

Health facilities capacity for tuberculosis diagnosis and treatment in Ethiopia

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Abstract

Introduction: Tuberculosis is one of the major public health challenges in Ethiopia. There are limited information on health facilities capacity to offer TB services at national level. The purpose of the study is to evaluate the capacity of health facilities to provide TB service and, its variations by type of health facilities and regions in Ethiopia.

Methods: Data from the 2018 Ethiopian Service Availability and Readiness Assessment (SARA) survey were used. The data were collected from all regions of the country. The overall TB service readiness score was calculated by considering twelve TB tracer items. Mean availability was considered for measuring health facilities overall capacity to provide TB service.

Multiple linear regression was done to assess the association of selected health facilities characteristics with overall readiness score.

Result: A total of 632 health facilities were included in the analysis. Twenty six percent of the clinics provided TB diagnosis, treatment prescription, or treatment follow-up; 18% had national diagnosis & treatment of TB guideline; and 16% TB smear microscopy diagnostic mechanism. Hospitals had better capacity score (76%) than health centers (69%) and Clinics (13%). The overall TB service capacity score for urban facilities (60%) was higher than that of the rural (49%) health facilities ($\beta = -0.13$, 95% CI: -0.18, -0.08). Clinics ($\beta = -0.59$, 95% CI: -0.67, -0.52) had lower capacity score than hospitals. Facilities in Afar ($\beta = -0.13$, 95% CI: -0.23, -0.02), Amhara ($\beta = -0.12$, 95% CI: -0.19, -0.04), Oromiya ($\beta = -0.12$, 95% CI: -0.20, -0.04) and Somali ($\beta = -0.13$, 95% CI: -0.23, -0.03) regions had lower capacity score than facilities in the Tigray.

Conclusion: Hospitals and health centers in Ethiopia had good capacity to provide TB service, however low capacity was observed in clinics. There was a significant regional heterogeneity on the capacity of health facilities for TB service diagnosis and treatment in Ethiopia. This is also detected by facility type and facility setting. TB service improvement interventions should focus on the clinics and the regions whose readiness score is low to ensure equity and its capacity.

Keywords: Capacity, health facilities, TB, Ethiopia

Introduction

Tuberculosis (TB) is an infectious disease which is caused by the bacillus *Mycobacterium tuberculosis*. It mainly attacks the lungs (pulmonary TB) and sometimes it can affect other parts of our body (extra pulmonary TB). This infectious disease has capacity to spread when people who are sick with pulmonary TB cough bacteria into the air, for example through coughing.

Diagnostic test for tuberculosis begins with the basis of clinical symptoms and then it includes rapid molecular tests, sputum smear microscopy, culture-based and radiography methods. But in low income countries commonly used method is sputum smear microscopy. TB is often diagnosed late and it results with poor treatment outcomes and becomes a cause of a continuous transmission to others. And the effective drug treatments were first developed in the 1940s. Now a days, the recommended treatment for cases of drug-susceptible TB is a 6-month regimen of four first-line drugs namely: isoniazid, rifampicin, ethambutol, pyrazinamide and Streptomycin (FMOH

of Ethiopia 2012; WHO 2017). Previous study on the natural history of TB disease without anti-TB drugs treatment found that about 70% of individuals with sputum smear-positive pulmonary TB died within 10 years of being diagnosed (Tiemersma et al. 2011). The estimated lives saved between 2000 and 2013 through TB prevention, diagnosis and treatment interventions were 37 million. Besides, between 1990 and 2013 TB mortality rate and prevalence rate were decreased by 45 percent and 41 percent, respectively (UN 2015).

According to World Health Organization (WHO) report, in 2017, Ethiopia was among the 20 high burden countries for TB, with estimated TB prevalence and incidence rates of 200 and 182 per 100,000 populations, respectively (WHO 2015b, 2017). Since a peak in 1996, the prevalence rates of TB in Ethiopia have declined by more than half; and in 2015 there were 191 000 new cases of tuberculosis estimation by WHO (WHO 2016). Between 2005-2015, in Ethiopia the treatment success rate and case detection rate improved from 79% to >90%, and from 33% to 71%, respectively; and tuberculosis mortality

decreased from 73 to 30 cases per 100 000 (Abebaw, Woldemichael, and Admassie 2009; Fekadu et al. 2017). However, in 2015 nearly 30% of TB incident cases remained missing (i.e, undiagnosed or unreported), and <20% of the estimated 3300 Ethiopia8n patients with multi-drug-resistant tuberculosis commenced treatment (WHO 2016).

By recognizing TB as one of the major public health problems in Ethiopia, the Federal Ministry of Health (FMOH) has given attention and priority to include TB prevention and control among major priority programs (FMOH of Ethiopia 2013). The known and basic strategies to reduce the burden of diseases are early case detection, provision of adequate chemotherapy, provision of comprehensive and standard patient care, and enhanced case management of cases. And also ensuring the availability and readiness of service is important to maintain quality health services in a health system (Getachew et al. 2015) . Though few studies are done in Ethiopia, there is limited information. Thus this study aims to assess capacity of health facilities for TB diagnosis and treatment and its association with region, location, facility type and managing authority in Ethiopia.

Materials and Methods

Study design: Data were used from The 2018 Ethiopian Service Availability and Readiness Assessment (SARA) survey which was a facility based cross sectional survey. A nationally representative 632 hospitals, health centers and clinics were selected from all 9 regions and 2 city administrations in the country (For details refer Table 1). WHO Service Availability and Readiness Assessment standard tool was used for data collection on availability of specific items, components of support systems, and facility infrastructure, including TB service delivery. All data entry and editing programs were written using CSPro software, a statistical software package with built in data collection functionality that allows for speedy data entry while also providing sufficient checks and data validation to ensure quality data.

Data analysis: TB service readiness score for each facility were generated based on 12 selected tracer items; these were guidelines on diagnosis and treatment of TB, management of HIV/TB co-infection, TB smear microscopy, HIV diagnostic test, and first-line TB medications (isoniazid, pyrazinamide, rifampicin, and ethambutal as separate drugs or in any fixed dosed combinations). Finally, multiple linear regression model was used to determine the association between health facilities capacity to provide TB service in terms of readiness score and health facility characteristics (Type of health facility, managing authority, location and region). The

analysis was done using SPSS version 20 and STATA Version 14. Ethical clearance was obtained from Ethiopian Public Health Institute (EPHI) scientific and ethical review board. Informed consent was taken from all facilities in charge. No facility level identifier was used to maintain confidentiality and data were maintained in password protected EPHI server.

Results

As shown in Table 1, in this analysis a total of 632 health facilities were included, of these 303, 164 and 165 were hospitals, health centers and clinics, respectively.

Table 1: Distribution of health facilities by region, managing authority and location, Ethiopia SARA 2018

Facility Characteristics	Facility Type			Total
	Hospitals	Health Centers	Clinics	
Region				
Tigray	39	14	12	65
Afar	6	16	15	37
Amhara	65	17	16	98
Oromiya	75	16	18	109
Somali	11	16	17	44
Ben/Gumuz	2	15	14	31
S.N.N.P	58	16	15	89
Gambela	3	13	14	30
Harari	5	8	11	24
Addis Ababa	32	22	23	77
Dire Dawa	7	11	10	28
Managing Authority				
Public	243	160	7	410
Others	60	4	158	222
Location				
Urban	273	86	135	494
Rural	30	78	30	138
Total	303	164	165	632

From the total health facilities 76%, 75%, 72% and 73% provided TB services, TB diagnosis, drugs to TB patients and management and treatment follow up for TB patients respectively. Larger proportion of hospitals (95%) followed by health centers (91%) and 26% of clinics offered TB services. Ninety- three percent of health facilities managed by the government and only 45% from other managing authority provided TB services. Regarding health facilities location, 79% from urban and 68% from rural provided TB services.

Ninety-one percent of health facilities in Tigray region had treatment service for TB, while in those emerging regions of Ethiopia less than 55% of facilities provided TB treatment service i.e. In Afar (54%), Benishangul Gumuz (52%) and Gambela (53%) offered TB treatment service.

When we see the TB diagnostic test in the health facilities situated in those emerging regions they are very few that is; in Afar (54%), Benshangul Gumuz (52%) and Gambela (50%) provided TB diagnostic test. One fourth of clinics provided TB diagnostic test. The proportion for TB diagnostic testing was higher in

hospitals (95%), but public diagnose comprises (92%), in urban the coverage is (78%) and from all regions in Tigray it is the highest (91%). Capacity in providing drugs to TB patients is almost similar in hospitals (94%) and health centers (90%). The proportion of public health facilities to provide TB was 91% and 73% in urban facilities. To compare the capacity of regions in providing drugs to TB Patients; Eighty-four percent of health facilities in S.N.N.P.R provided drugs to TB patients; which is followed by Tigray (83%), then Oromiya (83%), 50% and 52% of

facilities in Gambella and Benishangul Gumuz respectively have capacity to provide drugs to TB patients. Eighty-eight percent of health facilities in Tigray region offered management and treatment follow up for TB patients followed by S.N.N.P.R (84%) and Oromiya (83%), it was 50% in Gambela, 52% in Benishangul Gumuz and 54%. In hospitals this service was in 94% which had relatively higher proportion, followed in public health facilities (91%) and urban (74%). (See Table 2).

Table 2: TB diagnosis and treatment services by health facility characteristics

Health facility characteristics	TB diagnosis, treatment prescription, or treatment follow-up n (%)	TB diagnostic testing n (%)	Provision of drugs to TB patients' n (%)	Management and treatment follow up for TB patients' n (%)
Type of health facility				
Health centers	150 (91)	146 (89)	147 (90)	148 (90)
Hospitals	289 (95)	289 (95)	284 (94)	284 (94)
Clinics	43 (26)	42 (25)	23 (14)	27 (16)
Managing authority				
Public	381 (93)	377 (92)	373 (91)	374 (91)
Others	101 (45)	100 (45)	81 (36)	85 (38)
Location				
Urban	388 (79)	387 (78)	363 (73)	368 (74)
Rural	94 (68)	90 (65)	91 (66)	91 (66)
Region				
Tigray	59 (91)	59 (91)	54 (83)	57 (88)
Afar	20 (54)	20 (54)	20 (54)	20 (54)
Amhara	80 (82)	77 (79)	74 (76)	74 (76)
Oromiya	90 (83)	90 (83)	90 (83)	90 (83)
Somali	29 (66)	29 (66)	24 (55)	25 (57)
Ben/Gumuz	16 (52)	16 (52)	16 (52)	16 (52)
SNNPR	75 (84)	74 (83)	75 (84)	75 (84)
Gambella	16 (53)	15 (50)	15 (50)	15 (50)
Harari	21 (88)	21 (88)	13 (54)	13 (54)
Addis Ababa	55 (71)	55 (71)	52 (68)	53 (69)
Dire Dawa	21 (75)	21 (75)	21 (75)	21 (75)
Total	482 (76)	477 (75)	454 (72)	459 (73)

As shown in Table 3, guidelines for diagnosis & treatment of TB, management of HIV and TB co-infection, MDR-TB, TB infection control were available in 80%, 74%, 43% and 68% of health centers respectively. Eighty four percent, 77%, 49%, and 73% of health centers have at least 1 trained staff for diagnosis and treatment of TB, management of HIV and TB co-infection, MDR-TB and TB infection control respectively. TB microscopy, HIV diagnostic capacity, system for diagnosis of HIV among TB clients, and all first-line TB medications were available in 54%, 49%, 85% and 90% of the health centers, respectively. The mean availability of tracer items for health centers was 8 (69%) indicates on average 8 of the 12 tracer items existed. Seventy nine percent, 74%, 56% and 67% of hospitals have guidelines for diagnosis and treatment of TB, management of HIV and TB co-infection, MDR-TB

and TB infection control, respectively. From all hospitals for TB service, 85%, 78%, 61% and 74% have at least 1 trained staff for diagnosis and treatment of TB, management of HIV and TB co-infection, MDR-TB, and TB infection control in hospitals, respectively. TB microscopy, HIV diagnostic capacity, and system for diagnosis of HIV among TB clients, and all first-line TB medications were available in 81%, 71%, 91% and 95% of the hospitals, respectively. In hospitals, for TB service on average 9 of the 12 tracer items available. In eighteen percent of clinics the guidelines for diagnosis and treatment of TB was available followed by availability of TB microscopy (16%) and at least 1 trained staff for diagnosis and treatment of TB (15%). Only 7% of clinics had guideline for MDR-TB. The mean availability of tracer items in clinics was 13% implied on average only 2 out of 12 tracer items existed.

Table 3: Capacity indicators for TB diagnosis and treatment services by type of health facilities

Capacity indicators for TB service	Proportion of Health Centers n (%)	Proportion of Hospitals n (%)	Proportion of Clinics n (%)	Total
Guidelines available for diagnosis and treatment of TB	132 (80)	239 (79)	29 (18)	400 (63)
Guidelines available for management of HIV and TB co-infection	121 (74)	224 (74)	22 (13)	367 (58)
Guidelines available for MDR-TB	71 (43)	170 (56)	11 (7)	252 (40)
Guidelines available for TB infection control	111 (68)	202 (67)	23 (14)	336 (53)
At least 1 trained staff for diagnosis and treatment of TB	137 (84)	259 (85)	24 (15)	420 (66)
At least 1 trained staff for management of HIV and TB co-infection	127 (77)	235 (78)	22 (13)	384 (61)
At least 1 trained staff for MDR-TB	81 (49)	185 (61)	16 (10)	282 (45)
At least 1 trained staff for TB infection Control	120 (73)	225 (74)	23 (14)	368 (58)
TB microscopy	89 (54)	244 (81)	26 (16)	359 (57)
HIV diagnostic capacity	81 (49)	215 (71)	23 (14)	319 (50)
System for diagnosis of HIV among TB clients	139 (85)	276 (91)	21 (13)	436 (69)
All first-line TB medications	147 (90)	288 (95)	21 (13)	456 (72)
Mean availability of tracer items	8 (69)	9 (76)	2 (13)	

As shown in Table 4, at 5% level of significance, the simple linear regression model result revealed that both type of health facility, managing authority, location and region are associated with health facility readiness to provide TB services. The adjusted coefficient from multiple linear regression model showed that, overall TB readiness score for clinics was lower than that of hospitals ($\beta = -0.59$, C.I: -0.67, -0.52). Health facilities from rural have lower readiness capacity to provide TB service compared to urban health facilities ($\beta = -0.13$, C.I: -0.18, -0.08). The

expected value of TB readiness to provide the service was lower in health facilities from Afar ($\beta = -0.13$, C.I: -0.23, -0.02), Amhara ($\beta = -0.12$, C.I: -0.19, -0.04), Oromiya ($\beta = -0.12$, C.I: -0.20, -0.04) and Somali ($\beta = -0.13$, C.I: -0.23, -0.03) than health facilities from Tigray region. In this multiple linear regression model 54% of the variability of TB readiness score data around its mean explained by the independent variables and it is statistically significant (Adjusted $R^2=0.54$, p-value < 0.001).

Table 4: Determinants for TB service readiness score

Health facility characteristics	Mean	SE	Crude Model		Adjusted Model	
			Beta	95% CI	Beta	95% CI
Type of health facility						
Hospitals (Ref.)	0.759	0.014				
Health centers	0.689	0.022	-0.07	(-0.12, -0.02)	-0.04	(-0.09, 0.02)
Clinics	0.132	0.021	-0.63	(-0.68, -0.58)	-0.59	(-0.67, -0.52)
Managing authority						
Public (Ref.)	0.724	0.014				
Others	0.307	0.026	-0.42	(-0.47, -0.37)	-0.04	(-0.11, 0.03)
Location						
Urban (Ref.)	0.602	0.017				
Rural	0.491	0.031	-0.11	(-0.18, -0.04)	-0.13	(-0.18, -0.08)
Region						
Tigray (Ref.)	0.701	0.041				
Afar	0.412	0.065	-0.29	(-0.44, -0.14)	-0.13	(-0.23, -0.02)
Amhara	0.605	0.035	-0.09	(-0.21, 0.02)	-0.12	(-0.19, -0.04)
Oromiya	0.602	0.032	-0.09	(-0.21, 0.01)	-0.12	(-0.20, -0.04)
Somali	0.453	0.057	-0.25	(-0.39, -0.11)	-0.13	(-0.23, -0.03)
Benshangul Gumuz	0.425	0.075	-0.28	(-0.43, -0.12)	-0.09	(-0.2, 0.02)
SNNPR	0.639	0.036	-0.06	(-0.18, 0.06)	-0.07	(-0.15, 0.01)
Gambella	0.392	0.073	-0.31	(-0.47, -0.15)	-0.10	(-0.21, 0.02)
Harari	0.542	0.075	-0.16	(-0.33, 0.01)	0.01	(-0.11, 0.13)
Addis Ababa	0.601	0.047	-0.10	(-0.22, 0.02)	-0.05	(-0.14, 0.04)
Dire Dawa	0.649	0.075	-0.05	(-0.21, 0.11)	0.06	(-0.05, 0.17)

Discussion

This analysis which is focused on health facilities capacity for diagnosis and treatment of TB in Ethiopia has provided a comprehensive evidence on variations of TB service readiness score by type of health facility, managing authority, location and region in the country. Ethiopian government policy is focused to ensure a decentralized and high quality TB services at

lower level in both private and public health facilities. Similar study in 2014 showed that 69 % (excluding health posts) of health facilities in Ethiopia provided TB diagnostic, treatment or/and treatment follow up services and among those health facilities 67% have any TB diagnostic services using different methods (Getachew et al. 2015). However, this study further investigated TB service capacity score was low in

clinics, health facilities from rural areas and moreover in Afar, Amhara, Oromiya and Somali regions. The capacity of health centers in those regions of the country also show as low score in offering TB service i.e. TB diagnostic, treatment or/and treatment follow up services.

Less than half of Clinics and health facilities not managed by public/government have provided TB diagnosis, treatment prescription, or treatment follow-up. Similarly, less than 50% of Clinics and health facilities not managed by public/government have offered TB diagnostic testing, drugs to TB patients, and Management and treatment follow up for TB patients.

Another similar study which was done in 2017 shows us most facilities in the public sector offered tuberculosis treatment in Ethiopia i.e. large number of those public-sector facilities had the capacity to treat tuberculosis which indicates those facilities are equipped with the required TB drugs, test kits, professionals who can manage TB patients and as well as the required separate centers in their own compound. But in contrary to this study finding the private sector, treatment was available in >50% of hospitals, although private hospitals represented the site of care initiation for only 2% of patients. Tuberculosis treatment was available in <11% of the private clinics, where 18% of patients initiated care (WHO 2016).

On the other hand, less than half of health centers provided MDR-TB service using national guidelines. Using national guidelines, less than 20% of clinics provided both diagnosis & treatment of TB, management of HIV & TB co-infection, MDR-TB, and TB infection control services. These low health facilities capacities to provide TB related services especially in rural areas and some regions of Ethiopia will be a challenge to achieve the country's health sector transformation plan in 2019/2020, and the global TB epidemic target to end by 2035 and reduction in number of TB deaths by 95% compare with 2015 (FMOH of Ethiopia 2015; WHO 2015a)

Managing TB patients by inadequately trained staff, poor counseling skills and low awareness of clients could contribute for the poor quality of TB service which leads to poor treatment outcome. In the present study, at national level 83% and 84% (weighted) of the health facilities have TB services using guidelines and have at least 1 trained staff for diagnosis and treatment of TB, while it was 65% and 67% in 2016 (EPHI and FMOH of Ethiopia 2018; EPHI, FMOH of Ethiopia, and WHO 2016).

Among the facilities, in this study 57 % have diagnostic capacity using TB smear microscopy. It was 52% and 68% in Ethiopian 2014 Service Provision Assessment Plus (SPA+) and 2016 Ethiopia Service Availability and Readiness Assessment report respectively (EPHI 2016; Getachew et al. 2015), when we compare the current result with the 2016; there is a decrease in percentage of TB smear microscopy diagnostics in Ethiopia.

In general, since the policy of the Ethiopian government is to ensure a decentralized and high quality TB services at lower level in both private and public health facilities; this study will help the government of Ethiopia and development partners to adapt their interventions based on the national capacities assessment findings of the health facilities to provide TB related services in Ethiopia.

Conclusions

The availability of all first line TB drugs and the capacity of health facilities in terms of the mean availability of tracer items to provide TB services were low in clinics compared to health centers and hospitals. Besides only 15% of clinics had at least 1 trained staff for diagnosis and treatment of TB. Readiness to offer TB service was low in Afar, Amhara, Oromiya and Somali region compared to Tigray. So, future TB service improvement interventions should focus on the clinics and the regions whose readiness score was low to ensure equity and its capacity.

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Conflict of Interest: The authors declared that there is no conflict of interest.

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