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Delay in Tuberculosis Diagnosis among Tuberculosis Patients at the Three Hospitals: Asella, Robe and Abomsa of Arsi Zone, Oromia Regional State, March, 2015

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Abstract

Background: Tuberculosis (TB) remains a major global health problem. Delay in tuberculosis diagnosis may worsen the disease and increase transmission within the general population. This study estimated the prevalence of diagnosis delay and its determinants. Objective: To measure the magnitude of patient and health service delay and identify the factors associated with the delay. Methodology: A facility based cross-sectional study design was conducted at the three hospitals of Arsi Zone from December 2014-March 2015. All above 15 years old, all forms of TB patient who were on intensive phase and who were diagnosed during the data collection period were included in the study. Data were collected using semi-structured questionnaire and patient record review. Binary and multivariate logistic regressions were done using SPSS Ver. 20, to investigate determinants of patient, health system and total dely. The P-value of <0.05 was taken as significance. Result: Three hundred sixty two (362) all forms of TB patients enrolled in the study, of which 36.7% experienced patient delay, 49.7% health system delay and 48.9% total delay. The median patient, health system and total delay were 30, 9, 40 days respectively. Poor knowledge of TB (AOR 2.72 95% CI (1.33 - 5.56), P-value: 0.006), self treatment (AOR: 10.82, 95% CI (5.09 - 22.98), p-value: 0.000), alcohol consumption (AOR: 2.23, 95% CI (1.02 - 4.87, p-value: 0.045) and lack of money for health related expense (AOR: 3.15, 95% CI (2.05 - 12.92), p-value 0.000) were the independent predictors of patient delay. Visiting two health care providers (AOR: 2.86, 95% CI (1.20 - 56.76), p-value: 0.032), three and above (AOR: 14.41, 95% CI (1.68 - 123.44), p-value: 0.015) and being HIV negative (AOR: 5.32, 95% CI (1.35 - 20.93), P-value: 0.017) were independent predictors of health system delay. Conclusion: About 64.4% of the total delay was contributed by patient delay. Poor knowledge of TB and self treatment can be prevented by simple community based interventions.

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The Health Extension Workers (HEWs) should be supported to strengthen the activities of health education. A well-designed information education, communication/behavioral change communication (IEC/BCC) strategy for TB might improve the TB control program.

Keywords

Delay, Tuberculosis Diagnosis, Patients, Hospital, Arsi, Ethiopia

Subject Areas: **Infectious Diseases**

1. Introduction

Tuberculosis (TB) is an infectious disease that primarily affects the lung parenchyma. It also may be transmitted to other parts of the body, including the meninges, kidneys, bones, and lymph nodes. It is caused by mycobacterium (MB) tuberculosis, a rod-shaped "acid fast" bacillus. Occasionally, the disease can also be caused by mycobacterium bovis and africanum. It is most commonly transmitted by inhalation of infected droplet nuclei [1].

Primary infection occurs in people who have not had any previous exposure to tubercle bacilli. Infection begins when person inhales droplet nuclei containing MB bacilli that reach the alveoli (lungs). These tubercle bacilli are ingested by alveoli macrophages and the majority of bacilli are inhibited. The process of latent TB infection begins when extra cellular bacilli are ingested by microphages & presented to other White Blood cells (WBCs). This triggers the immune response in w/c WBCs kill or encapsulate most of bacilli, leading to formation of a granuloma [1].

Since the predominate site of TB is the lung, commonest symptoms are cough with or without sputum production, chest pain, hemoptysis and mild dyspnea and systemic complaints such as fever, night sweats, anorexia, and decreased activity [1].

Tuberculosis (TB) remains a major global health problem. In 2012, an estimated 8.6 million people developed TB. Tuberculosis is one of the most important infectious diseases responsible as 3rd cause of hospital admission and the second top causes of death in Ethiopia [1].

Delays in TB diagnosis contribute to TB transmission, its severity and mortality. Many studies tried to investigate factors for patient and health service delay. Patient delay was associated with literacy, rural residence, type of TB disease, occupation, nutritional status, self-treatment, first visit to non-formal health providers, the type of health facilities first visited by patients, Human Immune Virus(HIV) status, old age, sex and longer one way walking time to nearby health facility [1]-[6].

First visit to government clinics/health post, health centers and private health facilities, patient with good functional status, patients in contact with more than two health providers associated with health service's delay [3] [7].

Diagnostic delays of TB have been investigated in many parts of the world; however, total delays and risk factors for the delay vary significantly from region to region and country to country likely due to differences in culture, environment and infrastructure. On the other hand, a risk factor identified for a delay in one study has no/insignificant association in others [5]-[10]. A number of studies concluded that females experience increased diagnostic delay whereas, a substantial number of studies made the opposite conclusion [9] [10]. Inconsistencies of theories in the above three statements indicate the need for further studies to measure magnitude and explore further determinants. As far as my knowledge is concerned no studies have been conducted to assess TB diagnostic delay in Arsi Zone. Arsi is one of the first zones in Ethiopia where the Direct Observation Therapy (DOTs) strategy started in 1992 [11], but TB case detection is not as such improving as its age. Out of the 8008 (3352 SM+) expected incidence of all forms of TB in the year 2006 Ethiopian Fiscal Year (EFY), only 51% all forms and 38% Smear Positive (SM+) TB cases were notified in Arsi Zone which indicates the need of assessing the possible explanation for this [12]. Recent prevalence studies in the zone witnessed that 44.4% of smear positive TB cases were remain undiagnosed by the current passive way of case identification [13].

Early detection and treatment of TB cases is crucial in TB control program and it is obvious that any delay in the diagnosis and treatment of TB can foster TB transmission and its severity.

Therefore understanding the time delay and its determinant can help in prioritizing the appropriate TB control measures in this Zone. The aim of this study was therefore, to measure the magnitude of patient, health service and total delay in TB diagnosis and to assess the factors contributing to the delay among patients at the three hospitals of Arsi Zone; Asella, Robe and Abomsa.

There is no standard definition of delay in TB diagnosis. Different studies used different definitions of delay. Delay was defined as any time period from the onset of symptoms to presentation, to diagnosis, to treatment initiation; or from presentation to diagnosis or treatment initiation; or else from diagnosis to treatment initiation based on their objective of study [14]. Almost all studies reviewed used "patient delay" contextually as the time interval between the onset of major symptoms of TB to the first presentation to formal health care facility [2] [5] [7] [8] [15]-[18]. One study defined "patient delay" as the time interval between the onsets of TB symptoms-and the first formal or informal health care received [19]. Health system delay [6] [18], Medical provider delay [8] or Health service delay [15] was used to define the time interval from the first consultation at any formal health facility up to the date of diagnosis. Many other studies used the health system delay [3] [16] [20], health service delay [19] and health provider delay [7] more comprehensively to mean the time interval from first consultation up to treatment initiation.

There is no definitive cut-off point about the acceptable time for the patient delay. Different studies use different cut-off points to measure the delay in TB diagnosis both for the patient and health service delay. Three from Ethiopia [5] [6] [15], one from Tanzania [21], and one from Nepal [20] used 30 days as cut-off point. Two Studies from Ethiopia used the 2 weeks [7], and 21 days [2] as cut-off points to measure delay based on the World Health Organization's (WHO's) criteria to suspect TB for patients coughing for 2 - 3 weeks. The other studies [3] [8] [19] used median delay as cut-off points. As to the health service delay; one study from Chad [19], two studies from Ethiopia [3] [8] used median delay as cut-off point, where us the other three studies from Ethiopia used 7 days [7], 15 days [15] and 2 weeks [6] as cut-off point. One study used different cut-off points based on types of TB to measure health service delay as 5 days for SM+ TB and 10 days for SM− TB [22].

In this study patient delay is defined as the time interval from the onsets of the major pulmonary symptoms of the disease until the first visit to formal health care facility. Health service delay is defined as the time interval from the first consultation until date of first diagnosis and the total delay as the sum of the two. The median patient, health service and total delay will be used as a cut-off point to measure the delay in this study.

Studies in parts of the world, Sub-Saharan Africa and Ethiopia showed variability in the magnitude of the delay in TB diagnosis. Median patient delay is as high as 8 weeks in Brazil [23] and 50 days in Nepal [18]; as medium as 23.5 days in Georgia [24], 3 weeks in Vietnam [25].

The Sub-Saharan studies reported median patient delay as high as 61 days in Mozambique [16], and as low as 14 days in South Africa and Malawi [17] [20]. 58% of Ugandan and 38% of Tanzanian TB patients delay for diagnosis greater than 4 weeks [26] [27].

From studies conducted in Ethiopia, the highest median patient delays documented were 63 days [7]. Two studies conducted in two different settings at different time period documented similar findings of patient delay (60 days) [8] [15]. Whereas another two studies conducted in a population of similar setting reported significantly different patient delays (20 versus 60 days) [3] [8]. Other studies from Tigray region and Wollega zone showed 53% and 62% of TB patients delay for diagnosis respectively [4] [5].

The highest median health system delay reported in the reviewed studies was 62 days from Mozambique [16] and the lowest was 6 days from Addis Ababa Ethiopia [15]. Health service delay is longer than patient delay in one study from northern Ethiopia magnifying the contribution of health system to diagnosis delay [6].

Prolonged patient delay is associated with literacy, rural residence, types of TB disease, occupation, age, sex and nutritional status [2]-[6]. Self-treatment, use of informal treatment prior to first consultation at public health facilities, number and type of provider first consulted are risk factors for the delay [3] [5] [28].

First visit to government clinics/health post, health centers and private health facilities were determinants of longer health system's delay [3]. Patients with EPTB experience more delay compared to PTB. Human Immune Virus (HIV) positive patients were less likely to have increased health systems' delay compared to HIV-negative patients. Patients who first visited health centers, private facilities and health posts had longer health systems' delay compared to those who visited hospitals [6].

The major limitation from studies was the inconsistencies in patient delay which necessitates further investigation. Furthermore, Tuberculosis (TB) remains a major global health problem. In 2012, an estimated 8.6 million people developed TB. TB is one of the most important infectious diseases responsible as 3rd cause of hos-

pital admission and the second top causes of death in Ethiopia [1]. Out of the 8008 (3352 SM+) expected incidence of all forms of TB in the year 2006EFY, only 51% all forms and 38% SM+ TB cases were notified in Arsi Zone which indicates the need of assessing the possible reason behind this [12]. Early detection and treatment of TB cases is crucial in TB control program and it is obvious that any delay in the diagnosis and treatment of TB can foster TB transmission and severity. Therefore understanding the time delay for TB diagnosis and determinants of patient delay would help in prioritizing the TB control measure that could improve early detection and treatment of TB cases which further reduces disease transmission within the general population and severity to the individual patient. Identifying key determinants of patient delay also help in formulating key strategies and doable actions appropriate for intervention.

The objective of this study was to assess patient and health system delays in TB diagnosis at the three hospitals of Arsi Zone. The specific objectives were to measure the magnitude of delay in the diagnosis of TB and to identify factors contributing to patient delay in TB diagnosis

2. Methodology

This study was conducted in three hospitals Asella, Abomsa and Robe of Arsi Zone. Arsi Zone is located 175 km south east of Addis Ababa in Oromia Region. The total population of the zone is 3.1 million with 89% lives in rural setting. There are 78 public health facilities (three hospital and 75 health centers) in the zone. In 2011 70% of the population is living within two-hour walking distance from a public health facility [12]. The three hospitals are located in a way each of them serves as a center of referral for 5 - 7 woredas (HCs).

Institution based cross-sectional study design was used in this study. The source population in this study is all TB patients seen in health facilities in the Zone during the study period. The study population is all the TB patients in the selected health facilities.

Patients who were diagnosed throughout the data collection period from December-March 2014, and those on intensive phase of treatment (October-November 2014) at the beginning of data collection were consecutively recruited in to the study until the intended sample size was fulfilled. This is because the number of sample size may not have been attained in the specified time period if simple random sampling was followed. Number of patients to be interviewed from each hospital was based on the case load of the hospitals. Sample was calculated using the prevalence of previous study conducted in Bahirdar [2] which is 62% of the delay was contributed by the patient. The formula for estimation of sample size for patient delay $n = [(Z\alpha/2)^2 * p * (1 - p)]/d^2$ Where: $Z\alpha/2$ at 95% CI (1.96), d marginal error 0.05, and p = 62%, proportion obtained from previous study at Bahirdar, Ethiopia, in 2014. The sample size was =362.

The sample size for health service delay was calculated using EPi. Info V. 3.5.1 as follows: Using 63% single population proportion from previous study in Western Ethiopia [9], at 95% confidence level and 5% margin of error, the sample size for health service delay is equal to 358.

For objective two: To identify factors contributing to delay in TB diagnosis. This is calculated as unmatched case-control using Epi. Info V. 3.5.1 as follows (**Table 1**):

The data were collected both from the hospital unit TB register and from the patient interview using semi structured questionnaire administered by trained nurse from other department Maternal and Child Health (MCH) of respective hospitals. In addition a summary form was used for the information collected from Unit TB register. Patients who were transferred out just before the data collection started were not reached because of lack of accessibility. Data collection tools were in English and translated to the local language (Afan Oromo and Amharic) and again translated back to English to confirm consistency. Pretest was also done at Dera Health Center (HC) to 35 patients (10%) to see whether the questionnaire is valid or not.

The data were checked for its completeness every week, edited, coded and entered using Epi.info V. 3.5.1 to

Table 1. Summary of sample size calculation for selected factors for delay in TB diagnosis.

Obj.2	Factors	Conf. level	Power	Case to control ratio	Expected frequency of control	OR	Sample size		
							Case	control	Total
Determinants of patient delay	Being Rural resident	95%	80%	1:1	25.5%	2.00	163	163	326
	Being illiterate	95%	80%	1:1	26%	2.00	162	162	324

minimize error. Data were exported to SPSS V.21, frequency, cross-tabulation, and sorting was checked to monitor data quality. Descriptive statistics were used to summarize data and tables were used for result display. Delay of all forms were categorized as ≤median and >median to identify factors related to delays using binary logistic regression at 95% CI. Multivariate logistic regression analysis was done to control confounding factors. The P-value of <0.05 was taken as significance.

3. Operational Definitions

Patient delay: The time interval from the appearance of the major pulmonary symptoms of the disease until the first visit to formal health care facility.

Health service delay: The time interval from the first consultation until date of diagnosis.

The total delay: The sum of the two.

Formal health care facility: all facilities providing modern health care/services

Non formal health care facility: drug dispensaries, drug shop/vender, traditional injectors/healers, holy water.

Major pulmonary symptoms: cough, coughing up blood, difficulty breathing, night sweats/loss of appetite/ fever or weight loss.

Good knowledge/perception about TB: if the patient can answer 5 or more out of 7 questions asking about TB knowledge, otherwise poor.

Ethical clearance and supporting letter from Addis Continental Institute of Public Health, Adama Science and Technology University, Arsi Zone Health Department and the Three Hospitals Administration were obtained prior to collection of any patient information. The objectives and the benefits of the survey were explained to the participants in a language they understand. All participants, in some cases their representatives, provided informed consent prior to the beginning of the interview. Each participant was interviewed in a separate place to keep privacy and confidentiality. Codes were used to label individual respondents to keep confidentiality.

4. Results

Three hundred and sixty two patients were recruited in to the study. The median age of the respondents was 29 years with 59.1% found in the age group 15 - 34. Two hundred and twenty six (62.4%) were male, 58.6% were married. More than half (53%) resides in rural and 35.6% were farmers by occupation. Eighty eight (24.3%) of the respondents were dependant (students, elderly and terminally ill) on their family or others for living. Regarding the educational status of the respondents, 122 (33.7%) was illiterate or unable to read and write followed by primary school level education (30.4%). 51.9% of the respondents reported they were the primary income earner on which the families relay. More than half (55.2%) live on a monthly income of 500 birr and below (**Table 2**).

Half of the respondents 177 (48.9%) were smear negative in classification, 9.9% HIV positive and 19.7% were previously treated cases. Most (80.1%) of the respondents reported cough as the major symptom forced them to seek care followed by fever/night sweating/loss of appetite (74.7%). Regarding awareness about TB, 61.3% had good basic knowledge of TB. One hundred and eighty eight participants reported "contact with TB patient" as the possible way of acquiring TB, exposure to cold 75 participants, malnutrition 36 participants.

The median patient delay was 30 days (IQR: 20 - 50). More than half (63.3%) of the respondents sought medical care or advise within 30 days. The median patient delay of smear positive, smear negative and extra pulmonary TB patients was 25 (IQR: 20 - 41), 30 (IQR: 18 - 49) and 30 (IQR; 20 - 60) days respectively. 19.8% of the smear positive patients delayed > 60 days. The maximum patient delay in smear positive, smear negative and extra pulmonary TB were 180, 180 and 365 days respectively. The median health system delay was 9 days (IQR: 4 - 17). 49.7% of the respondents' health systems delay for more than 9 days. 49 (27.2%) of smear positive, 88 (48.9%) of smear negative and 43 (23.9%) of extra pulmonary TB patients had health system delay more than 9 days.

The highest health system delay (90 day) was registered by one smear positive patient. Regarding the smear negative patient health system delay, 112 (63.3%) diagnosed in the 1st 14 days, 12 (6.8%) exactly on day 15 and 53 (29.9%) beyond 15 days of their arrival.

The median total delay was 40 days (IQR: 26 - 64). The longest total delay observed was 385 days. 177 (48.9%) of the respondents had a total delay of more than 40 days. The majority 64.4% of the total delay was contributed by patient delay.

Table 2. Socio-demographic characters of TB patients at Asella, Abomsa & Robe Hospitals of Arsi Zone, Ethiopia, March, 2015.

Background characteristics of the study subjects		Frequency	
		No.	%
Sex	Male	226	62.4
	Female	136	37.6
Age (years)	15 - 34	214	59.1
	35 - 54	112	30.9
	≥55	36	9.9
Marital status	Married	212	58.6
	single	127	35.1
	Others (divorced/widowed/separated)	23	6.4
Occupation	Farming	129	35.6
	Employed	22	6.1
	Daily laborer	34	9.4
	Dependant	88	24.3
	Private business	29	8.0
	Housewife	60	16.6
Area of residence	Rural	192	53.0
	Urban	170	49.0
Level of education	Not attended/illiterate	122	33.7
	Read and write	61	16.9
	Primary	110	30.4
	Secondary/tertiary	44	12.2
	Tertiary	25	6.9
Primary income earner in the HH	Patient	188	51.9
	Wife/mother	68	18.8
	Husband/father	88	24.3
	Son/daughter	14	3.9
	Extended family	5	1.1
Income	≤500	200	55.2
	501 - 1000	85	23.5
	>1000	77	21.3

Those respondents who delayed more than 15 days, a WHO cutoff point to suspect TB, were asked for the reason and 122 (39.2%) reported they think the symptom will disappear by itself, 100 (32.2%) took treatment themselves, 47 (15.1%) lack of money, 30 (9.6%) thought it was cold and 12 (3.9%) was very sick.

As to the reason why other facilities were prioritized than public facilities, 63 (43.7%) time consuming to wait, 25 (18.5%) distance to facility, 25 (18.5%) mistrust of Government health service provision, 11 (8.1%) no drugs/equipment available at public facility, and 11 (8.1%) lack of family or friends accompany them to the facility.

Out of 134 patients who 1st sought alternative treatment either from non formal health care or private health facilities, referral/decision to visit public health facility was made by patients themselves (44.0%), family/

friends (27.6&), and private practitioner (28.4%).

Participants who had health system delay more than 3 days were asked for the reason and 138 of the them reported as related to diagnosis process (Lab, CXR, FNA), 70 related to OPD services (treatment, triage), two of them reported as their own problem and two reported they do not know.

In binary logistic regression, socio-demographic characteristics like age of the patient ≥ 55years (p-value: 0.010), being rural resident (p-value: 0.000), occupation being farmer (p-value: 0.025), dependent (P-value: 0.040) and housewife (p-value: 0.037), education being illiterate (p-value: 0.000), read and write (p-value: 0.002), monthly income ≤ 500 birr (p-value: 0.000), negative HIV status (p-value 0.012), EPTB (p-value 0.042), poor knowledge of TB (p-value 0.000), reason for delay as being lack of many for healthcare (p-value 0.000), took treatment themselves (p-value 0.000), one way walking hour to the PHF being > 2 hours (p-value 0.010), round trip transportation cost to the PHF being > 30 birr (p-value: 0.000), alcohol consumption (p-value 0.001), first place of visit being PHCU (p-value 0.000), non formal health care facility (p-value: 0.000), number of health care provider visited being two (p-value: 0.001) and three & above (p-value: 0.000) had statistically significant association with patient delay more than 30 days.

In multivariate logistic regression of these variables: knowledge of TB is significantly associated with patient delay. Respondents who have poor basic knowledge of TB delayed 2.7 more time than those patients who have the knowledge (AOR 2.72 95% CI (1.33 - 5.56), P-value: 0.006). Those patients who lack money for health care (AOR: 3.15, 95% CI (2.05 - 12.92), p-value 0.000), took treatment by themselves(AOR: 10.82, 95% CI (5.09 - 22.98), p-value: 0.000) were more likely to delay compared to patients who reported their reason as thinking the symptom will disappear by itself or thought it was cold. Alcohol consumption had also got statistical significance in association with patient delay (AOR: 2.23, 95% CI (1.02 - 4.87, p-value: 0.045) (**Table 3** & **Table 4**).

In binary logistic regression, first place of visit since onset of illness being PHCU (p-value 0.000), private HF (p-value 0.000), non formal HCF (p-value 0.000); monthly income being ≤ 500 (p-value 0.043), 501 - 1000 birr (p-value 0.013); and HIV status being negative (p-value 0.000), cost of round trip to the government health facilities being > 30 birr, (p-value: 0.004), previous history of TB (p-value: 0.001), patients who visited two health care provider (p-value: 0.000) and who visited three and above (p-value: 0.000) had significant association with health system delay >9 days.

When these variables analyzed all together in multivariate analysis, patients who visited two health care providers (AOR: 2.86, 95% CI (1.20 - 56.76), p-value: 0.032) and those who visited three and above (AOR: 14.41, 95% CI (1.68 - 123.44), p-value: 0.015) has significant association with health system delay compared to patients who first visited Hospital. HIV negative patients were 5.2 times more delayed compared to HIV positive one (AOR: 5.32, 95% CI (1.35 - 20.93), P-value: 0.017) (**Table 5**).

In binary regression, rural residence (p-value 0.000), monthly income of ≤500 birr (p-value 0.000), negative HIV status (p-value 0.010), extra pulmonary TB (p-value 0.047), previous TB treatment (p-value 0.016), poor knowledge of TB (p-value 0.000), one way walking time to public health facility being >2 hours (p-value 0.008), cost of round trip to the public health facility being > 30 birr (p-value 0.000), patients who took treatment themselves (p-value 0.000), alcohol intake (p-value 0.012) and patients who first visit PHCU (p-value 0.000), private health facility (p-value 0.000) and non formal health care facility (p-value 0.000) since onset of illness, patients who visited two care provider (p-value: 0.000) and who visited three and above care providers (p-value: 0.000) were found to affect the total delay. However, in multivariate analysis, patients who took treatment by themselves (AOR: 4.06, 95% CI (1.61 - 10.20), p-value: 0.003) and patients who lack money to come to health facility (AOR: 3.72, 95% CI (1.03 - 13.36), p-value: 0.044)) were more likely to delay compared to patients who thought their symptom will disappear by itself/who thought it was cold.

5. Discussion

The median patient, health system and total delay were 30 days, 9 days and 40 days respectively. 36.7% of the patients delayed beyond the median where as 49.7% of the patients encountered the health system delay beyond the median (9 days). In this study, 48.9% of the patients had a total delay beyond 40 days. The majority, 64.4% of the total delay was contributed by patient delay. Twenty one (19.8%) of smear positive patients had a delay more than 60 days. Poor knowledge of TB, self treatment, alcohol consumption and lack of money for health care were the independent predictors of patient delay. Visiting two or more health care providers and being HIV negative were independent predictors of health system delay as reported by participants.

Table 3. Factors associated with patient delay at Asella, Robe & Abomsa hospitals of Arsi Zone, Ethiopia, March, 2015.

Variables		Patient delay (>30 days)		COR (CI)	P-value	AOR (95%CI)	P-value
		Yes	No				
Sex	Male	83	143	1			
	Female	50	86	1.002	0.994		
Age (years)	15 - 34	70	144	1			
	35 - 54	45	69	1.28	0.306	0.81 (0.38 - 1.68)	0.563
	≥55	20	16	2.57 (1.26 - 5.27)	0.010	2.29 (0.80 - 6.57)	0.122
Marital status	Married	86	126	1			
	Single/other	47	103	0.669	0.073		
Occupation	Employed	5	17	1.41	0.626	3.57 (0.50 - 25.42)	0.204
	Farming	52	77	3.24 (1.16 - 9.04)	0.025	1.60 (0.36 - 7.08)	0.533
	Daily laborer	13	21	2.97	0.072	2.14 (.43 - 10.55)	0.352
	Dependant	34	54	3.02 (1.05 - 8.68)	0.042	3.50 (0.79 - 15.48)	0.099
	Housewife	24	36	3.2 (1.07 - 9.55)	0.037	2.10 (0.60 - 7.36)	0.245
	Private business	5	24	1			
Residence	Urban	46	124	1			
	Rural	87	105	2.23 (1.44 - 3.47)	0.000	0.72 (0.35 - 1.49)	0.380
Education	illiterate	69	53	6.18 (3.02 - 12.68)	0.000	2.29 (0.64 - 8.17)	0.201
	Read &write	26	35	3.53 (1.58 - 7.88)	0.002	1.67 (0.48 - 5.74)	0.418
	Primary	26	84	1.47	0.322	0.89 (0.29 - 2.68)	0.844
	Secondary & above	12	57	1			
Income	≤500	92	108	3.72 (1.99 - 6.95)	0.000	1.64 (0.65 - 4.14)	0.299
	501 - 1000	26	59	1.43	0.360	0.68 (0.24 - 1.89)	0.458
	>1000	15	62	1			
Alcohol intake	No	98	201	1			
	Yes	35	28	2.56 (1.48 - 4.46)	0.001	**2.23 (1.02 - 4.87)**	**0.045**
Types of TB	SM+	34	72	1			
	SM−	62	115	1.14	0.612	0.73 (0.36 - 1.48)	0.379
	EPTB	37	42	1.87 (1.02 - 3.40)	0.042	1.09 (0.48 - 2.48)	0.843

A delay beyond 30 days is high and the proportion of patients who delayed beyond 30 days are large (36.7%). 19.8% of the smear positive patients delayed 60 days and above since onset of symptoms before seeking health care. For this two months time it is obvious that they were in contact with the general population and obviously transmitting the disease to others. This may result in continues existence of TB cases which probably leads to the emergence of MDR TB. TB patients should be identified as early as possible to halt transmission and to improve TB prevention and control program.

In the general term, the median health system delay is in the reasonable time with regard to situations on the ground. But it is not acceptable for twelve (57%) of smear positive and twenty-two (66.7%) of smear negative patients with patient delay > two months to have extra health system delay beyond the median as most of them

Table 4. Factors associated with patient delay at Asella, Robe & Abomsa hospitals of Arsi Zone, Ethiopia, March, 2015.

Variables		Patient delay (>30 days)		COR (CI)	P value	AOR (CI)	p-value
		Yes	No				
Thought symptom will disappear itself/cold		33	119	1			
Very sick		5	7	2.58		3.69 (0.75 - 18.11)	0.108
Lack of money		24	23	3.76 (1.89 - 7.50)	0.000	**30.15 (20.05 - 120.92)**	**0.000**
Took treatment myself		70	30	8.41 (4.73 - 14.97)	0.000	**100.82 (50.09 - 220.98)**	**0.000**
Number of care providers visited	One provider	25	91	1			
	Two provider	78	112	20.54 (10.49 - 40.30)	0.001		0.999
	Three & above	30	26	40.20 (20.11 - 80.35)	0.000		0.999
One way walking time to Gov. health facility	<2 hour	109	209	1			
	>2 hours	24	20	20.30 (10.22 - 40.35)	0.010	10.06 (0.41 - 20.69)	0.908
Cost of travel to government health facility	<30 birr	60	166	1			
	>30 birr	73	63	30.21 (20.05 - 50.02)	0.000	10.71 (0.86 - 30.39)	0.129
Smoking	No	122	213	1			
	Yes	11	16	10.20	0.654		
HIV status	Positive	6	30	1			
	Negative	127	199	30.19 (10.29 - 70.88)	0.012	10.68 (0.46 - 60.20)	0.437
Knowledge of TB	Good	54	162	1			
	Poor	79	67	30.54 (20.26 - 50.54)	0.000	**20.72 (10.33 - 50.56)**	**0.006**
Previous treatment of TB	Yes	7	39	1			
	No	53	135	20.19	0.076		
First place of visit since onset of illness	Gov. Hospital	25	98	1			
	PHCU*	58	47	40.84 (20.69 - 80.67)	0.000		0.999
	Private HCF	33	79	10.64 (00.90 - 20.98)	0.106		0.999
	Non formal HCF	17	5	130.33 (40.80 - 390.62)	0.000		0.999

*See operational definition.

by this time supposed to manifest major pulmonary symptoms of TB. These patients were visiting two or more health care providers before diagnosis so that they could pose a risk to the health professionals as well unless otherwise properly managed.

The median patient delay in this study was 30 days. This is in accordance with studies from Bahir Dar and Tigray Region [2] [5] Ethiopia, and also comparable with the delay report from Uganda (median 28 days) [26]. It is slightly higher than findings from Afar, Ethiopia (median 20 days), northwest Ethiopia and Vietnam (median 21 days respectively), and Georgia (median 23.5) [3] [6] [24] [25]. It is also relatively higher than reports from South Africa and Malawi (median 14 days), and Chad (median 15 days) [17] [19]. However the median delay in this study is much lower than reports from Somali Region, Bale Zone, Addis Ababa Ethiopia, Mozambique, Nepal, Brazil and Tanzania (median 60, 63, 60, 61, 50, 56, 62 days respectively) [7] [8] [15] [16] [18] [23] [27]. The observed differences among these studies may be due to differences between countries and their health system, policies and infrastructure of the countries, differences in socio-demographic characteristics of the study population that is rural versus urban setups, and pure agrarian versus pastoralist communities. The

Table 5. Factors associated with health system delay at Asella, Robe and Abomsa Hospitals of Arsi Zone, Ethiopia, March, 2015.

Variables		Health system delay (>9 days)		COR	p-value	AOR (CI95%)	p-value
		Yes	No				
First place of visit since onset of illness	Gov. Hospital	13	150	1			
	PHCU (HCs & HPs)	82	23	30.17 (14.43 - 63.09)	0.000	3.51 (0.53 - 23.33)	0.193
	Private HF	73	29	15.84 (7.91 - 31.70)	0.000	2.32 (0.37 - 14.59)	0.370
	Non formal HCF	12	10	10.15 (3.67 - 28.08)	0.000	1.39 (0.14 - 14.12)	0.782
Income	≤500 birr	106	101	1.74 (1.02 - 2.97)	0.043	1.08 (0.49 - 2.38)	0.852
	501 - 1000 birr	45	33	2.26 (1.19 - 4.29)	0.013	2.59 (0.94 - 7.18)	0.067
	>1000 birr	29	48	1			
HIV status	Positive	7	29	1			
	Negative	173	153	4.68 (1.99 - 10.99)	0.000	**5.32 (1.35 - 20.93)**	**0.017**
Residence	Urban	81	89	1			
	Rural	99	93	1.17 (0.77 - 1.77)	0.457		
One way walking time to Government health facility	<2 hour	154	164	1			
	>2 hours	26	18	1.54 (0.81 - 2.92)	0.187		
Cost of travel to government health facilities	<30 birr	99	127	1			
	>30 birr	81	55	1.89 (1.23 - 2.91)	0.004	0.95 (0.46 - 1.96)	0.895
Previous treatment of TB	Yes	12	34	1			
	No	100	88	3.22 (1.57 - 6.60)	0.001	1.77 (0.72 - 4.33)	0.213
No. of health care provider visited	One provider	9	107	1			
	Two provider	127	63	23.97 (11.39 - 50.45)	0.000	**2.86 (1.20 - 56.76)**	**0.032**
	Three & above	44	12	43.59 (17.15 - 110.79)	0.000	**14.41 (1.68 - 123.44)**	**0.015**

other reason may be the time period when studies were conducted. Poor knowledge of TB is associated with patient delay. The association between poor knowledge of TB and patient delay is very strong as is also the case in other studies from Bahir Dar, Tigray, Somali and Uganda [2] [5] [8] [21]. Lack money for health care was associated with patient delay in this study. This is in line with report from Kampala [21]. Self treatment was found to be determinants of patient delay. This is similar with findings from Afar Ethiopia, Georgia [3] [24]. Alcohol consumption is associated with patient delay. This is in line with study from Russia [29].

Rural residence and being female sex had no statistically significant association with patient delay. This is in contrary to findings from East Wollega, Tigray North West Ethiopia, Kenya, South Africa, Uganda and Georgia [4]-[6] [10] [17] [24] [26]. This may be due to the gradually improving access to the health care in the rural community and the involvement of women in their own health issues (women's development army) in their community creating an opportunity for women to benefit from the awareness creation and promotion activities. Unlike other studies [7] [15] [25], the distance or time taken to health facility had not found to affect the patient delay. It seems this may be due to the fact that the majority (87.8%) of the respondents lives in a distance of less than 2 hours travel.

Even though it is difficult to assess factors for health system delay from patient side, it could reveal some information on the factors. Being HIV positive had less likely to associate with health system delay compared to HIV negative patients. We didn't get any similar reports from other study. However, this may be due to improved stigma associated with HIV/AIDS, or HIV positive patients are being strictly followed by the care provider, or basic knowledge about TB among HIV positive patients are good. This study also showed that 26 out

of 36 HIV positive patients had good knowledge of TB. But what matters here is the time of the diagnosis of HIV. If the diagnosis were made concomitantly during TB diagnosis, then it is less likely to be explained this way.

The reasons of health system delay were more related to diagnosis and outpatient department processes. On the other hand those patients who visited alternative health care providers than public health facility reported in 46.7% of cases that it is time consuming to wait for the service. Others 25 (18.5%) them also reported their reason as mistrust of the service provided by public health facility while 11 (8.1%) of them reported lack of drugs or equipments in the public health facility.

This study has limitations. The 1st one is we included illegible patients on intensive phase of treatment during the data collection period and the delay is also as reported by the patient. These might introduce recall bias to the study. The other is patients who are transferred out just before the start of data collection and those who were diagnosed in other health facilities were not included. These transferred out patients were supposed to be interviewed since the consecutive sampling was used to collect patient information.

The strengths of the study were: The selected area was representative of the general population that is method of selection was representative, strong analysis method was used, and sample size was adequate. In addition, since there was no similar study conducted in the zone, it could be a good input for the zone.

6. Conclusions

Overall, the majority 64.4% of the total delay was contributed by patient delay. Poor knowledge of TB, self treatment, lack of money for the health care and alcohol consumption were found to have association with patient delay. This may lead to continues existence of TB cases which probably leads to the emergence of MDR-TB (Multi Drug Resistant TB). Tuberculosis (TB) patients should be identified as early as possible to halt transmission and to improve TB prevention and control program.

In addition, as far as the health system delay is concerned we can conclude from these mentioned facts that any mismanagement, unnecessary waiting and the absence of up to dated service deliver at outpatient department and laboratory area will result in patient disappointment and predisposes the patients to look for alternative health care which further prolongs the patient and health system delays.

7. Recommendation

This study addressed TB diagnosis delay and its determinants. Therefore it is suggested that, the Health Extension workers (HEWs) should be supported to strengthen the activities of health education. A well-designed information education, communication/behavioral change communication (IEC/BCC) strategy for TB might improve the TB control program. It also necessitates further strengthening and decentralization of TB diagnosis and treatment to alleviate extra costs.

In addition, the health sector managers need to pay due attention to the service outlets and should regularly monitor client satisfaction about their services. The need to fulfill equipments and monitor its proper utilization is also of great importance because sometimes artificial shortages may hinder service provision.

Finally it is also recommended that a comprehensive future study that consists of robust methodologies and analysis focusing on TB diagnosis delay should be conducted in order to obtain detailed information on factors contributing to patient and health service delay to strengthen or further formulate TB prevention and control program.

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