of treatment initiation in this study were 60 days (60 ±131SD); at the start of the program the patients were those who kept on waiting list to be treated in Addis Abeba. As displayed in the Table:2 below more than three-forth, 111(77.6%) had started treatment at less than 2 months from the time of diagnosis and 32(22.4%) were delayed treatment for more than 2 months. Twenty-six (17.8%) of MDR-TB patients were found to be HIV positive at the time of diagnosis, out of which 24(92.3%) were on HAART and 2(7.7%) were newly diagnosed. 18

patients with HIV had CD4 report at the time of diagnosis, out of which 9(50%) of them had CD4 count more than 200 cells/dl and 8(44.4%) had CD4 count less than 100 cell/dl.
Regarding registration category of MDR-TB patients 57(39%) of study participants were registered as after failure of retreatment and 47(32.26%) were after failure of first treatment. Meanwhile 115(78.8%) were previously treated with first line Anti-Tb and 5(3.4%) were previously exposed to second line Anti-TB. The magnitudes of MDR-TB among newly diagnosed patients were 10(6.8%).
Only 1 patient(0.7%) had extra pulmonary (lymph node) MDR-TB case. 142 (97.3%) of the study participants were treated with standardized treatment regimen and 4(2.7%) were treated with individualized regimen which is based on their DST results. 38(26%) of the study participants had at least one form of comorbidities other than HIV. The most common comorbid condition were COPD 24(16.4%), DM 9(6.2%), hypertension 2(1.4%) and 3(2.1%) had other comorbid condition.
After the MDR-TB treatment initiation 49 (33.6%) of the study participants had history of drug interruption; out of which majority 32(64%) were interrupted due to adverse drug effect (discussed below) and 15(30%) were interrupted medication because of poor adherence.
Considering socio-behavioral risk factors; 98(67.6%) had no documented social and behavioral risk factors while 48(32.4%) had at least one socio-behavioral risk factors, out of which majority 26(17.9%) were khat chewers, 8(5.5%) drug abuser, 7(4.8%) were alcohol misusers and 6(4.1%) were homeless.
The anthropometric characteristics of patients at the time of diagnosis was kept as follows, the mean height of the study participants was 167 cm (167± 8.9 SD). The mean weight at the start of MDR-TB treatment was 48 Kg (48±9.2SD) and the mean BMI was 17 Kg/m² (17±3.2). Similarly about three-fourth 109(74.7%) of the study participants were malnourished (BMI< 18.5 Kg/m²) and 3(2.1%) were with in normal weight (BMI< 25 Kg/m²) at the time of diagnosis. On the other hand 100% of the study participants had treatment and nutritional support, majority 114(78.1%) were from NGO and some had support from family members (19.2%) and governments (2.7%).
One hundred-thirty (89%) of MDR-TB patients had experienced adverse drug side effect during the course of their treatments. The commonest drug adverse effect patients repeatedly encountered was GI upset 101(77.7%), psychiatric illness 8(6.2%), renal toxicity 7(5.4%), electrolyte imbalance (severe hypokalemia 6(4.6%)), ototoxicity/ hearing impairments 3(2.3%) and hepatitis/jaundice 3(2.3%) of the study participants.

Table:2 Clinical characteristics of MDR-TB patients in Dilchora Hospital, Dire Dawa, Eastern Ethiopia (n=146)

Variables	Frequency	Percentage%
Delay of treatment initiation		
<2 month	111	77.6
>2 months	32	22.4
HIV status of the patients		
Positive	26	17.8
Negative	120	82.2
Treatment status of HIV positives at the time of diagnosis		
New	2	7.7
On HAART	24	92.3
CD4 count of HIV positives at the time of diagnosis		
<100	8	44.4
100-200	1	5.6
>200	9	50.0

Registration category of MDR-TB patients		
New	10	6.8
Relapse	25	17.1
After lost to follow-up	6	4.1
After failure of first treatment	47	32.2
After failure of retreatment	57	39.0
Transfer in	1	.7
History of previous TB treatment		
New	26	17.8
Treated with first line	115	78.8
Treated with second line	5	3.4
Site of MDR-TB		
Pulmonary TB	145	99.3
Extra pulmonary TB	1	.7
Treatment regimens		
Standard regimens	142	97.3
Individualized regimens	4	2.7
Presence of comorbidity		
None	**108**	**74**
COPD	24	16.4
DM	9	6.2
HTN	2	1.4
Others	3	2.1

History of drug interruption		
Yes	49	33.6
No	96	65.8
The reason for drug interruption		
Adverse drug effect	32	64.0
Poor adherence	15	30.0
unknown	3	6.0
Socio-behavioral risk factors		
None	**98**	**67.6**
Homeless	6	4.1
Drug abuse	8	5.5
Alcohol misuse	7	4.8
Khat chewing	26	17.9
Anthropometric measurement(BMI)		
Height	**Mean=167cm SD±8.9**	
weight	**Mean =48Kg±9.2**	
BMI	**Mean =17Kg/m²±3.2**	
< 18.5 kg/m²	109	74.7
18.5- 25 kg/m²	34	23.3
>25 kg/m²	3	2.1
Having treatment and nutrition support		
Yes	**146**	**100**
No	**0**	**0**

The support giver		
Family members	28	19.2
Governments	4	2.7
NGO	114	78.1
Adverse drug side effect		
Yes	130	89.0
No	16	11.0
Type of adverse drug side effect		
Hepatitis(jaundice)	3	2.3
GI upset	101	77.7
Renal toxicity	7	5.4
Psychiatric illness	8	6.2
Ototoxicity	3	2.3
Severe hypokalemia	6	4.6
others	2	1.5

4.2.2 Laboratory and Chest x ray characteristics

Regarding base line smear grading of MDR-TB patients majority 129(88.4%) of the study participants had positive smear result before initiation of treatment. As displayed in the table 3 below out of the positive result 32(21.9%) had +3 smear, 37(25.3%) had +2 smear, 39(26.7%) had +1 smear and 21(14.4%) had scanty smear grading. On the other hand 17(11.6%) of the study participants had negative AFB result at the start of treatment. Similarly majority 122(83.6%) of the study participants had positive baseline culture at initiation of treatment. Here some patient's culture result were not returned from central laboratory and some were diagnosed with gene x pert only.

Concerning drug and sensitivity pattern of the MDR-TB patients 76(52.1%) of the study participant had Rifampicin resistance only, about 63 (43.2%) had resistance for both R and INH and 7(4.8%) had resistance to Rif, INH, E and SM. The mean month of first culture conversion in the study was 2 months (2 months SD±1.1).

Considering radiological pattern of lung lesion majority (based on radiologist and physician at the center documents); 58(39.7%) of the study participants had cavitary lesion, 28(19.2%) had consolidation, 24(16.4%) had reticulonodular lesion. However 36(24.7%) of MDR-TB patients had normal radiological finding at the time of diagnosis. Majority 59(40.7%) of the study participants had bilateral lung lesion and 51(34.9%) had unilateral lung lesion before initiation of treatment.

Table 3: Laboratory characteristics of MDR-TB patients in Dilchora Hospital, Dire Dawa, Eastern Ethiopia (n=146)

Variables	Frequency	Percentage%
Smear grading at base line		
+ 3 smear	32	21.9
+2 smear	37	25.3
+1 smear	39	26.7
scanty	21	14.4
Negative	17	11.6
Result of baseline culture		
Positive	122	83.6
Negative	19	13.0
Unknown	5	3.4
Baseline DST result		
RIF resistance only	76	52.1
Resistance to RIF, INH	63	43.2
Resistance to RIF,INH,EMB,SM	7	4.8
Month of first culture conversion	**Mean= 2 month± SD 1.1**	
Radiological(x-ray) pattern of lung lesion		
Cavitary lesion	58	39.7
Consolidative	28	19.2
Reticulonodular	24	16.4
None	36	24.7
Radiological extent of lung lesion		
Unilateral	51	34.9
Bilateral	59	40.4
None	36	24.7

4.2.3 Bivariate and multivariate analysis

In table:4 below, 71(57.6%) of MDR-TB patients who earn monthly income less than 1000 ET birr had favorable treatment outcome(p=.005). About 19(14.8%) of TB/HIV co-infected patients have favorable treatment outcome compared with 109(85.2%) of HIV negative patients(p=.017). 7(26.9%) of unfavorable outcome were found among TB/HIV co infected patients compared with 11(9.2%) among HIV negatives(p=017). 91(71.1%) of patients who had no any socio-behavioral risk factors had favorable treatment outcome compared with 37(28.9%) of favorable outcome among those MDR-TB patients who had at least one socio-behavioral risk factors. Among patients who had history of drug interruption 11(22.6%) had unfavorable treatment outcome compared with only 7(7.2%) among uninterrupters. About 94(93.1%) of MDR-TB patients whom culture convert less than 2 months had favorable treatment outcome versus 34(77.3%) of those who convert after 2 months and unfavorable outcome was higher among those whom culture convert after 2 months(10/22.7% Vs 7/6.9%). Meanwhile 52(40.6%) of study participants with cavitary lesion and 51(39.8%) who has abnormal chest x-ray without cavitation had successful treatment outcome. About 50(39.1%) and 53(41.4%) of favorable treatment outcome were found among those with unilateral lung lesion and bilateral lung lesion respectively.

On bivariate analysis of the dependent and independent variables, monthly income, TB/HIV co-infection, presence of at least one socio-behavioral risk factor, history of drug interruption, culture conversion (<2 months), type and extent of lung lesion were found to have significant association with unfavorable treatment outcome ($p \leq 0.05$).

However when adjusted on multivariate analysis only TB/HIV co-infection {AOR (0.206), 95%CI (0.042, 0.991); p-value (0.05)} and presence of at least one socio-behavioral risk factor {AOR (0.227), 95%CI (0.057, 0.907); P-value (0.036)} were statistically significantly associated with poor treatment outcome (table-5).

Thus, HIV co-infected MDR-TB patients and those who had at least one socio-behavioral risk factor were associated with unfavorable treatment outcome. Those TB/HIV co-infected patients were 79.4% less likely had favorable treatment outcome than non HIV co-infected MDR-TB patients. Similarly patients who had at least one socio-behavioral risk factor were 77.3% less likely had favorable treatment outcome than MDR-TB patients who had no risk factor.

Table 4 Bivariate analysis of factors associated with treatment outcome among MDR-TB patients in Dilchora hospital, eastern Ethiopia **(n=146)**

Variables	**Favorable outcome**		**COR (95%CI)**	**P-value**
	Yes	**No**		
Age				
10-29 years	**83(93.3%)**	**6(6.7%)**	**0.32(0.097, 1.093)**	.069
30-39 years	18(75.0%)	6(25.0%)	1.5(.417, 5.390)	.534
>40 years	27(81.8%)	6(18.2%)	R	
Sex				
Male	77(88.5%)	10(11.5%)	1.208(.447, 3.266)	.710
Female	51(86.4%)	8(13.6%)	R	
Marital status				
Single	86(95.6%)	4(4.4%)	7.167(2.222,23.111)	**0.001**
Ever married	42(75.0%)	14(25%)	R	
Residence				
Urban	114(87.7%)	16(12.3%)	1.018(.211, 4.899)	.982
Rural	14(87.5%)	2(12.5%)	R	

Monthly income				
< 1000 birr	71(89.9%)	8(10.1%)	.135(.034, .545)	**.005**
2000-2999 birr	48(90.6%)	5(9.4%)	.125(.028, .561)	**.007**
>3000 birr	6(54.5%)	5(45.5%)	R	
TB/HIV				
Yes	19(73.1%)	7(26.9%)	.274(.094, .795)	**.017**
No	109(90.8%)	11(9.2%)	R	
Comorbidity				
Comorbidity other than HIV	31(83.8%)	6(16.2%)	.639(.221, 1.845)	.408
No comorbidity	97(89.0%)	12(11.0%)	R	
CD4 count				
< 200	7(77.8%)	2(22.2%)	1.75(.215, 14.224)	.601
≥ 200	6(66.7%)	3(33.3%)	R	
History of drug interruption				
Yes	38(77.6%)	11(22.4%)	.269(.097, .746)	**.012**
No	90(92.8%)	7(7.2%)	R	
Treatment delay				
<2 months	100(90.1%)	11(9.9%)	2.545(.896, 7.231)	.079
>2 moths	25(78.1%)	7(21.9%)		

BMI				
Normal	32(86.5%)	5(13.5%)	R	
Under nutrition(BMI< 18.5)	96(88.1%)	13(11.9%)	.867(.287, 2.620)	.800
Culture conversion				
Less than 2 months	94(93.1%)	7(6.9%)	3.95(1.39, 11.202)	**.010**
Greater than 2 months	34(77.3%)	10(22.7%)	R	
Risk factors				
At least one risk factors	37(78.7%)	10(21.3%)	.325(.119, .889)	**.029**
no risk factors	91(91.9%)	8(8.1%)	R	
Lung lesion				
Cavitary lesion	52(89.7%)	6(10.3%)	.262(.087, .790)	**.017**
Abnormal x-ray without cavitary lesion	51(98.1%)	1(1.9%)	.045(.005, .365)	**.004**
Normal	25(69.4%)	11(30.6%)	R	
Extent of lung lesion				
Unilateral	50(98.0%)	1(2.0%)	.045(.006, .372)	**.004**
Bilateral	53(89.8%)	6(10.2%)	.257(.085, .775)	**.016**
None	25(69.4%)	11(30.6%)	R	

Table 5: Bivariate and multivariate analysis of factors associated with treatment outcome among MDR-TB patients in Dilchora hospital, eastern Ethiopia (n=146)

Variables	Favorable outcome/ Rx success		Total	COR (95%CI)	*AOR(95%CI)*	*P-value*
	Yes	No				
Monthly income						
< 1000 birr	71(57.6%)	8(44.4%)	79(55.2%)	0.135(0.034,0.545)	.665(.081,5.478)	.705
2000-2999 birr	48(38.4%)	5(27.8%)	53(37.1%)	0.125(.028,0.561)	.379(.045,3.224)	.374
>3000 birr	6(4.8%)	5(27.8%)	11(7.7%)	R	R	
Total	125	18	143			
TB/HIV						
Yes	19(14.8%)	7(38.9%)	26(17.8%)	0.274(0.094, 0.795)	.206(.042,.991)	**.050**
No	109(85.2%)	11(61.1%)	120(82.2%)	R	R	
Total	128	18	146			
Risk factors						
At least one socio-behavioral risk factors	37(28.9%)	10(55.6%)	47(32.2%)	0.325(0.119,0.889)	.227(.057,.907)	**.036**
No risk factors	91(71.1%)	8(44.4%)	99(67.8%)	R	R	
Total	128	18	146			
History of drug interruption						
Yes	38(29.7%)	11(61.1%)	49(33.6%)	0.269(0.097, 0.746)	.254(.059,1.096)	.066
No	90(70.3%)	7(38.9%)	97(66.4%)	R		
Total	128	18	146			

Table 5: Bivariate and multivariate ……

Culture conversion						
< 2 months	94(73.4%)	5(29.4%)	99(68.3%)	6.63(2.177,20.226)	3.392(.786,14.68)	.101
> 2 months	34(26.6%)	12(70.6%)	46(31.7%)	R	R	
Total	128	17	145			
Lung lesion						
Cavitary lesion	52(40.6%)	6(33.3%)	58(39.7%)	0.262(0.087,0.79)	.262(.051,1.350)	.109
Abnormal x-ray without cavitation	51(39.8%)	1(5.6%)	52(35.6%)	0.045(.005,0.365)	.073(.007,.1)	**.052**
None	25(19.5%)	11(61.1%)	36(24.7%)	R	R	
Total	128	18	146			
Extent of lung lesion						
Unilateral	50(39.1%)	1(5.6%)	51(34.9%)	0.045(0.006, 0.372)	.277(.025,3.066)	.295
Bilateral	53(41.4%)	6(33.3%)	59(40.4%)	0.257(0.85, 0.775)		

4.3 Treatment outcomes of patients

Treatment outcome was assessed for 146 (82.9%) patients, and the proportion of MDR TB patients who successfully declared cured treatment among these patients was 106 (72.6%). The proportion of patients who declared treatment completed according to national TB program guideline were 22(15.1%). The overall favorable treatment outcome (cured and treatment completed) was 87.7%. The magnitude of the unfavorable treatment outcome was 18(12.3%); 12(8.2%) died and 6(4.1%) treatment failed. The treatment outcome was not evaluated for 30(17%) patients because 4(2.3%) were still on treatment, 10(5.7%) transferred out to another MDR-TB treatment center and 8(4.6%) were lost to follow-up and 8(4.6%) had incomplete data records so that we excluded from data analysis.

Unfavorable treatment outcomes were more common among MDR-TB/HIV co infected than HIV negatives (26.9% vs 9.2%, p=0.05) (Table 5). The presence of at least one socio-behavioral risk factor was also associated with unfavorable treatment outcome, (21.3% vs 8.1%), for those who have at least one risk factor and those who have no risk factors respectively.

5. Discussion

This study was designed to assess treatment outcomes and determine predictors of unfavorable treatment outcomes of MDR-TB patients who were treated as outpatient in ambulatory model of care in Dire Dawa Dilchora Hospital eastern Ethiopia. We found that the overall treatment success (i.e. having an outcome of cured or treatment completed) at the end of the treatment (24 months) was 87.7% (95% CI), which is in accordance with the WHO target (75%-90%) [(10)], and the treatment outcomes so far done for inpatient model of care in Addis Abeba at St peter hospital in 2015(78.6%).[(25)] This favorable outcome is higher than findings in other resource-constrained countries such as Egypt and India(78) [26, 27] and also high-income countries such as Switzerland (76%) [28], the United Kingdom (70.60%) [29]; and the United States of America (78%).[30]

This encouraging outcome in Dire Dawa, eastern Ethiopia may be due to several reasons, related to the study population and the treatment program. The patients in our study were generally young with mean age of 30 years (30 ±12SD), and stable patients who were able to follow at outpatient were selected at the start of program which may have been contributed to the high favorable outcome. In addition, all patients were started treatment as outpatient ambulatory model of care and followed at treatment initiation center during the first month of treatment and received directly observed therapy at various treatment follow up center. In the continuation phases of treatment, patients were followed and traced using several strategies: health professionals from the treatment centers visited the patients every month; the patients were appointed monthly to visit the treatment initiation site; treatment supporters were assigned from the patient's family to assist the patient with directly observed therapy; and food baskets were provided regularly for the patient.

Furthermore, the treatment center was new with new outpatient model of care, treatment-inexperienced with advanced disease, had a substantial HIV-coinfection rate and nearly all of the patients had malnutrition (BMI<18.5). Our positive outcomes are thus in striking contrast to reports of high mortality and lower treatment success rates (40–62%) for patients with MDR TB treated elsewhere in Africa.[(5, 8,9,10)]

Even though this study had lower rates of unfavorable treatment outcome, death (8.2%) and treatment failure (4.1%), compared with studies in patients who began treatment as inpatients in Addis, [25] these outcomes may have been influenced by a more favorable baseline clinical status at the onset of treatment, leading to their selection as outpatient candidates for this new outpatient program. However this is still significant and there are several possible explanations for this result. Firstly, adverse effects from second-line drugs may be most acute during the intensive phase, which might cause frequent drug interruption and poor adherence which may have been contributed for this unfavorable treatment outcome.[20] Secondly, a diagnosis of MDR-TB (and the prospect of taking treatment for 2 years) may create psychosocial problems that led to a poor prognosis, particularly in the early phase of the treatment [24], and thirdly, late diagnosis of MDR-TB might be responsible, as the majority of our patients were treated with first-line anti tuberculosis drug several times. This finding suggested that for further improvement of the treatment outcome, early diagnosis of drug-resistant TB is paramount and then effective treatment and management should follow as early as possible before the patient's compliance declines as a result of fatigue with the first-line anti-TB drug treatment without any perceived benefit. It is also necessary to provide psychological counselling for the patients at the time of MDR-TB diagnosis and to closely monitor all patients for adverse drug effects, especially at the early stages of treatment [5,10,19, 25].

Since the first reports of MDR TB in the early 1990s, HIV coinfection has been associated with poor outcomes in patients with MDR TB.[28–30] In more recent studies, unfavorable treatment outcome has continued to be higher among HIV co infected patients, particularly at lower CD4 cell counts.[31,32] In the data from our study presented here, regardless of CD4 cell count, unfavorable treatment outcome was statistically significantly associated with HIV coinfection. Strikingly, however, our treatment success rate (73%) among HIV co infected patients was higher, and unfavorable outcome (27%) lower, than reported elsewhere in sub-Saharan Africa.[5,8,9,11,26] This could have been due to effective use of ART drugs since most of our patients here were on HAART at the time of diagnoses.

The presence of at least one social and or behavioral risk factor was the other factor that was significantly associated with unfavorable treatment outcome in this study. A fundamental aspect of the program presented here was the implementation of adherence strategies successfully employed in the outpatient program; including monthly home visits and monthly patient visits to the treatment initiation site's outpatient department, identification of a patient supporter to assist with DOT, psychosocial support, monthly food baskets and social support for the patients who have no family supporter. We note that other program that have reported high rates of favorable treatment outcome also provide some nutritional, social and/ or economic support.[11] We assume that such measures are integral to the success of outpatient treatment program, especially in settings of resource constrained countries like Ethiopia.

Around 68% of patients in our study had a sputum culture conversion at 2 months and 32% achieved sputum culture conversion after 2 months. Sputum culture conversion is an important indicator of treatment response that also determines the duration of MDR-TB treatment. Multiple previous studies have shown baseline sputum smear positivity as predictors of unfavorable MDR-TB treatment outcome.[33,34] However this has no statistical association with unfavorable treatment outcome in our study.

Adverse drug effects in this study were encountered in most patients, with gastrointestinal toxicity, psychiatric illness, renal toxicity and hypokalemia as the most frequent adverse drug effects though these are not statistically associated with the treatment outcome in contrast with reports from other MDR TB treatment studies elsewhere.[11,25] This may be due to small sample size and incomplete documentation of the severity of the side effects from the retrospective records that we used.

Conclusion and Recommendation

The new outpatient program to manage MDR TB in Dire Dawa showed a favorable outcome, , amid large resource constraints and with a substantial HIV burden. The outcome of MDR-TB treatment was poor in patients with HIV seropositive and those who had at least one social and/ or behavioral risk factor. HIV screening should be reemphasized among MDR-TB patients for early initiation of ARTs. In order to prove the association between the outcome of MDR TB treatment and socio-behavioral risk factors, larger scaled researches may be needed.

Limitation

All the data for necessary variables could not be obtained and the reliability of the data may not be ascertain because it is retrospective study and based on records. The side effect of medication could not be analyzed by MDR TB regimen properly due to limited biochemical findings. Small sample size might have limited the statistical power of the study.

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