2017-06

Treatment Outcomes of Patients With Tuberculosis in Districts of Burie Zuria, Jabitehinan And Fenoteselam Administrative Town Health Facilities, North West Ethiopia

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Title	Treatment Outcomes of Patients with Tuberculosis in Districts of Burie zuria, Jabitehinan and Fenoteselam administrative town health facilities, North West Ethiopia.
Study Design	Facility Based Crossectional Survey
Study Area	West Gojjam zone, North West Ethiopia
Study Period	2012-2016 G.C
Investigator	Getnet Bizengaw (B.Sc.)
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Declaration

This Thesis has been submitted to School of Public Health with Approval of my University Advisors.

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A Research Paper Submitted to Bahirdar University School of Public Health Department of Epidemiology in Partial Fulfillment of Master of Public Health (MPH) in Epidemiology and Biostatistics

June , 2017

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List of Acronyms and Abbreviations

AFB……..Acid Fast Bacilli

DOT'S……..Directly Observed Therapy

EPTB……Extra Pulmonary Tuberculosis

EXDR-TB……Extensive Drug Resistance Tuberculosis

HIV ……..Human Immuno Deficiency Virus

HBC's……High Burden Countries

LMIC……Low, Middle Income Country

MBT……Mycobacterium Tuberculosis

MDG……Millennium Development Goal

MDR TB …….Multi-Drug Resistant Tuberculosis

NTLCP……National Tuberculosis and Leprosy Control Program

PTB+…….Smear Positive Pulmonary Tuberculosis

PTB-……..Smear Negative Pulmonary Tuberculosis

SDG……..Sustainable Development Goals

SP……..Smear Positive

SN…….Smear Negative

TB…….Tuberculosis

TSR ……..Treatment Success Rate

WHO…….World Health Organization

Acknowledgements

I would like to thank Bahirdar university college of medicine and health sciences allowing me to improve knowledge, skills and to conduct this study and I thank Amhara regional health Bureau, west Gojjam zone health department , the district and town administrations health offices for facilitating this study.

I would like to appreciate and thanks also to my advisors Professor Getu Degu and Mr. Yihun Mullugeta for their unreserved advices and i would like to extend my thanks to Fenoteselam and Burie hospital and health center staffs for their provision of the necessary information, genuine cooperation and for data collection. I am indebted to data collectors, supervisors and health care leaders for their cooperation during the field work.

Abstract

Background: Assessment of treatment outcome, monitoring and evaluation of its Risk factors of Directly Observed Treatment are among the major important indicators for performance of tuberculosis prevention and control program.

Objectives: The aim of this study was to assess anti-TB treatment outcomes and associated factors among patients with tuberculosis in Districts of Burie zuria, Jabitehinan and Fenoteselam town government owned health institution.

Methods: Retrospective data (2012-2016) of tuberculosis patients (n=832) registered for Anti-TB treatments at Districts of Burie zuria, Jabitehinan and Fenoteselam town government owned health facility, were reviewed. Data were entered using Epi-info and transported to SPSS version 20 for analysis. Descriptive Statistics and binary regression models were used to present data. The odds ratio and 95% confidence intervals were calculated. A P-Value of <0.05 was considered statistically significant.

Results: The overall treatment success rate was 82.5%. The odds of HIV negative TB patients were about four times more likely to have successful treatment outcome than the odds of TB patients with unknown HIV sero-status (AOR=4.4(1.83,10.79)). Study subjects whose age group is ≤14 years(AOR=3.6(1.56,8.57)),15-24 years (AOR=1.9(1.09,3.54)) and 25-34years of age (AOR=2.6(1.40,5.15)) were four, two and three times more likely to have successful treatment outcome compared to those age group ≥50 years of age respectively. Urban dwellers were two times more likely to have successful treatment outcome compared to their rural counterparts(AOR=2.2(1.50,3.33)). Pulmonary tuberculosis patients were also three times more likely to have successful treatment outcome (AOR=2.9(2.00,4.46)) compared to EPTB patients.

Conclusion and recommendation: The overall treatment success rate was lower than National Treatment success rate target 87%. Patients who are HIV negative, whose age<14 years, whose age 15-24 years, 25-34years,urban residents and those having Pulmonary tuberculosis TB patients were identified associated factors for successful tuberculosis treatment outcome

Keywords: Treatment outcomes, tuberculosis patient, DOTS, North West Ethiopia

1. Introduction

1.1. Background

Tuberculosis (TB) is a chronic infectious disease caused by mycobacterium tuberculosis (MTB). It typically affects the lungs (pulmonary TB) but can affect other parts of the body (extra pulmonary TB). The disease is spread via droplet infection when people with pulmonary TB expel the bacilli while coughing, sneezing, talking, etc (1, 2).

Almost 1/3 of the world population (about 2 billion) is infected with mycobacterium tuberculosis during the past decade(1). Currently, TB is the leading causes of mortality among infectious diseases worldwide, 95% of TB cases and 98% of TB deaths occur in developing countries (3). Direct observed treatment (DOTS) is one of the widely accepted global health intervention for tuberculosis. The target of DOTS was to achieve a case detection rate of 84% (all forms of TB) and treatment success rate (TSR) of 87% by 2015 (4).

Ethiopia adopted the DOTS Strategy and has been implementing early. Overall, DOTS coverage among government owned hospitals and health centers has reached to 95%.The "STOP TB" strategy was launched by World Health Organization (WHO) in 2006 to achieve Millennium Development Goals (MDGs) for TB in 2015. Ethiopia also adopted this strategy to achieve the national TB /leprosy targets (5).

The END TB strategy was also launched by WHO with envision of zero deaths, diseases, and suffering due to Tuberculosis along with Sustainable Development Goals (SDGs) at 2035(6).Though recently studies are showing a decline in the incidence and prevalence of tuberculosis in many countries, case numbers but Multidrug resistance tuberculosis (MDR TB) continue to rise in much of Sub-Saharan countries where HIV is pandemic including Ethiopia (7). Treatment outcome results serve as a proxy measure of the quality of TB treatment provided by a health care system. Treatment success measured by treatment outcome monitoring is a key output of TB control program (8). Treatment outcome in all patients should be routinely monitored by the epidemiological surveillance system. This will make it possible to recognize and amend system failures (9). In addition treatment outcome monitoring is important to evaluate the effectiveness of DOTS Program. Moreover, understanding the specific reasons for unsuccessful outcomes is important in order to improve treatment strategy (10).

1.2. Statement of the problem

Despite the availability of effective drugs tuberculosis (TB) is still a global emergency and one of the major public health problems in the 21st century [6].It is not only a public health problem, but also a socio-economic issue (11). Globally, TB prevalence in 2015 was 42% lower than in 1990 (5). Nearly, 1.5 million people died including 0.4 million people who were HIV positive. There were also an estimated 9.6 million new cases of TB including 1.2 million people living with HIV. Of the estimated 9.6 million people who developed TB, more than half (58%) were in the south-east Asia and Western Pacific regions and 28% were in the African Regions but the highest rates of cases and deaths out of the total population (281 cases for every 100 000 people) more than double the global average of 133 occurred in the African region (12).However, the TB death rate has decreased by 47% since 1990 with nearly all of that improvement taking place since 2000 when the Millennium Development Goals (MDGs) were set. Globally, the treatment success rate for people newly diagnosed with TB was 86% in 2013 and approximately 480,000 people developed multidrug-resistant TB (MDR-TB) and there were an estimated 190,000 deaths from MDR-TB (5).

Global trends show that TB incidence, prevalence and mortality rates are gradually declining. However, the increase in MDR- and EXDR-TB cases is worrisome. Tuberculosis remains a disease of poverty with a high burden of disease in the low middle income countries (LMICs) and in countries with a high HIV prevalence (13). In developing countries, there is high burden of TB and HIV, delayed diagnosis which is a major contributing factor to the continued transmission and failure to treatment outcome (2). Ethiopia ranks tenth among the 30 high-TB, HIV and MDR TB burden countries (HBCs) and third in Africa. TB remains one of the leading causes of mortality. It is also the leading cause of morbidity, the third cause of hospital admission and the second cause of death in Ethiopia (14).

According to WHO TB report in 2014, the prevalence and incidence of all forms of TB in Ethiopia is 211 and 207 per 100,000 populations respectively. Excluding HIV related deaths; TB death rate was estimated to be 33 per 100,000 populations in 2014. Among estimated all new TB cases, 13% are HIV co-infected. Moreover, Ethiopia is also one of the high TB/HIV and multi-drug resistant TB (MDR TB) burden countries. According to the recent national TB drug resistance surveillance report, 2.3% of new TB cases and 17.8% of previously treated TB cases were estimated to have MDR which indicates increasing trends in TB drugs resistance burden compared to the first Drug Resistance Survey conducted in 2003-2005(5).

Treatment outcome and detection rate are the performance indicators of DOTs program set by World Health Organization (WHO)(14,15). Disease surveillance system and treatment outcome monitoring are considered as the key source of evidence to evaluate the effectiveness of tuberculosis prevention and control program like DOTs (12).

In Ethiopia, DOTs reach coverage of 90 % (9) so the target of halving TB prevalence and mortality rates by 2015 has also been met (5). DOTs given for at least the first two months of treatment under the direct observation of health care providers has been found to be effective in achieving a highly successful treatment outcome ranging from 86 to 96.5% (16). Similarly, treatment success rate is considered as a proxy indicator of the quality of health care services and it is usually affected by various reasons despite the existence of increment in treatment success rate in almost all of the studies done in Ethiopia (17). The average treatment success rate in most of them was below the MDG target (14). On top of these, 2016 marks the beginning of End TB Strategy and it is SDG target for 2035 (18).

1.3. Literature review

Globally, the TB prevalence rate in 2015 was 42% lower than in 1990. The target of 50% reduction was met in three WHO regions and in nine HBCs. The treatment success rate for people newly diagnosed with TB was 86% in 2013, a level that has been sustained since 2005 and only 50% of MDR-TB patients were successfully treated. However, the 2015 treatment success target of ≥75% for MDR-TB patients was reached by 43 of the 127 countries and territories that reported outcomes for the 2012 cohort, including three high MDR-TB burden countries (Estonia, Ethiopia and Myanmar (22).

Cross-sectional survey conducted on Treatment outcome and follow-up of tuberculosis patients put on DOTS under rural health training center, paithan, Aurangabad in India shows that cure rate among category I was 61.7%. Treatment completion rate were 16.7%, 30%, 75% in patients put on category I, category II and category III respectively. Death rates were higher (5%) among patients of category II. During the follow-up visit, 82.4% were found to be alive while 17.6% were dead. A total of 18 deaths were related to TB and its squeal. Defaulters were 18.3 %, 25% and 20% in patients who were put on category I, category II, and category III respectively. Around 20% of defaulters were because of feeling of wellbeing. No case of treatment failure was observed in this study (23).

Euro-surveillance treatment outcome monitoring of pulmonary tuberculosis cases conducted in France shows the proportion of treatment success rate was significantly higher in cases with negative sputum smear result than those with a positive sputum result (73% vs. 67%; $p \leq 0.001$). Factors significantly associated with unfavorable TB outcome was being male (AOR:1.6;95%CI:1.1-2.1),having previous history of Ant-TB(AOR:2;95%CI:1.2-3.1), residence (AOR:2.5;95%CI:1.7-3.7). The proportion of patients with successful treatment decrease with age, while the proportion of deaths increased thus in persons younger than 25 years, the proportion of pulmonary cases with treatment success was 76%, and the proportion of death was 1.1% while they were respectively 57% and 28% among those aged 65 years and older ($p<0.001$) (24).

The study conducted in Johannesburg, South Africa on tuberculosis treatment outcomes in adult TB patients attending a rural HIV clinic shows TB mortality among study participants was 62.5% during pre-ARV rollout period and treatment completion was 31.7%. Factors associated with TB mortality were Age($p<0.006$),sex($p<0.017$), BMI($p<0.001$), marital status($p<0.004$), education ($p<0.03$),alcoholic beverage consumption($p<0.04$) and ARV treatment($p< 0.001$).However only age, sex, ARV treatment were found to predict TB mortality(26).

The Study conducted in Addis Ababa on epidemiology of childhood tuberculosis and treatment outcome shows treatment outcomes were documented for 95.2% of children of whom 85.5% were successfully treated while rates of mortality and defaulting from treatment were 3.3% and 3.8% respectively. On multivariate logistic regression, children 5–9 years (AOR=2.5,95% CI (1.67-3.74)) and 10–14 years(AOR=2.7,95%CI(1.86-3.91)) had a significantly higher successful treatment outcomes. On the other hand, smear positive PTB (AOR=0.44,95% CI(0.27-0.73)), HIV co infection (AOR=0.4, 95%CI(0.30-0.80)) and unknown HIV sero-status (AOR=0.6,95% CI(0.42-0.86)) were predictors of poor treatment outcomes (2).

The a five-year retrospective analysis conducted in Addis Ababa shows overall treatment success rate was 420(85.5 %) and the poor treatment outcome was 71(14.5 %). Of the children with poor treatment outcome, 9(1.8 %) died, 3(0.6 %) defaulted from treatment, 2(0.4 %) were treatment failure and 55(11.2 %) were transferred out. Males and females had similar treatment success rates of 85.8 % and 85.3 % respectively. Infants under one year had significantly lower treatment success rate of 72.7 % compared to those above 1 years of age of 86.5 %($P<0.001$). Associated factors for treatment outcome were age above 5 years(AOR=0.5, 95 % CI (0.62–0.97)) and sero-positive for HIV infection (AOR=6.6, 95 % CI(3.07–14.47))(27).

Study conducted on Investigation Outcomes of Tuberculosis Suspects in the Health Centers of Addis Ababa, Ethiopia shows the prevalence of both pulmonary and extra pulmonary TB was 46.0%. The smear positivity rate among pulmonary TB suspect was 21.3%. Of the TB suspects, 298 (58.9%) of them were tested for HIV and 27.2% were HIV sero-positive. Fifty percent of the HIV positive TB suspects had TB. TB suspects who had a contact history with a TB patient in the family were 9 times more likely to have TB than those who did not have a contact history (AOR =9.1,95%CI(4.0, 20.5)).Individuals who had poor (AOR=5.2,95%CI(2.3, 11.2)) and fair knowledge (AOR=3.7,95%CI(1.3, 10.4)) about TB were more likely to have TB than individuals who had good knowledge (28).

Register based cross sectional study conducted at Debreberhan Hospital, Amhara Region, Northern Ethiopia shows 79.4% of the patients had favorable treatment outcome; 15.8% were cured and 63.5% completed their treatment. There was a continuous increment of treatment success rate from 2010 to 2013 in the area and the treatment success rate in the year 2013 was 84.4% (29).

A retrospective study conducted in Debretabor hospital on TB treatment out come and associated factors among tuberculosis patient, 2016 shows the successful treatment outcome 87.1% while unsuccessful treatment outcome was 12.9%.In multivariate logistic regression analysis, the odds of successful treatment outcome were higher among patients>45 years of age(AOR=3.8, 95%CI:(1.15-12.54)) and lower among females (AOR=0.3, 95%CI(0.13-0.917)), rural residents (AOR=0.3,95%CI(0.11-0.986)) and negative smear result at 2^{nd} month of treatment (AOR=0.05,95% CI:(0.005-0.5)) as compared to their counterparts (30).

A retrospective study conducted in west Gojjam shows tuberculosis notification for all forms of TB decreased from 207/100,000 to 155/100,000 population in 2012. Among patients whose treatment outcomes were evaluated, 94.4% were successfully treated, 0.3% had treatment failure, 1.5% defaulted and 3.7% died. In multivariate analysis the odds of unsuccessful treatment outcome was higher among retreatment cases than new cases (AOR=3.44,95%CI(1.9,6.1)).HIV co-infected cases were more likely to have unsuccessful treatment outcome compared to HIV negatives(AOR=2.6,95% CI(1.92,3.72))(31).

A retrospective study conducted on profile of tuberculosis and its responses to anti TB drugs among tuberculosis patients treated under the TB control program in Felegehiwot referral hospital,2016 shows the overall treatment success rate accounts 542(80.2%) with unsuccessful treatment of 129(19.2%).Being HIV positive(AOR=4.2,95%CI(2.20,8.37)),retreatment (AOR=5.3,95%CI(1.92-14.3)),rural residency(AOR=18.0,95%CI(9.06-37.82)),the age group of 15-24 years(AOR=2.9,95%CI(1.0-8.45)) showed statistically significant association for poor treatment outcome (32).

A retrospective study conducted on the outcomes of tuberculosis treatment in Felegehiwot Referral Hospital, Northwest Ethiopia 2013 shows successfully treated were(26%), defaulted(2.5%), died(5.8%), treatment failed(0.5%) and transferred out(68.6%) patients. The percentage of deaths and defaulters was higher in females than in males. Being an older age group($p<0.004$), a rural resident($p<0.001$) and EPTB patients($p<0.004$) were associated with a lower treatment success rate, which are serious public health concerns that need to be addressed urgently(33).

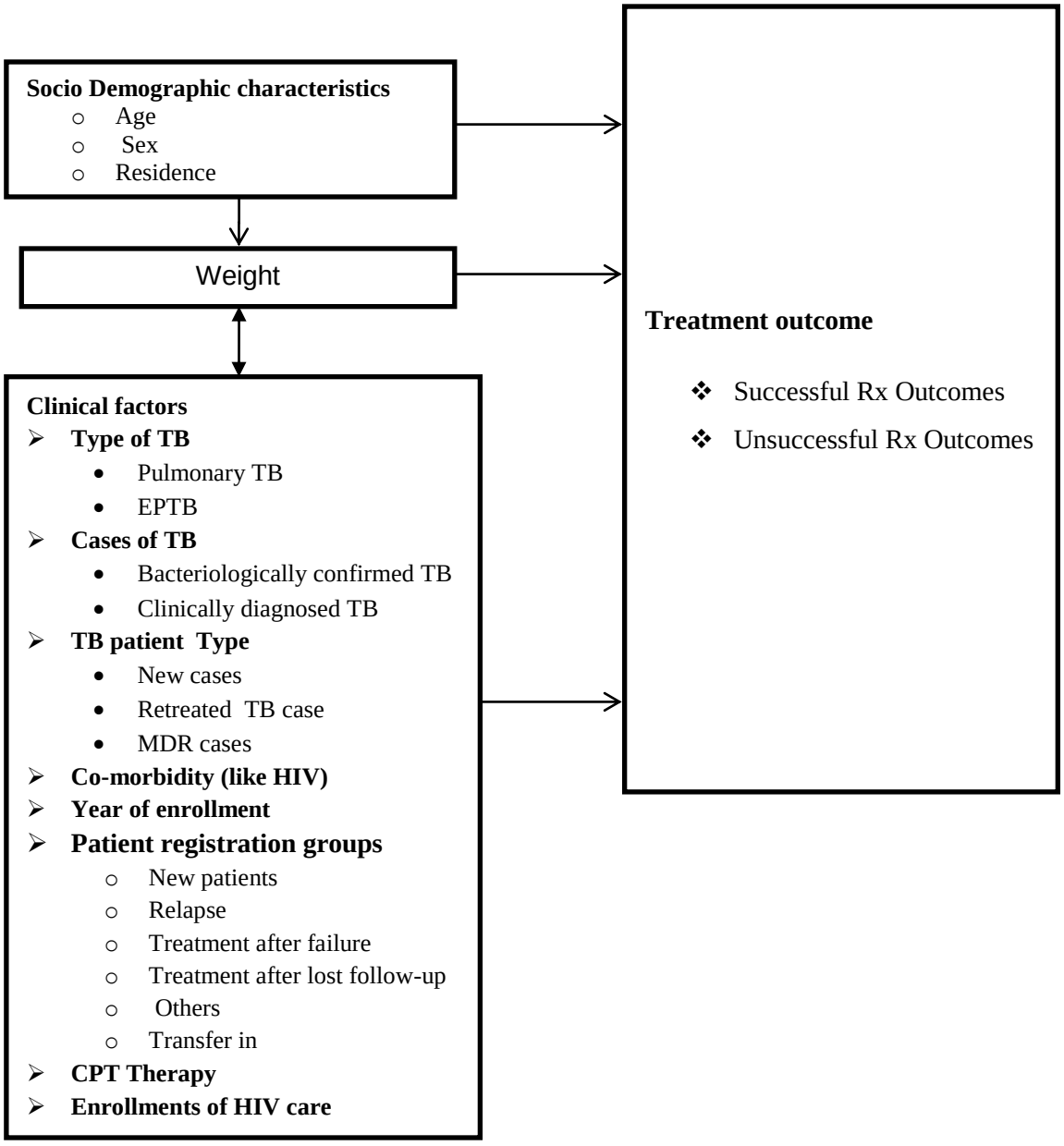


Diagram 1. Conceptual Frame Work: The Relationship between Tuberculosis treatment outcome and associated factors:

2. Justification of the study

WHO recommends TB Diseases surveillance system and treatment outcome should be monitored periodically and there is no reports on the DOTS experience in Burie zuria, Jabitehinan and Fenoteselam administrative town health facilities. This study is aimed at assess the treatment Success and associated risk factors for tuberculosis patients registered at Burie zuria, Jabitehinan and Fenoteselam town health facilities DOTS program. Determining the treatment success rate of the health institutions will help program planners and health professionals to show where they are relative to MDG tuberculosis target. if the TSR is under the target, it could lead them to identify potential areas of improvement for implementing End TB strategy. it could have its own role in preventing multidrug resistance (MDR-TB) and extensive drug resistance (EXDR-TB) tuberculosis. Generally, this study is important to Amhara regional health bureau, Fenoteselam administration health office, Jabitehinan health office, Burie zuria Health office and studied health facilities to know the treatment outcome of tuberculosis patient and associated factors to plan appropriate interventions. It will also be evidence to researchers who are interested on the topic.

3. Objectives

3.1. General Objective

- To assess the treatment outcome and associated risk factors of patients with tuberculosis at Burie zuria, Jabitehinan and Fenoteselam town health facilities.

3.2. Specific Objectives

- To describe the success rate of treatment outcomes of patients with tuberculosis registered for anti-tuberculosis treatment.
- To identify associated factors for successful treatment outcomes among patients who are on direct observatory therapy.

4. Methods

4.1. Study Location

Fenoteselam and Burie towns are located in the northwest Ethiopia 378 kilometers and 390 kilometers away from Addis Ababa, capital city of Ethiopia respectively. They have its Zuria Woreda which have been serving for rural populations. There are two Hospitals, 20 health centers which all delivers DOTS service for the people living in and around Fenoteselam and Burie. Patients were diagnosed, registered, treated and referred to other DOTS clinics following the National Tuberculosis and Leprosy Control Program (NTLCP) guideline(19).TB contact tracing and identification of high risk group, intensive follow up TB patients, mentoring MDR patients on household level and Nutritional and other economic support Programs are lunched targeting to enhance TB treatment outcomes in the study settings. The study was conducted at districts of Burie zuria, Jabitehinan and Fenoteselam town.

4.2. Study design and period

Facility based Cross-sectional survey was conducted among TB patients registered from 2012 to 2016 at DOTS clinic at districts of Burie zuria, Jabitehinan and Fenoteselam town.

4.3. Source Population

The source populations of the study were all tuberculosis patients registered for TB DOTS program (N=7124patients) in government owned health institution in districts of Burie zuria, Jabitehinan and Fenoteselam town from July, 2012 to June, 2016.

4.4. Study Population

The study population were selected patients with tuberculosis (n=832) who have had treatment outcomes in government owned health institution in districts of Burie zuria, Jabitehinan and Fenoteselam town health facilities between July, 2012 and June, 2016.

4.4. Inclusion criteria and exclusion criteria

All TB patients with complete data like age, sex, residence, treatment outcome were included. Missing of study variables were excluded.

4.5. Sample Size Determination

The sample size was calculated using single population proportion formula, for the dependent variable and to the identified factors which have significant association with dependent variable by considering 95% Confidence level, 5% margin of error. Tuberculosis treatment success rate of by taking estimated average 28%,treatment success rate ranges from 26%-94.8% [[17], [27], [29], [30], [31], and [32]in Amhara Region.

$n= z\ a/2*p\ (1-p)/W^2 = (1.96)^2 x\ 0.28(1-0.28)/0.05^2 =309.78=\underline{310}$

Where n- Sample size

p- Estimated average tuberculosis treatment success rate

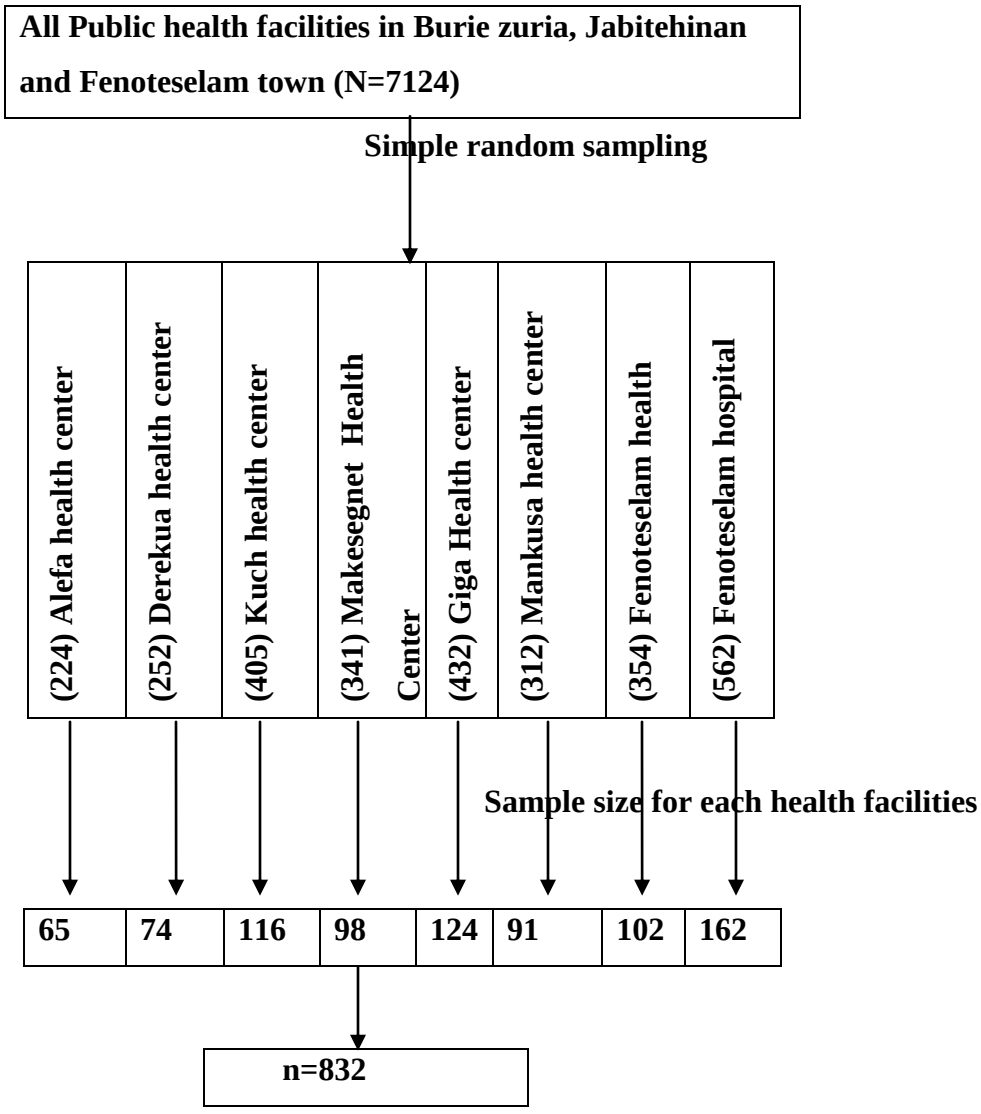
z- Standard normal value at 95% confidence interval=1.96

w- Margin of error (relative precision) Using Epidemiological information (Epi-info), sample size will be 832 **(16).**

Identified Factors	power	Ratio(unexposed :exposed	Confidence level	%outcome unexposed group	OR	%outcome exposed	Sample size
Co-morbidity	80%	2	95%	4.79	2.29	10.4	832
Type of TB	80%	2	95%	4.90	2.3	10.6	816
Retreatment	80%	2	95%	2.1	3.3	6.6	765

4.6. Sampling procedures

First we obtained the list of all public health facilities providing TB diagnosis and treatment Services in districts of Burie zuria, Jabitehinan and Fenoteselam town. There are twenty two health facilities which are serving TB/DOTS service in the study area. Eight health facilities were selected randomly and proportional allocation of the total sample size was carried out to attain the required sample size in each health facilities. The shared sample size for each health facilities divided by the total number of registered TB patients in a given health facility to determine a sampling interval and then study units were selected by systematic random sampling every K^{th} from registers of health facilities during the study period.



4.7. Data Collection Procedures and Quality Assurance

Data were extracted from registers of health facilities using a structured data sheet especially designed for this study. The contents of the checklist was included socio-demographic data (such as sex, age, and residence),Weight, HIV status, Type of TB, previous history of TB treatment , year of enrolment, and the treatment outcomes of the TB patients were collected from the DOTS registration book. Data extraction was conducted by Nurses and Health Officers who were not working in the Study area.

To ensure data quality the following measures were taken:

a) One day training was given for data collectors before the start of data collection.
b) The overall activities of data extraction were monitored by principal investigator and there were strict supervision during data collection.
c) All completed data sets were examined by the principal investigator for completeness during data collection.
d) From the data extracted from each health facility,5% of the sample was randomly selected and validated against the registration book by the principal investigator.

4.8. Variables

- **Dependent variables :**
  - Tuberculosis treatment outcomes (Codes was given as Successful treatment outcome (1), unsuccessful treatment outcome (0)).
- **Independent variables**
  - **Socio-demography**: Age, Gender, Weight, Residence
  - **Clinical factors**: type of TB (PTB, EPTB), Cases of TB (Bacteriologically confirmed TB, Clinically diagnosed TB), TB patient Type (New cases, Previously treated TB case), HIV Status, Year of enrollment, Center of TB screen, Patient registration groups (New patients, Relapse patients, Treatment after failure, Treatment after loss to follow up, Others, Transfer out).

4.9. Operational Definition

Pulmonary Tuberculosis: Any bacteriologically confirmed or clinically diagnosed cases of TB involving the lung parenchyma or the trachea-bronchial tree.

Extra pulmonary TB (EPTB): Any bacteriologically confirmed or clinically diagnosed cases of TB involving of organs other than the lungs such as lymph nodes, abdomen, genitourinary tract, skin, joints and bones and meninges.

Previously treated cases: Patients that have received 1 month or more of anti-TB drugs in the past.

New patients: patients that have never been treated for TB or have taken anti-TB drugs for less than 1 month.

Relapse patients: patients that have previously been treated for TB were declared cured or treatment completed at the end of their most recent course of treatment and is now diagnosed with a recurrent episode of TB.

Treatment after failure: patients are those who have previously been treated for TB and whose treatment failed at the end of their most recent course of treatment.

Treatment after loss to follow-up: patients have previously been treated for TB and were declared lost to follow-up at the end of their most recent course of treatment and are now diagnosed with TB.

Others: Patients who have previously been treated for TB but whose outcome after their most recent course of treatment is unknown or undocumented or patients that do not fit into any of the categories listed above.

Transfer out (T):A patient who started treatment in one treatment unit and is transferred to another treatment unit to continue treatment.

Successful Treatment outcome: if bacteriologically confirmed PTB were cured (i.e. negative smear result at the end of treatment and on at least one previous follow-up test) or clinically diagnosed PTB/EPTB were Completed their treatment with resolutions of symptoms.

Unsuccessful treatment outcome includes treatment of PTB/EPTB patients resulted in treatment failure ,defaulted , death and not evaluated.

- **Treatment failure:** this term used for pulmonary confirmed TB patients whose follow up smear results remain positive at or beyond fifth month into treatment.

- **Lost to follow up (LTFU):** This term used for TB patient on treatment for at least four weeks and who has discontinued TB treatment for eight or more consecutive week.
- **Died:** This term used for TB patient who is reported dead while receiving TB treatment, cause of death may not be related to TB.
- **Not evaluated**: This term used for patient whose final treatment outcome is not known at time of evaluation
- **Moved to MDR-TB is** termed as TB patient who are found to harbor drug resistant strain at least for Rifampicin, with documentation of lab result, before fifth month of TB treatment.

4.10. Data processing and analysis

All data were entered in to Epi Enfo 3.1 and analyzed using SPSS version 20. A descriptive analysis was used to determine differences within the data of Variables. All explanatory variables a p value $\leq$0.25 in bi-variate analysis were included in the multivariable logistic regression model to identify independent predictive Variables. Odds Ratio (OR), 95% confidence Interval (CI) were calculated. The results were considered statistically significant at P value <0.05 in the final model.

4.11. Ethical Clearance

Permission was obtained from the research and publication committee of Bahirdar University and Amhara regional Health Bureau and west Gojjam Zone health Office.

5. Results

5.1. Socio demographic and Clinical Characteristics of study Participants

A total of 832 patients' were included in the study whose age ranged from 1 to 80 years, mean and standard deviation of 29.33±14.26 years were included in the study with response rate of 100%. Among study participants, 53.6% were males and 46.4% were females. Children ≤14 years of age accounted 9.7% of the study participants. The majority of participants were in the age group of 15-24 and 25-34yrs old which accounts 31.6% and 25.2% respectively . Majority of patients were urban residents 61.9%**.**

Table1. Characteristics of TB patients (n=832) with type of TB DOTS Clinics of at Burie zuria, Jabitehinan and Fenoteselam town health facilities, 2012 to 2016.

Characteristics of Variable	PTB n (%)	EPTB n (%)	Total n (%)
Sex			
Male	260 (30.8)	190 (22.71)	450(53.6)
Female	205 (25)	177 (21.3)	382(46.4)
Residence			
Urban	269 (32.3)	246 (29.5)	515 (61.9)
Rural	196 (23.5)	121 (32.1)	317 (38.1)
Age			
≤14	27 (3.2)	54(6.4)	81(9.7)
15-24	140(16.8)	140(16.8)	263(31.6)
25-34	129(15.5)	81(9.7)	210(25.2)
35-49	112(13.4)	56(6.7)	168(20.2)
>50	57 (6.8)	36(4.3)	93(11.1)
HIV Test			
positive	94(11.3)	42(5.0)	136(16.3)
Negative	357(42.9)	315(37.9)	672(80.7)
Unknown	14(1.7)	10(1.2)	24(2.9)
Total n (%)	**465 (56)**	**367 (44)**	**832 (100)**

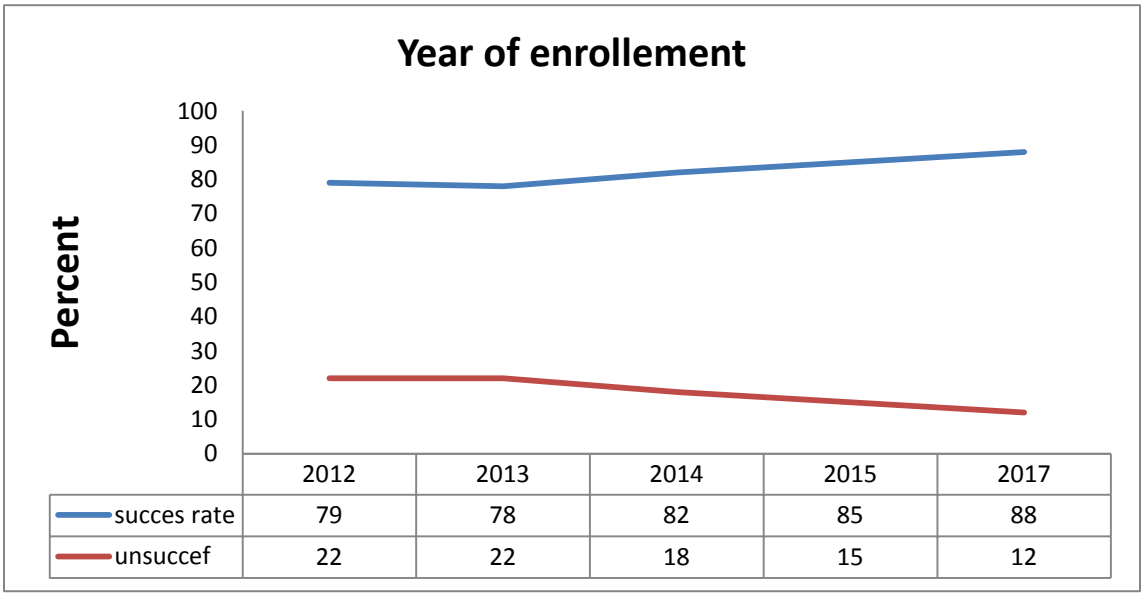
PTB: pulmonary tuberculosis, EPTB: Extraplumonary tuberculosis

Most tuberculosis patients 95.6% were new cases. During the study period, TB patients' defaulter, death and failure rate were 2.6%, 3.1% and 1.2% respectively. Of 832 TB patients registered for anti-tuberculosis treatment 97.1% were tested for HIV. The TB-HIV co-infection was 16.8%. The PTB and EPTB type of TB among TB-HIV co-infected patients was 69.2 % and 30.8% respectively. The death rate of PTB and EPTB were 61.5% and 38.46% respectively.

5.2. Treatment outcome by year

The overall treatment Success rate was 82.5% across a period of five years. Among all known treatment outcome 13.1% were cured, 69.4% completed, 1.2% treatment failure,2.6% defaulters, 3.1% deaths while 1.2% were moved to MDR whereas the rest was transfer out 9.5%.

In this study, a high proportion of defaulter 0.57% and moved to MDR 0.78% was recorded for males. In this study, MDR TB was increased over a period of the study years. During the study years, the successful treatment outcome under DOTS program of TB patients vary from years to years thus in 2012(98%),2013(78.3%),2014(82.5%),2015(85.3%)and 2016(88%).



	2012	2013	2014	2015	2017
succes rate	79	78	82	85	88
unsuccef	22	22	18	15	12

graph 1: Treatment Success rate across Years, Northwest Ethiopia, 2012 - 2016.

Table 3. Treatment outcome of TB patients (n=832) by sex, age group, residence and tuberculosis type at Burie zuria, Jabitehinan and Fenoteselam town health facilities, Northwest Ethiopia, 2012 to 2016.

Characteristics	Treatment outcome							
	Cured N (%)	Rx completed N (%)	Defaulter N (%)	Died N (%)	RX Failure N (%)	Transfer out N (%)	Moved to MDR N (%)	Total N (%)
Age								
0-4	*	71(8.5)	4(0.5)	3(0.4)	1(0.1)	2(0.2)	*	81(9.7)
15-24	28(3.4)	205(24.6)	5(0.6)	7(0.8)	5(0.6)	29(3.5)	1(0.1)	280(33.6)
25-34	51(6.1)	133(15.9)	5(0.6)	4(0.5)	1(0.1)	12(1.5)	4(0.5)	210(25.2)
35-49	20(2.4)	110(13.3)	5(0.6)	8(0.9)	2(0.2)	20(2.4)	3(0.4)	168(20.2)
≥50	10(1.2)	58(6.9)	3(0.4)	4(0.5)	1(0.1)	16(1.9)	2(0.2)	93(11.8)
Sex								
Male	55(6.5)	306(36.5)	12(1.5)	16(1.8)	5(0.6)	48(5.8)	8(0.9)	450(53.6)
Female	54(6.6)	271(32.8)	9(1.1)	10(1.3)	5(0.6)	31(3.7)	2(0.2)	382(46.4)
Residence								
Urban	87(10.4)	354(42.5)	4(0.5)	12(1.5)	3(0.4)	54(6.5)	1(0.1)	515(61.9)
Rural	22(2.6)	223(26.8)	17(2.1)	14(1.7)	7(0.8)	25(3.0)	9(1.1)	317(38.1)
TB Type								
PTB	100(12.0)	306(36.8)	5(0.7)	14(1.7)	4(0.5)	30(3.6)	6(0.7)	465(55.9)
EPTB	9(1.1)	271(32.6)	16(1.9)	12(1.5)	6(0.7)	49(5.9)	4(0.5)	367(44.1)

RX: Treatment, PTB: Pulmonary Tuberculosis, EPTB: Extraplumonary Tuberculosis,*: Not Applicable, MDR: Multi-Drug Resistance

5.3. Factors associated with tuberculosis treatment outcome

In multivariable logistic regression model, the odds of HIV negative TB patients were about four times more likely to have successful treatment outcome than the odds of TB patients with unknown HIV sero-status (AOR=4.4(1.83,10.79)). The odds of study subjects whose age group is ≤14years(AOR=3.6(1.56,8.57)), 15-24 years (AOR=1.9(1.09,3.54)) and 25-34years of age (AOR=2.6(1.40,5.15)) were about two, four and three times more likely to have successful treatment outcome compared with those age group ≥50 years of age respectively. Urban dwellers were two times more likely to have successful treatment outcome compared to their rural counterparts (AOR=2.2(1.50,3.33)). Pulmonary tuberculosis patients were also three times more likely to have successful treatment outcome(AOR=2.9(2.00,4.46)) compared to when compared to EPTB patients.

Table 4: Association between Different Factors and Treatment Outcome among Tuberculosis Patients (N=832), North West Ethiopia, 2012-2016.

Variables	Successful Treatment=686	Unsuccessful Treatment=146	Total (N=832)	COR(95% CI)	AOR(95% CI)
Sex					
Male	361	89	450	0.7(0.49,1.02)	0.72(0.46,1.06)
Female	325	57	382	1	1
Residence					
Urban	441	74	515	**1.7(1.22,2.51)**	**2.2(1.50,3.33)***
Rural	245	72	317	**1**	1
Age in (years)					
<=14	71	10	81	**2.6(1.14,5.84)**	**3.6(1.56,8.57)***
15-24	233	47	280	**1.8(1.04,3.17)**	**1.9(1.09,3.54)***
25-34	184	26	210	**2.8(1.40,4.81)**	**2.6(1.40,5.15)***
35-49	130	38	168	1.2(0.71,2.25)	1.3(0.74,2.57)
>=50	68	23	93	1	1
TB type					
PTB	406	59	465	**2.1(1.48,3.07)**	**2.9(2.00,4.46)***
EPTB	280	87	367	**1**	1
HIV Status					
Positive	106	30	136	**2.5(1.01,6.25)**	1.9(0.74,5.13)
Negative	566	106	672	**3.8(1.65,8.81)**	**4.4(1.83,10.79)***
Unknown status	10	14	24	**1**	1

***Significant at P value <0.05**

6. Discussion

In this study, we evaluated the treatment outcomes of 832 TB patients who registered at Burie zuria, Jabitehinan and Fenoteselam Administrative town health facilities DOTS clinic over a period of 5 years. Statistically gender had no significant difference on treatment outcome. similarly, the study conducted in Addis Ababa, Ethiopia showed that no significance difference between male and female [2].Whereas higher rate of males were defaulted than females and this was consistent with a study conducted in southern Ethiopia. The higher social interaction outside home and social isolation lead to TB treatment rejection, alcoholism and other related behaviors among males might contribute to their higher defaulter. A study conducted in Nigeria reported that patient behavior and attitude about the diseases are the major factors affecting adherence to TB treatment (4).

Our study showed that 13.1% and 69.4% of TB patients attending DOTS were cured and completed the treatment. These account an overall treatment success rate of 82.5% which was similar with treatment success rates reported as 82.7% Addis Ababa, Ethiopia(2) but it was higher than the rates reported as to 26% at Felegehiwot referral hospital (33), 61.7% paithian India (12) and 73% in Euro Surveillance France (24).

There was yearly variation of treatment success rate from 2012 to 2016. The treatment success rate in the year 2016 was 88% which is in line with WHO international target of 87%(22).This could be taken as an indicator that TB treatment outcome has improvement(18).

The treatment success rate obtained from this study was slightly lower than those reported from Debretabor Hospital (87.1%) (30). However, we noted that defaulter, death rate, failure rate, moved to MDR, and transfer out of (2.6%),(3.1%),(1.2%),(1.2%) and (9.5%) respectively. These constituted an overall unsuccessful TB treatment outcome rate of (17.6%) which was higher than unsuccessful treatment outcome reported from Enfranz Northwest Ethiopia (8.1%).This finding was almost similar to reports by some studies in the country(30, 33). default rate was higher than study conducted in Addis Ababa(0.6%) (28).There were 1.2% treatment failures comparable with study conducted at Gondar Teaching Hospital(1.2%), Debreberhan Hospital(1.13%) and Debretabor Hospital(0.96%)(29,30).

This study also found a death rate of 3.1% which was Comparable finding reported from the study conducted in Addis Ababa(27), Metema hospital northwest Ethiopia(17). This is lower than study conducted in Fenoteselam district hospital 8.5% (31). This may be due to difference in sample size and time difference .

The odds of patients age group ≤ 14 years(AOR=3.6(1.56,8.57)), 15-24 years(AOR= 3.9, 95% CI (2.13, 7.63)) and 25-34years of age(AOR=1.9(1.09,3.54)) were four, four and two times more likely to have successful treatment outcome compared with the odds of age group >50 years of age respectively which is supported by study conducted at Gondar University Hospital[9], and Felegehiwot Referral Hospital (12).

In this study, the odds of patients from urban dwellers were about two times more likely to have successful treatment outcome compared to the odds of rural counterparts (AOR=2.2(1.50,3.33))which is in line with study conducted in Felegehiwot referral Hospital 2013(12).

In this finding, the odds of Patients with Pulmonary tuberculosis patients were about three times more likely to have successful treatment outcome(AOR=2.9(2.00,4.46)) compared to the odds of EPTB patients. It is in line with studies conducted in Felegehiwot referral hospital, 2016[32],west Gojjam zone (31).

HIV infection increases the chance of tuberculosis reactivation and infection(13). In the present study, the prevalence of HIV among TB patients was 16.8%.This was higher rate reports from different parts of Ethiopia such as Enfranz 11.7%(17), and studies conducted in south region. However, the present study TB-HIV co infection was lower than previous reports from different health centers at Addis Ababa, Metema Hospital, and Felegehiwot Referral Hospital 27.2%, 20.1% and 25% (28)(31, 32) respectively. TB-HIV co infection in present study(16.8%) was also lower than in the WHO estimate (39%) in Africa(1) .

Twenty six (3.1%) study participants died during their course of their treatment. This report was consistent with reports from Enfranz Health Center(3.6%)(17) and different health centers in Addis Ababa 2011(3.7%)(28) and Nigeria(3.9%) (4).

The death rate among TB-HIV co-infection was 57.6%, the failure rate was 28.5%, and defaulted rate was 0.23%, indicating that extraordinary care to HIV-positive TB cases is required in the study region. This study presented that the treatment success rate for HIV negative tuberculosis patients 68.9% was higher than for HIV positive patients 11.6%.

7. Limitation of the Study

The finding of this study should see insight of the fact that the study incorporated data of patients with complete information of their treatment outcome at selected health facilities. Important socio-demographic Variables, which could affect TB treatment outcome including, co morbidity with other chronic illness, distance from the treatment center , educational status of the patients, nutritional history of patients were not obtained thus they were not included in the analysis. Hence these limitation need to be considered during while interpreting the finding.

8. Conclusion

In this study, the overall treatment success rate was still below WHO Target of Success rate, 87% and the trend of treatment success rate showed varying across the study periods. Patients who are HIV negative, whose age<14 years, whose age 15-24 years, 25-34years,urban residents and those having Pulmonary tuberculosis TB patients were identified associated factors for successful tuberculosis treatment outcome.

9. Recommendations

- Amhara regional Health bureau

  In order to improve tuberculosis treatment outcome, Amhara regional Health bureau should develop Strategies to monitor the associated factors for unsuccessful tuberculosis treatment outcome.

- West Gojjam Zonal Health department

  It also develops monitoring Strategies to monitor the associated factors for unsuccessful tuberculosis treatment outcome and it should be incorporated in tuberculosis prevention and control program.

- Districts Burie zuria, Jabitehinan and Fenoteselam town Administration

  Districts should be monitor promptly HIV positive TB patients, whose age ≥50 years TB patients, retreatment tuberculosis cases, rural residents and extra-pulmonary TB cases for achieving national target of treatment Success.

- Health professionals

  Health professionals should identify those factors for unsuccessful treatment outcome early and they follow them consciously.

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