Treatment outcome of tuberculosis patients at Adare general Hospital, Hawassa, Southern Ethiopia. (A five year retrospective study)

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Research article

Abstract

Background Globally still Tuberculosis remains a major public health problems and socio-economic issue in the 21st century. Ethiopia is among the countries most heavily affected by Tuberculosis, where it is the leading cause of morbidity, the third cause of hospital admission and the second cause of death. To improve Tuberculosis management and control, early detection of cases, effective treatment and persistent evaluation of treatment outcome are vital issues that should be taken into consideration. Hence, this study was designed to determine treatment outcomes and associated risk factors among TB patients registered and receiving anti-TB treatment at Adare general Hospital, Southern Ethiopia. Methods A five years retrospective study was conducted by reviewing medical records of TB patients at Adare general Hospital. A total of 1151 Tuberculosis patients' cards registered from (September 2013 to August 2017) for treatment at TB clinic were reviewed. Data was coded, cleaned and entered into Microsoft Excel sheet then ported and analyzed using SPSS version 20 statistical soft ware. Logistic regression with odds ratios (OR) along with the 95% confidence interval was computed and interpreted. A P value <0.05 was declared as statistically significant. Result Among 1122 cases 620 (55.3%) were male, 748(66.7%) were from urban areas, 319 (28.4%) were smear positive, 352 (31.4%) were smear negative and 451 (40.2%) were extra pulmonary patients. Of the 1122 284 (25.3%) were cured, 753(67.1%) completed treatment, 29(2.6%) defaulted, 53(4.7%) died and 3 (0.3%) had treatment failure. The mean treatment success rate was 92.4%. The risk of unsuccessful TB treatment outcome was significantly higher among TB patients from rural areas (AOR = 0.43, 95% CI: 0.27, 0.67); patients with extra pulmonary TB (AOR = 0.87, 95% CI; 0.67, 1.14), and HIV positive TB patients (AOR = 5.47, 95% CI; 3.47, 8.63) were more likely to have poor treatment outcomes as compared to their counter parts. Conclusion The treatment success rates of Tuberculosis, at Adare hospital was comparable to national health facility level coverage, but it should be maintained and strengthen further to attain tuberculosis related national and millennium goal.

Background

Tuberculosis is a communicable disease that caused by *Mycobacterium Tuberculosis*, which mainly affect the lung and causespulmonary tuberculosis or other organsand causesextra pulmonary tuberculosis[1]. It is a major public health problem in the world being among the ten top leading diseases that cause death [2]. As to WHO report, 2017, about 10 million people were infected and 1.6 million died due to TB [3]. About 56%cases were from South-East Asia and Western Pacific Regions and 29% cases were from Africa where the highest rate of death occur [4].

Among 30 high TB burden countries in the world, Ethiopia ranks seventh and theestimated TB prevalence rate in the country was 27/1000000 population with an estimated incidence rate of 224 per 100,000 population [3]. Annually there are an estimated 5000 or more MDR-TB cases, hence as to the report of WHO among 27 high MDR-TB burned countries, Ethiopia was placed at rank of fifteenth [5]. The health Minister of the country indicated that disease was the leading cause of morbidity, the third leading cause of hospital admission, and the second cause of death [6]. The globally accepted TB intervention strategy was Directly Observed Treatment Short Course (DOTS). Since, 1992 DOTS strategy was started as a pilot in Ethiopia and then scaled up and implemented at national level [6]. Then after all public, private and non-governmental health facilities

provide the service [7]. As various studies conducted in different health institutions in the country indicated the treatment outcome showed increment after the delivery of DOTS services[8-12], though other studies indicated presence of various challenges [13, 14]. Adare General Hospital implemented DOTS strategy starting national scale up period, however the institutional status of treatment outcome and associated challenges were not studied so far. Therefore, this retrospective study was aimed to assess the treatment outcome of TB patients and identify factors associated with unsuccessful outcome in Adare general Hospital, southern Ethiopia.

Methods

Description of the study area

Hawassa, the capital city of South Nations Nationalities and People Region State (SNNPRS) is located about 275km South of Addis Abeba. Geographically it lies at 705' latitude N and 38029' Longitude E at an altitude of 1708 masl (meter above sea level). The mean annual rainfall and temperature of the area varies from 800-1000mm and 20.10c-250c respectively (Fig. 1). Based on 2007 national population and housing census Hawassa town has 329, 734 inhabitants, of whom, 169, 677 were males and 160, 057 were females. Adare general Hospital is located at the center of the city and has 70 functional beds. The hospital has one DOTS clinic that performing as per National TB and Leprosy Control Program (NTLCP) guideline of Ethiopia. The clinic provides basic treatment and diagnostic service for all forms of TB through clinical examination, Ziehl–Nielsen staining method or sputum smears examination and chest radiographs. Patients diagnosed with TB were registered and treated according to the national TLCP guideline [6].

Study Design, Period, and Data Collection

Institutional based retrospective study was conducted from April to May2018 by reviewing registration book of tuberculosis patients registered and treated from 2013-2017 at DOTS clinic of Adare Hospital. Registered data with complete information were collected retrospectively by trained health professionals using a structured checklist and used as a source of data for the investigation. The basic required information such as patient's sex, age,the address of patients, date of treatment started, date of treatment completed, HIV serostatus, type of TB cases, and treatment outcome.

Data processing and analysis

Data were entered into Microsoft Excel sheet cleaned and then ported and analyzed using SPSS version 20 statistical soft ware. Frequency and percentage of data was determined using descriptive statistics. To check the significant association Bivariate and multivariate analysis were done to analyze whether there is association between the TB treatment outcomes and independent variables. Crude and adjusted odd ratio were computedandused to see the strength of association. P < 0.05 was considered as statistically significant.

Operational Definition

The following clinicalcase and treatment outcome operational terms were used in this article based on standard definitions NLCP adopted from WHO[6]

Smear-positive pulmonary TB (PTB+): A patient with at least two sputum specimenswhich were positive for acid fast bacilli (AFB) by microscopy, or a patient with only one sputumspecimen which was positive for AFB by microscopy, and chest radiographic abnormalitiesconsistent with active PTB.

Smear-negative pulmonary TB (PTB-): A patient with symptoms suggestive of TB, withat least two sputum specimens which were negative for AFB by microscopy, and with chestradiographic abnormalities consistent with active PTB, or a patient with two sets of at least twosputum specimens taken at least two weeks apart, and which were negative for AFB by microscopy,and radiographic abnormalities consistent with PTB and lack of clinical response to oneweek of broad spectrum antibiotic therapy.

Extra pulmonary TB (EPTB): This included TB of organs other than the lungs, such aslymph nodes, abdomen, genitourinary tract, skin, joints and bones, the meninges and others.Diagnosis of EPTB was based on fine needle aspiration cytology or biochemical analyses ofcerebrospinal/pleural/ascitic fluid or histopathological examination or strong clinical evidenceconsistent with active EPTB, followed by a decision of a clinician to treat with a full course ofanti-TB chemotherapy. In all the cases of EPTB, sputum examinations and chest radiographswere used to rule out involvement of the lung parenchyma. This hospital lacks the facilities forculture and drug susceptibility testing.

Categories of treatment outcomes

Successful outcome: If TB patients were cured (negative smear microscopy at the end oftreatment and on at least one previous follow-up test) or completed treatment with resolutionof symptoms.

Unsuccessful outcome: If treatment resulted in treatment failure (remaining smear-positiveafter 5 months of treatment), defaulted (patients who interrupted their treatment for twoconsecutive months or more after registration), or died.

Result

Socio-demographic and clinical characteristics of the patients

A total of 1151 tuberculosis patients were registered in the TB registrar unit of the hospital, of which 1122 (97.5 %) tuberculosis cases had complete records on the treatment outcome. Among the total registered TB patients with complete record (n=1122), 620 (55.3%) were males and66.7% (n=748) of the patients were urban residents. Majority of the cases were in the age group of 15-34 690 (61.5%), children less than 14 accounts for 9%. Smear positive (PTB+), smear negative (PTB-) and extra pulmonary TB (EPTB) cases were 319 (28.4%), 352(31.4%) and 451(40.2%) respectively. Most of the TB patients were new 1064 (94.8%), while relapse, transfer in and treatment after failure accounts for 48(4.3%), 8(0.7%) and 2(0.2%) respectively. All of the registered cases for anti-TB treatment were tested for HIV voluntarily and 238(21.2%) of the study participants were HIV positive (Table 1).

Treatment outcome of the participants

The treatment outcome of most study participants was successful 753 (67.1%) completed their anti-TB treatment and 284 (25.3%) cured. Treatment failure, died and defaulter were 3 (0.3%), 53 (4.7%), and 29 (2.6%), respectively. We excluded 29 TB patients (transferred out cases) from the treatment success rate analysis, since the status of the patients is not known. Majority of treatment failure and defaulter were observed in the age of 45-54 and 55-64 respectively, and the high rates of deaths (15%) were registered among HIV/TB co-infected patients (Table 2).

Treatment outcome of TB and its trend

We analyzed treatment outcome of 1122 tuberculosis patients who were registered at the hospital during the study period, January 2013 to December 2017. The death rate, defaulters and fallers rate of tuberculosis patients showed increment from 2013 to 2017, though death rate seems stagnant in 2013 and 2014. In general the unsuccessful (poor treatment outcome) rate increased from 2014 to 2017 (3 to 12.8%). The cure rateof the TB patients increased year to year from 2013 to 2017, though it decreased in 2015. Treatment complete rate of the patients decreased from 2013 to 2017. The success rate of the TB patients decreased from 2013 to 2017, though the overall five-year treatment success rate of the TB patients was 1037 (92.4%) (Table3).

Treatmentsuccess rate and its associated factors

The treatment success rate was (51%) in males and (41.4%) in females. Majorities (63%) of the patients with successful (favorable) outcome were urban residentsand (29.4%) were rural residents. The treatment success rates were 37.3%, 29.2% and 25.9% among EPTB, PTB- and PTB+ patients, respectively. The success rate among new and relapse cases was (88.6%) and (3.8%) respectively. In addition, high treatment success rate were observed among TB patients of age 0-14 and 45-54 years.

Logistic regression analysis was performed to identify independent predictors of treatment outcome among TB patients (Table 4). Six explanatory variables that were associated with treatment outcome in bivariate analyses at 0.2 level of significance were entered into multiple logistic regression model, in the last step of analysis, three variables residence, HIV status and type of TB of the patients showed significant association with treatment outcomeat $P < 0.05$. Accordingly as the adjusted odds ratio result indicated the risk of unsuccessful TB treatment outcome was significantly higher among TB patients from rural areas (AOR = 0.43, 95% CI: 0.27, 0.67) compared to their counterparts. Those patients with extra pulmonary TB (EPTB) were more likely to have poor treatment outcomes as compared to patients with smear positive (PTB+) and smear negative (PTB-) (AOR = 0.87, 95% CI; 0.67, 1.14).In addition, HIV positive TB patients were also more likely to develop risk of poor treatment outcomes as compared to their counterparts (AOR = 5.48, 95% CI; 3.47, 8.63).

Discussion

In this study Males account for more than half of the study participants, correspondingly studies conducted in different health institutions in the county also indicated that more males were involved [15, 16]. However

finding from studies conducted in Gambella [17] and Raya Kobo [18] were in contrast.Most (83.4%)of the study participants were 15–54 years old, WHO also reported that the productive age was more affected by Tuberculosis and associated morbidity and mortality [19]. The situation might have negative impact on the economic and social development of the community and the nation at large. In present study majority 671 (59.8%) were pulmonary TB patients, and 451 (40.2%) were extra pulmonary TB patients and as to the TB profile data high proportions of TB patients were EPTB and smear negative PTB, which is comparable to other TB profile data in the country [15, 20-23].

The treatment success rate was 92.4%, which islower than the success rate (94.8%) report from northwest Ethiopia[22]. However, it was higher than the report from Tigray, Northern Ethiopia, (89.2%) [21], Gambella, Western Ethiopia (86.1%) [17], Dilla, Southern Ethiopia (85.3%) [15],NekemteWestern Ethiopia (70.8%) [24] and Hossana,South Ethiopia (43.3%) [25]. The unsuccessful TB treatment outcome rate was 7.6%, the finding is lower than unsuccessful treatment outcome reported fromDilla14.7% [15], Gambella 13.9% [17] and Tigray10.8% [21]. This could be associated with differences in socio-demographic characteristics of the patient, appropriateness of the institutional setup, follow-up and counseling of patients in DOTS clinics, and knowledge and attitude towards and side-effect due to DOTS [26].

The death rate (4.7%) was lower than that reported from Ethiopia(5%) [18], Nigeria (6.5%) [27] and Zimbabwe (8.7%) [28]. However, the finding was higher than the death rate reported fromEthiopia(3% and 3.4%) [25, 15], Turkey (2.4%) [29] and Brazil (2.8%) [30]. The default rate in this study was (2.6%), which might be due to a better supervision and health education activities. The finding was lower than the studies conducted in Ethiopia (3.2%, 8% and 11.1%) [21, 32, 15], Uzbekistan (6%) [31], Turkey (3.9%) [29] andNigeria (9.8%) [27].

Treatment failure rate 0.3% was in consistent with the rate of reported from other study in Ethiopia (0.3%) [15], and higher than treatment failure rate in Malaysia (0.2%) [33]. Nonethelessthe rate observed in this study was lower than that of the finding from Ethiopia (0.5, 2.2%, and 3.7%) [25, 18, 21], Uzbekistan (3%) [31], Turkey (1.1%) [29], Brazil (2.1%) [30] and Nigeria (1.5%) [27].The overall TB-HIV co infection rate was 21.2%, which was lower than studies conducted inGonder,North west Ethiopia (52.1%) [10] and Gambella region (26.12%) [17]. However, it was higher than (12.7%) Debre Tabor, Northwest Ethiopia [34], (16.5%) Hossana, Southern Ethiopia [25], (11.7%) Gojam,Northwest Ethiopia [22] and (17.1%) Nekemte, Western Ethiopia [24].

There present study indicated the presence of association between treatment outcome and HIV status, hence as compared to HIV negative TB patients,HIV positive TB patients were more likely to develop risk of poor treatment outcomes (AOR = 5.47, 95% CI; 3.47, 8.63). This finding was in line with investigations conducted in Ethiopia [21, 35], Somalia [36] South Africa [37], Finland [38] and Brazil [30]. The risk of poor treatment outcomes in TB/HIV co-infected patients could be due to the fact that HIV infection decline CD4 cells count progressively by about 50-80 cells/mm3 per year and hence the immune status the individual might not be efficient enough to prevent the dissemination of *Mycobacterium tuberculosis* in the body [39]. Also it might be associated to co-administration of ART along with anti-TB therapy, which can lead to drug-drug interactions, overlapping drug toxicities and immune reconstruction syndrome [40].

Residence and treatment outcomes were also highly associated, patients from rural settlement were more likely exposed to poor treatment outcomes as compared to those in urban (AOR = 0.43, 95% CI: 0.27, 0.67).

The result was in consistent with studies conducted in Southern Ethiopia [15, 41] and Central Ethiopia [42], but in contrary to study conducted in, Southern Ethiopia [43]. As suggested by [41] the lower treatment success in rural residents could be associated with lower awareness of TB treatment and the long distance between their homes and the treatment centers. There was also a significant association between treatment out come and TB type, patients who presented extra pulmonary TB (EPTB) were more likely to risk of poor treatment outcomes as compared to the patients with smear positive (PTB+) and smear negative (PTB-) (AOR = 0.87, 95% CI; 0.67, 1.14). The finding was in line with the study conducted in Hossana, South Ethiopia [25], but in contrary with the finding of study conducted in North West Ethiopia [22].

Conclusion

As the five years retrospective study indicated the DOTS strategy improved TB treatment success in Adare hospital. Treatment outcome rate of registered patients in the study area was high and hasmet the target success rateset by WHO. Residence, HIV status and TB category are main predictors for unsuccessful treatment outcome. Hence, awareness creation through health education for rural patients and regular follow of patients with unsuccessfuloutcome on the wayof treatment is essential.

LIMITATIONS

A limitation of this study could be that since the data collected is retrospective secondary data and the data source (which was the standard TB register) did not capture detailed information, hence in some cases there was missing and/or inaccurate data. Moreover, the data was collected from one site, Adare Hospital which might not be representative to give general conclusion since patients from other facilities have different profile.

Abbreviations

AOR Adjusted odds ratio

DOTs Direct observed treatment strategies

EPTB Extra pulmonary TB

FMOH Federal ministry of health

MTBMycobacterium tuberculosis

NTLCPNational tuberculosis and leprosy control program

SNNPR Southern nations nationalities and peoples region

SPSS Statistical package for social science

PTB Pulmonary tuberculosis

TB Tuberculosis

WHOWorld Health Organization

Declarations

Ethics

Institutional ethical clearance was obtained from the ethical Review Committee of Hawassa University. The supportive letter was obtained from Hawassa University and approved by Adare Hospital Medical director office to utilize the retrospective data. Permission to adopt a map of Hawassa city was obtained from Hawassa City dministration.

Authors' contributions

BT and ZB conceive the idea and developed proposal. BT collected the data, entered the data and conducted data analysis. ZB and SA analyze the data further, interpreted the results and reviewed the initial and final drafts of the paper; finally SA critically reviewed and wrote the manuscript and submited for publishing. All authors read and approved the final manuscript ahead of submitting for publication.

Competing interests

The authors declare that they have no conflict of interests.

Consent for publication

Not applicable

Availability of data and materials

All data generated and analysed during the present study are included in this manuscript. However, the overall dataset of this study is not openly accessible because some sensitive information that is forbidden for sharing. However, the data are available from the corresponding author upon reasonable request and with permission from the Adare General Hospital.

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Tables

Due to technical limitations, Table(s) 1 and 4 are only available as a download in the supplemental files section.

Table 2: Tuberculosis treatment outcomes by demographic and profile of TB patients in Adare Hospital, South Ethiopia, from 2013-2017.

Variables		Successful		Unsuccessful			Total N (%)
		Cured N (%)	Completed N (%)	Died N (%)	Defaulter N (%)	Failure N (%)	
Sex	Male	172 (27.7)	401(64.7)	28(4.5)	18 (2.9)	1 (0.2)	620(55.3)
	Female	112 (22.3)	352 (70.1)	25(5)	11 (2.2)	2 (0.4)	502(44.7)
Residence	Urban	183(24.5)	524(70.1)	27(3.6)	13(1.7)	1(0.1)	748(66.7)
	Rural	101(27)	229(61.2)	26(7)	16(4.3)	2(0.5)	374(33.3)
Age	0-14	9 (8.9)	88 (87.1)	1(1)	2(2)	1(1)	101(9)
	15-24	111 (30.7)	231 (63.8)	9 (2.4)	10(2.8)	1(0.3)	362(32.3)
	25-34	98 (29.9)	211 (64.3)	14(4.3)	5(1.5)	0(0.0)	328(29.2)
	35-44	32 (18.6)	12 (70.3)	12(7)	7(4.1)	0(0.0)	172(15.3)
	45-54	19 (25.6)	45 (60.8)	8(10.8)	1(1.4)	1(1.4)	74(6.6)
	55-64	8 (16)	31 (62)	7(14)	4(8)	0(0.0)	50(4.5)
	≥ 65	7 (20)	26 (74.3)	2(5.7)	0(0.0)	0(0.0)	35(3.1)
Microscopy profile of TB	PTB+	278 (87.1)	12 (3.8)	15(4.7)	13(4.1)	1(0.3)	319(28.4)
	PTB-	4 (1.1)	324 (92.1)	20(5.7)	4(1.1)	0(0.0)	352(31.4)
	EPTB	2 (0.4)	417 (92.5)	18(4)	12(2.7)	2(0.4)	451(40.2)
HIV status	Unknown	0(0.0)	6(1)	0(0.0)	0(0.0)	0(0.0)	6(0.5)
	Positive	40 (16.8)	151 (63.4)	35(15)	11(4.6)	1(0.4)	238(21.2)
	Negative	244 (27.8)	596 (68)	18(2)	18(2)	2(0.2)	878(78.3)
Over all Total		284 (25.3)	753 (67.1)	53 (4.7)	29 (2.6)	3 (0.3)	1122 (100)

Table 3. Trend of treatment outcome of all form of registered TB cases (n=1122) in Adare Hospital, South Ethiopia, from 2013 to 2017.

Treatment outcome	Year					Total (%)
	2013	2014	2015	2016	2017	
Cured (%)	50 (20.8%)	97(26.8%)	67 (23.6%)	57 (30%)	13(33.3%)	284(25.3)
Treatment completed (%)	183(76.3%)	242(66.9%)	197(67.7%)	110(57.8%)	21(53.8%)	753(67.1)
Successful Total (%)	233 (97%)	339(93.6%)	264(90.7%)	167(87.9%)	34(87.2%)	1037(92.4)
Died (%)	6 (2.5%)	9 (2.5%)	19 (6.5%)	15 (7.9%)	4 (10.3%)	53(4.7)
Defaulter (%)	1 (0.4%)	13 (3.6%)	6 (2.1%)	8 (4.2%)	1 (2.6%)	29(2.6)
Treatment Failure (%)	0 (0.0)	1(0.3%)	2 (0.7%)	0 (0.0)	0 (0.0)	3(0.3)
Unsuccessful Total (%)	7 (2.9%)	23 (6.4%)	27 (9.3%)	23 (12.1%)	5(12.8%)	85(7.6)
Over all Total (%)	240(21.4)	362(32.3)	291(25.9)	190(16.9)	39(3.5)	1122(100)

Figures
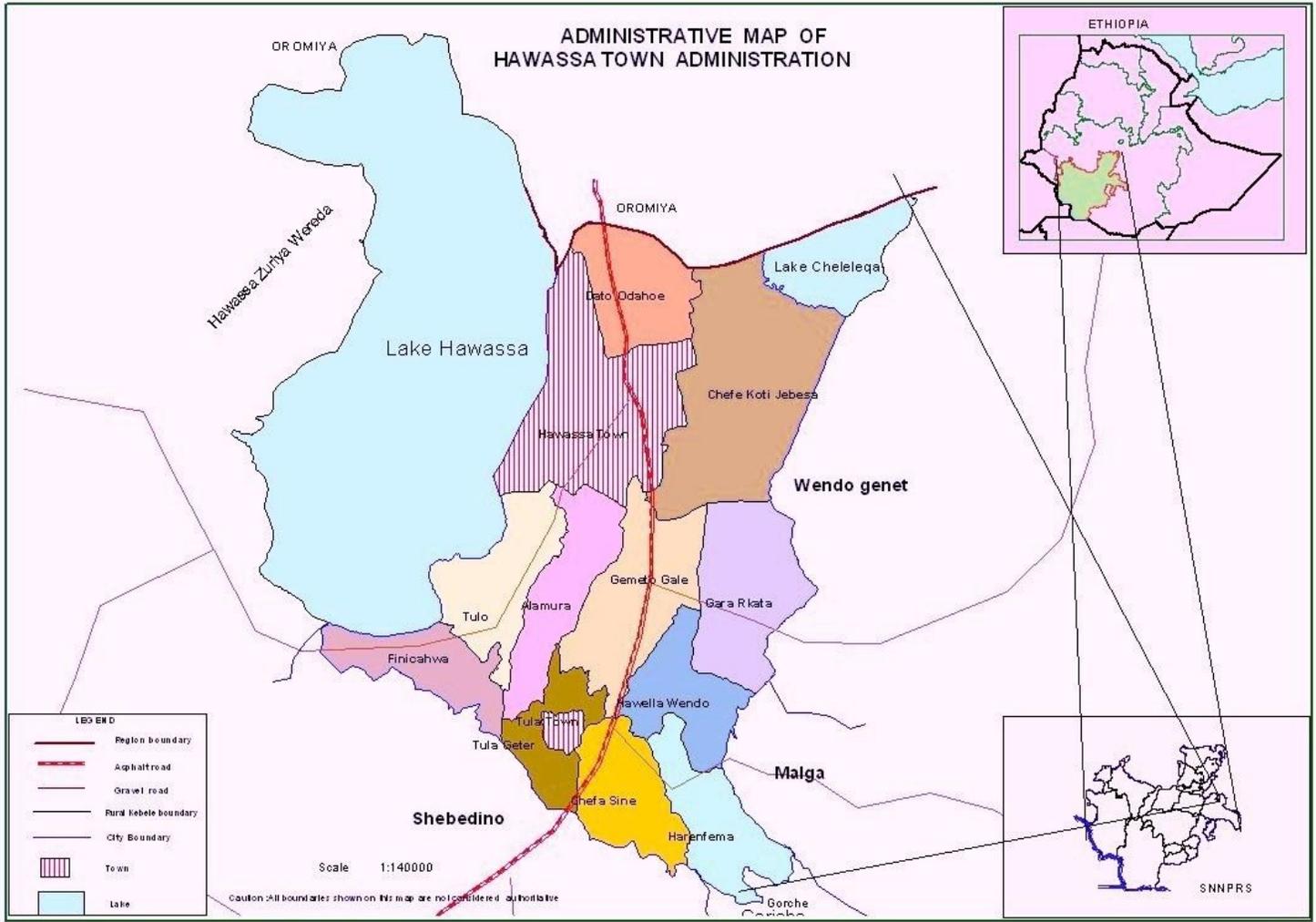
Figure 1

Map of the study area (Source Hawassa city Administration)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- supplement1.pdf
- supplement2.pdf