Addis Ababa University Medical Faculty
Department Of Community Health

THE PREVALENCE OF TUBERCULOSIS AMONG ADDIS ABABA CITY BUS DRIVERS AND CASH COLLECTORS

By

Mohammed Abseno, MD

A thesis submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Master in Public Health

April- 2004
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Dedication

This Master thesis is dedicated to my beloved son, Merih Mohammed, six years old, for his patience to allow me more time so that I could spend it for my research activities that would have been his childhood right to use it for his paternal attachment.

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ACRONYMS

AAU-MF	Addis Ababa Medical Faculty
AFB	Acid Fast Bacilli
AHRI	Armauer Hansen Research Institute
AIDS	Acquired Immuno Deficiency Syndrome
ARV	Anti-retroviral
BCG	Bacille Calmettee Guerin
CXR	Chest X-ray
DOTS	Directly Observed Treatment, Short Course
EPTB	Extra-Pulmonary Tuberculosis
FNA	Fine needle aspiration
HIV	Human Immunodeficiency Virus
IUATLD	International Union against Tuberculosis and Lung Disease
MDR-TB	Multi-Drug Resistant Tuberculosis
NTLCP	National Tuberculosis and Leprosy Control Program
PLWHA	People Living With HIV/AIDS
PTB	Pulmonary Tuberculosis
PTB+	Smear-Positive Pulmonary Tuberculosis
PTB-	Smear-Negative Pulmonary Tuberculosis
TB	Tuberculosis
TLCP	Tuberculosis and Leprosy Control Program
USSR	Union of Soviet Socialist Republic
WHA	World Health Association
WHO	World Health Organization

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Abstract

Tuberculosis control policies emphasize the importance of case finding and treatment, particularly of Smear-positive cases aiming at a cure rate of 85%. This is a Cross-sectional survey which was mainly aimed to estimate the magnitude of smear-positive pulmonary tuberculosis among Addis Ababa City Bus drivers and cash collectors. The specific objectives were to determine the proportion of all forms of tuberculosis among the bus drivers and cash collectors; to determine the proportions of smear-negative and extra-pulmonary TB cases, relapses, defaulters, and treatment failures among all types of the identified TB cases; to determine the proportion of registered Smear-positive TB cases among all the identified cases; and to look for trends in the magnitude of tuberculosis over the years. A total of 903 [466 (51.6%) Addis Ababa City Bus drivers and 437 (48.4%) cash collectors] aged between 19 and 59 years (mean age = 35.6 years) were screened for tuberculosis. Six hundred and forty (70.9%) were males and 263(29.1%) females. The study took place starting from December 28/2003 to March 15/2004. A pre-tested standardized questionnaire was used to collect socio-demographic characteristics and clinical information. All the study participants had a full physical examination and laboratory tests (sputum smear for AFB, chest x-ray, and FNA) were ordered for all suspected TB cases as recommended by the National Tuberculosis and Leprosy Control Guide line. EPI-INFO Version 6 and SPSS statistical packages were used for data entry and analysis. There were 12(1328/100,000) existing cases of tuberculosis and 4(442/100,000) newly diagnosed. The prevalence of Smear-positive pulmonary TB (PTB+) was 4/903(443/100,000) ($P > 0.05$). There was no significant difference with the proportion of smear-positive pulmonary TB cases in Wereda 16, Addis Ababa (189/100,000). The prevalence of all types of tuberculosis was 16/903(1772/100,000) ($P < 0.05$) as compared with the prevalence of notified cases in Addis Ababa in 2003(372/100,000). The proportion of Smear-negative pulmonary TB (PTB-) cases among all types of tuberculosis was 8/16(50%) ($P>0.05$) and the proportion of extra-pulmonary tuberculosis (EPTB) 3/16(18.8%) ($P> 0.05$). In Addis Ababa the two proportions were 33.4% and 33.01% respectively. The proportion of relapse TB cases was 1/16(6.25%). There was no association between the prevalence of tuberculosis and the various socio-demographic characteristics. All the identified cases were registered in health institutions where there were DOTS program ($P<0.05$). The trend of tuberculosis was **a**nalyzed starting from 1989 G.C. to 2003/04 G.C. There was no increasing or decreasing trend for all forms of tuberculosis, Chi-square test for trend for PTB+, PTB-, and EPTB were 1.86, 1.26, and 0.0635 respectively. Since our comparison group was not an appropriate one it was concluded that this study will help as a base line for future studies and it was recommended that further future studies will be required.

Key words: Tuberculosis, Case finding, Smear-positive, Smear-negative, Extra-pulmonary, Relapse, Defaulters, Prevalence, DOTS, Trend, Ethiopia.

1. Introduction /Background

Although a cure for tuberculosis was developed more than 50 years ago, Tuberculosis (TB) still remains one of the world's deadliest infectious diseases. Tuberculosis is among the top ten causes of global morbidity and mortality (1,2,3).

The Global incidence rate of TB is growing at approximately 0.4 % per year in sub-Saharan Africa and in countries of the former Soviet Union (4). Recently published estimates suggest that 32% of the world population have tuberculosis infection. About eight million new cases occur each year and between 2 to 3 million people die of TB each year. Over 95 % of new tuberculosis cases and deaths Occur in developing countries. TB kills 5,000 people a day. It is also a major killer of adult women (720,000 deaths/year), more than all causes of maternal mortality combined (2,3,5).

The World Health Organization (WHO) estimates that 80 % of all TB cases are found in 22 countries with India as number (one) and Ethiopia number (ten). The highest incidence and number of deaths occur in Asia and sub-Saharan Africa. The Case fatality rate exceeded 50 % in some African countries where Human Immuno Deficiency Virus (HIV) infection rates are high (5-8).

Studies conducted in Tanzania by the National Tuberculosis and Leprosy Program (NTLP) in collaboration with the World Health Organization (WHO) from 1991 to 1998 clearly showed that the HIV epidemic has had strong influence on TB incidence in the country (9).

Tuberculosis control policies emphasize the importance of case finding and treatment, particularly of smear-positive cases, aiming a "cure" rate of 85%. High cure rate is seen as the key priority. Incomplete treatments add to the pool of infectious cases and increasing drug-resistant TB (5, 10).

TB notification rates in the 1990s have doubled or tripled in some African countries such as Malawi, Tanzania and Zimbabwe in as short a period as 10 years. This prompted alarmist views of what could be done in this region (10). In 1991, a paper reviewed the TB situation. At the time, 1.7 billion people, i.e. a third of the human population, were estimated to be infected with the tubercle bacillus. At the same time, less than 15 countries world wide were capable of reporting on treatment out comes, less than half of TB cases were covered by proper treatment services, and less than half of the cases treated were cured. These estimates clearly required a new global strategy to address TB control. WHO embarked on the promotion of an approach that was successfully implemented by K. Styblo of the International Union against Tuberculosis and Lung Diseases (IUATLD) in some of the poorest African Countries, like Tanzania and Malawi. The approach was based on the concepts expressed in the 9th Report of the WHO expert committee on TB that met in December 1973 (11). Styblo first implemented the theoretical approach in Tanzania, perfecting it with the addition of the practical tools necessary to evaluate programming performance. The request showed that, even in a very poor country it was possible to achieve high cure rates. Inspired by these observations, WHO requested all countries to focus on cure rates and achieve 85% (12).

Starting from about 1999, several organizations working on tuberculosis control joined hand and formed the stop TB initiative. This initiative was created to Expand and nurture the new international partnership of agencies, institutions, organizations and groups involved in TB control. Simultaneously, efforts were increasingly directed towards two major constraints, the HIV/TB co-epidemic and the rise of multi-drug resistant tuberculosis (MDR-TB). The Global Directly observed treatment, short course Expression Plan (GDEP) launched in 2001 by WHO, promotes the establishment of National coalitions between country programs and local and international partners and creation of long-term directly observed treatment, short course (DOTS) expansion plans with countries, and development of regional coalitions addressing the needs of all countries (2,13).

In **Ethiopia,** TB is a disease of major public health Importance. Unfortunately, due to low health service coverage and poorly developed health information system, the actual magnitude of the tuberculosis problem has not been accurately determined. However, during the period from 1985 to 1994, the number of reported TB cases increased from about 70,000 to 100,000 (2). Currently TB is among the leading causes of outpatient visits to health institutions. In the absence of a well-developed tuberculosis service and information system, tuberculin surveys are helpful in estimating incidence and prevalence rates of TB cases (2,4). Tuberculin surveys serve this purpose best when repeatedly undertaken in at regular intervals for example every 5-10 years among non BCG vaccinated children of the same age group. Since such repeated surveys are not available in Ethiopia, estimates of the disease magnitude are still made based on the tuberculin survey that was conducted in 1987-1990. The survey showed an average annual risk of infection (ARI) of 1.4% (2).

This paper aims to assess the prevalence of tuberculosis among Addis Ababa City bus drivers and cash collectors. Because of overcrowding and poor ventilation in the buses especially in cities like Addis Ababa, it is assumed that there is a great chance of day to day transmission of tubercle bacilli from infectious pulmonary TB case to other healthy people. The best example for transmission of TB due to overcrowding and poor ventilation is tuberculosis in prisons. The level of TB in prisons, for example, has been reported to be up to 100 times higher than that of the civilian population. Cases of TB in prisons may account for up to 25% of a country's burden of TB. Late diagnosis, overcrowding, poor ventilation and inadequate treatment encourage the transmission of TB infection (14). City bus drivers are assumed to be both Vulnerable to acquire infection from other infectious pulmonary TB patients and also to transmit infection if they themselves are infectious PTB cases. The investigators didn't come across any study done concerning tuberculosis in this occupational group. Thus, the study helps in filling information gap and as a baseline for future studies. It is also helpful to forward recommendations like the need for regular screening of this occupational group.

2. Literature review

2.1. Infection and Transmission

Tuberculosis (TB) is a bacterial disease caused by *Mycobacterium tuberculosis* (and occasionally by *Mycobacterium bovis* and *Mycobacterium africanum*). These organisms are also known as tubercle bacilli or acid fast bacilli (AFB). The source of infection is a person with TB of the lungs who is coughing. An individual's risk of infection depends on the extent of exposure to droplet nuclei and his susceptibility to infection. Once infected with *M. tuberculosis,* a person stays infected for many years, probably for life. The vast majorities (90%) of people without HIV infection who are infected with *M. tuberculosis* do not develop tuberculosis disease. Without treatment, after 5 years, 50% of PTB patients will be dead, 25% will be healthy, self cured by strong immune defense and 25% will remain chronic infectious TB cases (2).

The type of disease that a person develops is related to the age of that person. Children will mainly develop smear-negative and extra- pulmonary tuberculosis, whilst adults will develop all forms but mainly smear positive pulmonary tuberculosis. In the past an estimated 85% of post-primary TB cases were pulmonary disease with the remaining 15% extra-pulmonary cases. Less than half of the total cases are highly contagious i.e. smear positive pulmonary tuberculosis, that means shedding large amounts of bacilli in the sputum. To have a 95% probability of identifying *M. tuberculosis* bacilli on microscopy, 100,000 bacilli per ml of sputum sample is needed. Studies in Tanzania and Kenya involving 9000 TB patients visiting a primary health care facility before the HIV epidemic showed that: 90% presented with pulmonary TB, 78% had positive sputum smears and 66% had cavitations on the chest X- ray (15, 16).

A health institution based cross-sectional study that was carried out in Shashemene town, southern Ethiopia between September, 1993, and January, 1994, to determine the sero-prevalence and the clinical impact of HIV among newly diagnosed tuberculosis patients indicated that extra-pulmonary disease both alone and in combination with parenchymal lung disease, was strongly associated with HIV infection (OR = 3.92; 95% CI: 1.49, 9.7) (P< 0.05). The lungs were, however, the commonest site of the disease in both HIV positive and negative patients (17).

2.2. High risk groups

Persons dually infected with HIV and TB are at a high risk to develop active tuberculosis disease. A dual epidemic thus arises in those situations where the populations infected by HIV and TB overlaps. This is the case in sub-Saharan Africa where the populations infected with TB and HIV is largely the same, in particular the Adult populations in the reproductive age group (15-49 Years). Women are particularly at risk. The female spouse or family member is likely to be the major caretaker of people living with HIV/AIDS (PLWHA) with tuberculosis (particularly if she is HIV positive herself (6).

Hospital workers are at increased risk both for tuberculosis and HIV infection (blood) because of the nature of their work. All high-risk populations for HIV/AIDS in sub-Saharan Africa are at increased risk for tuberculosis, particularly if they live in crowded quarters. Such groups include military and police living in barracks, prisoners and their wardens, Sex workers, people with multiple sex partners, immigrant workers away from their families, truck drivers, children of HIV mothers (11, 15).

TB and HIV

"TB/HIV is a deadly combination and needs to be tackled with an approach treating the whole person" said Dr. LEE Jong-wook, Director General of the World Health Organization. "With effective treatment, TB can be cured, HIV managed, and the health of millions of people preserved" (18).

The World Health Organization (WHO) announced today a plan to expand collaboration between national tuberculosis and HIV/AIDS programs to curb the growing pandemic of TB/HIV co-infection, with a principal focus on Africa where 70% of the world's 14 million people who are co-infected live (18).

A key element will be to rapidly expand voluntary HIV counseling and testing in TB programs, with the aim of identifying and referring more than half a million TB patients who are HIV positive for Anti retro-viral (ARV) treatment in the next two years. With additional training for health workers, TB programs will also assist in HIV prevention, ARV distribution and patient care (18).

Even more exciting for the future it emerged that TB/HIV collaboration can help in reaching the "3 by 5" target - 3 million PLWHA on anti retroviral treatment by 2005. Already, more than 300,000 people with HIV are diagnosed with TB each year in Africa alone, and an estimated 400,000 more cases are not yet identified or notified by national programs, all these patients were offered HIV testing and counseling they would, without doubt, constitute the largest single group eligible for ARV treatment (19).

2.3. The TB Epidemic

The last decade has been characterized by a new understanding of the global tuberculosis (TB) epidemic and acceleration in TB control efforts worldwide. Many key events took place in the 1990^{s} and this resulted in intensified action in endemic countries towards the control of TB (9).

In 1992, less than 20 countries were implementing a sound TB control strategy. At the same time, TB was being resurrected as a major public health problem world-wide after two decades of neglect. Awareness of upward trends in the industrialized countries and MDR-TB outbreaks in large cities were driving forces behind the re-emergence of TB in the international health agenda. New evidence, and consequent estimates, suggested that the situation in developing countries, especially in sub-Saharan Africa, was deteriorating rapidly. Similarly major increases were observed in the former USSR. It was estimated that some 7-8 million new cases and 2-3 Million deaths were occurring annually in the world (8).

2.3.1. Global situation in 2002

At the beginning of the new millennium, the stop TB partner ship is still facing a formidable challenge. The latest set of estimates suggested that 8.2 million new TB cases occurred world wide in the year 2000 (8, 20). The sub-Saharan African countries have the highest incidence rates, with an average for the region of about 300 per 100,000 populations, however, in absolute terms, 60% of all cases were in Asia. More than 1.8 million deaths occurred in the same year, and more than 95% of those were in developing countries.

Twenty-two countries suffered 80% of the global case burden and are priority for action if the global 2005 targets are to be achieved (7, 8) (Table 1).

To face this situation, there has been a remarkable expansion of the DOTS strategy during the last decade. The latest information shows that in 2000, 148 out of 210 countries and territories had adopted DOTS, and that 55% of the human population lived in areas where DOTS was potentially available (7, 8). Essentially, all of the 22 highest burden countries were implementing DOTS, although with different coverage ranging from 7% in Brazil to 100% in countries such as Kenya, Tanzania and Uganda (7). However, this rapid adoption of DOTS has not necessarily meant full geographical coverage in all settings, nor has it fully translated into universal access to services ready to manage TB patients appropriately. Today only Vietnam is consistently reaching the targets, while Peru, the other high-burden country that reached the targets, left the high-burden country list in 2000 (7, 8).

However, most of the 22 high-burden countries, especially the largest ones, have neither achieved full service coverage nor more importantly the World Health Assembly (WHA) targets. India has expanded impressively between July 1998 and mid-2002, reaching coverage of nearly half a billion. However, more than half of its population (9% of the global population) is still to be covered with DOTS. In the case of China, about one-third of the population (7% of the global population) still needs to be covered. There are also high-burden countries which still cover less than 20% of their population; these include Pakistan, Russia, Brazil and Afghanistan (Table 1).

Table 1. The 22 highest-burden countries responsible for 80% of the global TB incidence, cumulative incidence, percentage of population covered by DOTS in 2000, and case detection rate under DOTS in 2000.

No	22 High Burden Countries	Cumulative Incidence (%)	Population Covered in 2000 (%)	Case detection rate under DOTS in 2000 (%)
1	India	21	30	11
2	China	37	68	33
3	Indonesia	44	98	19
4	Nigeria	48	47	12
5	Bangladesh	51	92	24
6	Ethiopia	54	85	29
7	Philippines	57	89.6	45
8	Pakistan	60	9	3.0
9	South Africa	63	77	67
10	Russian Federation	65	12	2.7
11	Dr. Congo	67	70	51
12	Kenya	68	100	43
13	Vietnam	70	99.8	80
14	Ur. Tanzania	72	100	45
15	Brazil	73	7	0.8
16	Thailand	74	70	46
17	Uganda	75	100	50
18	Myanmar	76	77	48
19	Mozambique	77	100	40
20	Cambodia	77	99	44
21	Zimbabwe	78	100	52
22	Afghanistan	79	15	9.2
	Total	**79**	**55**	**26**

Source- Mario C. Raviglione. The TB epidemic from 1992 to 2002, Tuberculosis (2003), 83, 4-14.

2.3.2. Barriers to effective DOTS implementation

Several misconceptions about Tuberculosis Control threaten to undermine the success of DOTS. These issues are directly relevant to developing countries but are also relevant for industrialized countries as well (21).

Misconceptions

The first misconception is that treatment observation is unnecessary. DOTS regimens using the same drugs without direct observation achieve close to 30% lower rates of treatment completion than programs that observe treatment. Direct observation of treatment also prolongs survival among tuberculosis patients infected with HIV; treatment regimens with direct observation have achieved survival rates of more than 85% compared with 56% among those without direct observation (21, 22).

The second misconception is that health sector reform will inevitably strengthen, or at least weaken tuberculosis control. The managerial framework for tuberculosis control has been the focus of debate over the past 50 years. Currently, there is some degree of consensus that specialized oversight and integration of patient care services are not mutually exclusive. Health sector reform provides both opportunities and risks for DOTS programs (21).

A third misconception is that multi-drug resistant tuberculosis (MDR-TB) is the top priority. This point should not be misunderstood. Treatment of drug resistant tuberculosis is clearly an important component of tuberculosis care. And the fact that multi-drug resistant tuberculosis can be cured is truly wonderful. Every patient deserves the right to be cured and to live free of

tuberculosis. To the extent that this can be done it should be done. However, the misconception is to treat MDR-TB cases without addressing the root causes of MDR-TB (21).

The vast majority of TB cases globally are not multi-drug resistant. WHO estimates that out of the 8 million new cases of TB each year, at most 2% were multi-drug resistant (23).

The fourth misconception is that concerns about sustainability Justify inaction. Sustainability is seen as the ability to guarantee continued indefinite funding for a program from the outset. However, some tasks must be started even if their completion is not in sight. We could not have predicted 10 years ago that drugs and microscopes would now cost a small fraction of what they did then (21).

Institution based descriptive cross-sectional study that was carried out to assess the knowledge, attitude and practices of tuberculosis patients and their care takers in two health institutions of Bahir Dar zone in 2002, showed that the level of knowledge of tuberculosis among TB patients and their care takers was low. Only 31.6% of the respondents scored higher overall knowledge score. Overall attitude of the respondents was found to be unfavorable to the control of tuberculosis. Only 15% care takers and 14% of patients had favorable attitude to the follow up and control of the spread of tuberculosis (24).

Ethiopia

Table 2. The burden of TB in Ethiopia.

Population	**70,700,000**
Global rank (by estimated number of cases)	10
Estimated incidence (all cases/ 100,000 Population)	292
Estimated incidence (new SS+/ 100,000 Population)	123
Estimated % of adult (15-49) TB cases HIV +	42
Estimated incidence % of new cases multi drug resistant	2.3

- **Source –** WHO. Global Tuberculosis Control – WHO Report.

Case detection and treatment

The reported DOTS coverage in Ethiopia was adjusted from 85% in 2000 to 70% in 2001. This follows a more detailed assessment of coverage, and is not due to a decrease in the provision of DOTS. In 2001, DOTS was in place in parts of 47 out of 66 zones but, now that zones play a lesser role in TB control, coverage was determined by wereda; 522 out of 605 weredas provide DOTS in at least one health facility (3, 5).

Nation wide, nearly 4000 more cases were detected in 2001 than in 2000, of which 2,500 were smear-positive. Poor access to health facilities probably explains the low, if slowly increasing, case detection rate (42% for 2001) (3, 5).

The proportion of notified pulmonary cases that are smear-positive has increased steadily from 27% in 1997 to 36% in 2001, suggesting that diagnosis is improving, although the proportion is still lower than expected. The treatment success rate is also increasing, from 72% of patients registered in 1997 to 81% of patients registered in 2001 (21).

Progress in TB control in Ethiopia

Indicators

- Treatment success 2000 cohort 81%
- DOTS detection rate 2001 42%
- Proportion TLCP budget available 98%
- Proportion government health expenditure used for TB 1.6%

Table 3. Trends in TB control in Ethiopia

Trends	**1998**	**1999**	**2000**	**2001**
DOTS population coverage (%)	64	63	85	70
Notification rate (all cases/100,000 Population)	116	117	145	147
Notification rate (new SS+ cases /100,000)	31	35	48	51
Case detection rate (new SS+ %)	28	30	41	42
DOTS detection rate (new SS+, %)	28	30	41	42
DOTS treatment success rate (new SS+, %)	74	76	80	-

Source:- WHO. Global Tuberculosis Control–WHO Report, 2003,http//www.who.int/gtb/publications/globrep/pp 76-78.

In Addis Ababa, A rapid survey to determine the prevalence of Smear-positive pulmonary tuberculosis was conducted in May 2001. Four kebeles in a typical district of Addis Ababa (Wereda 16) were randomly selected. A total of 12,149 individuals were screened, of whom 173 had symptoms suggestive of TB. Twenty-three were positive for AFB (189/100,000) (2). This prevalence (189/100,000) of PTB+ cases is taken for comparison purpose of this research as the investigators didn't come across any study done among Addis Ababa city bus drivers and cash collectors or other occupational groups with regard to tuberculosis.

In 2003, the total notified cases of tuberculosis in Addis Ababa was 13,015 (372/100,000) out of which 3,879 (29.8%) were new smear positive PTB, 394 (3.03%) relapse cases, 27(0.2%) treatment failures, 40(0.3%) defaulters, 4,378(33.6%) smear-negative pulmonary TB, and 4297(33.02%) Extra-pulmonary TB cases (25).

3. Objectives of the Study

3.1. General Objective.

To estimate the proportion of smear-positive pulmonary tuberculosis among Addis Ababa city bus drivers and cash collectors.

3.2. Specific Objectives

1. To determine the proportion of all types of tuberculosis cases through active case finding of all forms of tuberculosis among Addis Ababa city bus drivers and cash collectors.

2. To determine the proportion of registered smear-positive pulmonary tuberculosis cases among Addis Ababa city bus drivers and cash collectors through records: historical, retrospective and passive case detection.

3. To determine the proportion of relapses, defaulters or treatment failures for TB among Addis Ababa city bus drivers and cash collectors: historical, record review.

4. To look for trends in active tuberculosis over the last five years.

4. Hypothesis

The proportion of smear positive tuberculosis among Addis Ababa City bus drivers and cash collectors was the same as the estimated proportion of smear positive tuberculosis in Wereda 16: a typical district of Addis Ababa.

5. Materials and Methods.

5.1. Study Design:- Cross sectional survey.

5.2. Study area: - Addis Ababa City Bus Organization. It is located in the Eastern part of Addis Ababa, near Imperial Hotel. It is also the main Garage for the organization. The other garage is located around shegole, in the western part of the city. The clinic is located in the main garage. It is staffed with one Health officer, four nurses working in two sessions, one laboratory technician, and one health assistant working in the dispensary. The clinic has three examination rooms. It gives basic health services for all workers in the organization. It refers patients to Zewditu Hospital and Ras Desta Hospital when it is needed for medical, surgical and other reasons

5.3. The study population

The total number of bus drivers and cash collectors was 1,664. There were 93 bus routes in the city that were covered by a total of 416 buses. One bus driver and one cash collector were working on each bus at a time in two sessions (in the morning and in the after noon).

All bus drivers and cash collectors were included in the study. This was because, the purpose of the study was an active case finding of all forms of tuberculosis. Since the prevalence of tuberculosis is measured in terms of 100,000 populations, we would get a sample size of only three people if we used the proper sample size calculation for a target population of less than 10,000. A total of 903 bus drivers and cash collectors were screened for tuberculosis.

5.4. Description of the study design.

The responsible people of city bus administrative office were contacted. The aim of the study was discussed and they were asked for cooperation to facilitate the study process. Information about the total number of city buses, the number of routes and the corresponding numbers of buses along each route was obtained.

The aim of the survey was to identify all types of tuberculosis cases during the data collection process. Steps included:

- Suspected cases were identified based on symptom history and physical examination, as recommended by the National Tuberculosis and Leprosy Control Program (NTLCP) Guideline. All the study subjects were interviewed with regard to socio-demographic characteristics and clinical information was obtained by symptom history. All study subjects did have a full physical examination.
- Cases of tuberculosis were confirmed by laboratory tests (Sputum microscopy, chest x-ray, fine needle aspiration (FNA)/biopsy) based on guidelines given by NTLCP manual.
- Ongoing (existing) cases were identified based on the current history of anti- tuberculosis drug intake. Further confirmation was attained by personal record review (personal follow-up card). Disease classification was also confirmed by record review.

5.5. Types of data collected

Data was collected starting from the end of December, 2003 up to the middle of March, 2004. All types of tuberculosis cases were identified based on history of anti tuberculosis drug intake (for those cases who were already diagnosed), symptom history, physical examination and laboratory tests (for suspected cases).

A pre-tested standardized questionnaire, which was translated into Amharic, was used to collect socio-demographic and clinical information. Pre-testing on 20 bus drivers and cash collectors that were not included in the study was exercised. Two physicians who were working at St. Peter TB specialized Hospital and the principal investigator examined all the 903 study subjects. The questionnaires were regularly checked for consistency and clarity upon collection by the principal investigator. Three sputum samples were collected for suspected pulmonary TB cases for AFB stain as recommended by the NTLCP guideline, i.e. if a study subject comes with 1) a history of persistent cough for three weeks or more, 2) productive cough with or without blood stained sputum and shortness of breath and chest pain, 3) loss of weight, intermittent fever, night sweats, loss of appetite, fatigue and malaise. If two or all the three samples turned to be positive for AFB, the patient was considered as smear-positive pulmonary TB case and was treated accordingly. If all the three sputum smears were negative, the patient was given non-specific broad-spectrum antibiotic for 7-10 days. He was then reviewed after 2-4 weeks and if there was no improvement, sputum smears were repeated three times. The finding of one positive sputum result was then considered as smear-positive pulmonary tuberculosis. If all smears were negative for AFB, and if the Chest X-ray result was suggestive of TB, the patient was considered as a case of smear-negative pulmonary tuberculosis (Note: Chest X-ray was ordered for all suspected cases). The questionnaires, clinical notes and laboratory records were checked at the end of each examination for consistency and clarity. All the identified cases were properly recorded and reported.

Sputum samples were collected for all suspected cases using sputum cups. The cups were always ready at each visit, in the city bus organization clinic. One spot sample was taken at the first contact and the second was collected overnight and the third on the spot. All suspected cases

were given a cup to take home for the second sample and strictly informed to bring it in the next morning for those working in the afternoon. For those working in the morning, the administrative people were pre-informed for co-operation during the general discussion so that the study subjects were allowed to discontinue work for 30 minute to an hour. Medical certificate was used at this level. All the cups were checked for correct labeling.

Fine needle aspiration (FNA) was requested for lymph node swelling and pleural fluid when clinical examinations were suggestive of tuberculosis. The patient was informed of the benefit of the procedure, which was essential for starting treatment. The pathologist at Armauer Hansen Research Institute (AHRI), who had several years of experience in the technique, collected the FNA. The cytological diagnosis was also made by this senior individual. Laboratory test was free of charge.

Excel 2000 statistical package was used to draw the Graph which we used to see the trend of tuberculosis over the past five years.

5.6. Data Processing and analysis.

Data entry and analysis was made using EPI-INFO version 6 and SPSS version 10 computer statistical packages. Test of hypothesis for a single population proportion was used to estimate the prevalence of the different types of tuberculosis. The results were considered statistically significant at $P \leq 0.05$. Odds ratio and confidence interval were used to measure the strength of associations between tuberculosis and various socio-demographic variables. Chi-square test was applied whenever necessary, for example, chi-square test for trend was used to look for changes in the prevalence of tuberculosis over the years.

6. Variables measured

6.1. Independent variables:

Socio-demographic characteristics: age, sex, housing condition, job type (bus driver or cash collector), number of family members, educational status

Clinical data: previous history of TB, contact with a chronically coughing person or a known TB patient,

6.2. Dependent variables: Presence of all forms of tuberculosis: - PTB+, PTB-, Extra-pulmonary tuberculosis, Relapse, Defaulters, treatment failures

7. Operational Definitions. (Reference- Tuberculosis and Leprosy Control Program (TLCP) guidelines)

PTB suspect case: - a person who had a "persistent productive cough for three weeks or more. Suspect cases for other types of tuberculosis followed the NTLCP guidelines based on signs and symptoms.

Smear-Positive PTB: - was diagnosed when there were two positive results of smear microscopy for AFB or one sputum smear-positive and suggestive chest x-ray finding.

Smear-negative PTB:- 1) a patient with three initial smear examinations negative for AFB by direct microscopy, 2) no response to broad spectrum antibiotics, and 3) three smear-negative examinations by direct microscopy for the second time, 4) radiological abnormality consistent with PTB.

EPTB: - TB in organs other than the lungs proved by histo-patological evidence of biopsy or FNA from an extra - pulmonary site.

New Case: - A patient who was for the first time be diagnosed for tuberculosis or had been on treatment for less than 4 weeks.

On going Case: - Any TB patient who was found taking anti TB treatment.

Relapse: - A patient declared cured or treatment completed of any form of TB in the past, but who was found to be smear positive.

8. Available Facilities

Sputum smear was performed at the city bus organization clinic that has a skilled laboratory technician and sputum culture was sent to Ethiopian Health and Nutrition Research Institute for one smear-positive case that was newly diagnosed for AFB. Fine needle aspiration (FNA) was performed for one patient at Armauer Hansen Research institute (AHRI). Chest X-ray was done at "Selam" clinic in the vicinity of the Organization. A Radiologist at AAU-MF interpreted the result for the second time for quality assurance.

9. Ethical Consideration

The city bus administrative office was informed of the purpose of the study and the benefit that the organization gets from the final result. The purpose of the study was informed for all study subjects, i.e. a written paper was distributed to all bus drivers and cash collectors through the administrative office although it was difficult to confirm the required coverage. They were particularly informed that 'having tuberculosis' doesn't mean that a patient has HIV infection. This is because many laymen are associating TB with HIV/AIDS. Efforts were made to convince them that TB was present long time before HIV/AIDS, and tuberculosis is curable once it is diagnosed. They were thoroughly informed about what suspicion of tuberculosis means, about the nature of clinical and laboratory examinations e.g. that they are not going to be investigated for HIV, the benefit of the treatment outcome if TB was diagnosed (i.e. TB is curable if properly

treated and is a killer disease if not treated). They were also informed to be confident that they would not lose their job if diagnosed to have tuberculosis. Patients were also informed that every clinical examination, laboratory tests and treatment were free of charge and it would be beneficial to have such examinations so that he/she knew his/her disease status. Any patient who was found to be a case of tuberculosis was referred to his/her respective clinic where there is tuberculosis control program. The patient was also informed that no HIV screening would be done but if he/she wanted to have the screening, he/she was given a voluntary counseling and testing (VCT) card that was freely available from Bete-Zata clinic. Every precaution was taken to respect the privacy of the patient and to keep confidentiality. Addis Ababa health Bureau was the facilitator of the project. Arrangements were made to have easy access of study subjects. The Ethical committee of the Department of Community Health, AAUMF and AHRI reviewed and approved the study.

10. Results

The total number of City Bus drivers and cash collectors was 1,664 (832 bus drivers and 832 cash collectors). A total of 903: 466(51.6%) city bus drivers and 437 (48.4%) cash collectors aged between 19 and 59 years (mean age =35.6 years) were screened for tuberculosis making a non-response rate of 45.7%. But the non-responses were similar with regard to their socio-demographic characteristics. Among the bus drivers there were only 2(0.2%) females and the majority, i.e. 464 (99.8%) were males. The majority of the cash collectors, [261(59.7%)] were females with the remaining being males, 176(40.3%). Thus, the higher proportion of the study participants was constituted by males. With regard to ethnicity, the majority [529 (58.6%)] were from the Amharas followed by Oromos (23.3%). The minorities were from ethnic groups like Wolaita and Kembata (4.2%). When we consider marital status, the majority of the workers, 562(62.2%) were married followed by 305(33.8%) who were single. Only 8(0.9%) workers were widowed. With regard to educational status, only 2(0.2%) workers were illiterate. A high proportion of the workers, 694(76.9%) were between 7-12th grades. A large proportion of the workers, 489(54.2%), worked for five years and above with in the organization. Considering the number of family members, 758(83.9%) had three or more family members including them selves and this group constituted the largest proportion. The other two groups, i.e. those 69(7.65%) who live alone and others, 76(8.4%) who had two family members constituted nearly a similar proportion. (Table 4). Among the 213(23.6%) workers who gave history of contact with a known TB patient or a chronically coughing person, 18(8.4%) had history of previous tuberculosis themselves and 3(1.4%) were currently taking anti-tuberculosis drugs.

Table 4. Socio-demographic characteristics of Addis Ababa city bus drivers and cash collectors

Variables	Frequency
Age group	
19-34	406(45.0%)
35-49	430(47.7%)
50-65	66(7.3%)
Sex	
Males	640(70.9%)
Females	263(29.1%)
Occupational status	
Bus drivers	466(51.6%)
Cash collectors	437(48.4%)
Ethnicity	
Amhara	529(58.6%)
Oromo	210(23.3%)
Gurage	73(8.1%)
Tigrai	52(5.8%)
Others	38(4.25)
Marital status	
Married	562(62.2%)
Single	305(33.8%)
Widowed	28(3.1%)
Divorced	8(0.9%)
Educational Status	
Illiterate	2(0.2%)
Read and write	4(0.4%)
1-6th Grade	72(8.0%)
7-12th Grade	694(76.9%)
Above 12th Grade	131(14.5%)
Duration of employment	
<1 year	141(15.6%)
Between 1-4 years	273(30.1%)
5 years and above	489(54.2%)
Number of family members	
Live alone	69(7.6%)
Two (including themselves)	76(8.4%)
Three and above	758(83.9%)
Contact with a known TB patient	
Yes	213(23.6%)
No	690(76.4%)

Among the sixty (6.7%) subjects who had previous history of tuberculosis, the proportion of males was twice as compared to the females [41(68.3%) Vs 19(31.7%) respectively],

(95% C.I. 0.49 – 1.64, OR=0.88). The proportion of the cases in the age group 19-34 and 35-49 years was nearly the same, (46.7% Vs 48.3%). Only 3(0.05%) cases were in the age group 50-65 years (P-value=0.77). With regard to occupational status, the majority, twenty-nine of them (48.3%) were bus drivers who were all males, and 31(51.7%) were cash collectors, 95% C.I (0.49 -1.64, OR=0.87). Considering contact history, eighteen (30.0%) of them gave prior history of contact with a known TB patient or a chronically coughing person (P-value>0.05). (Table 5).

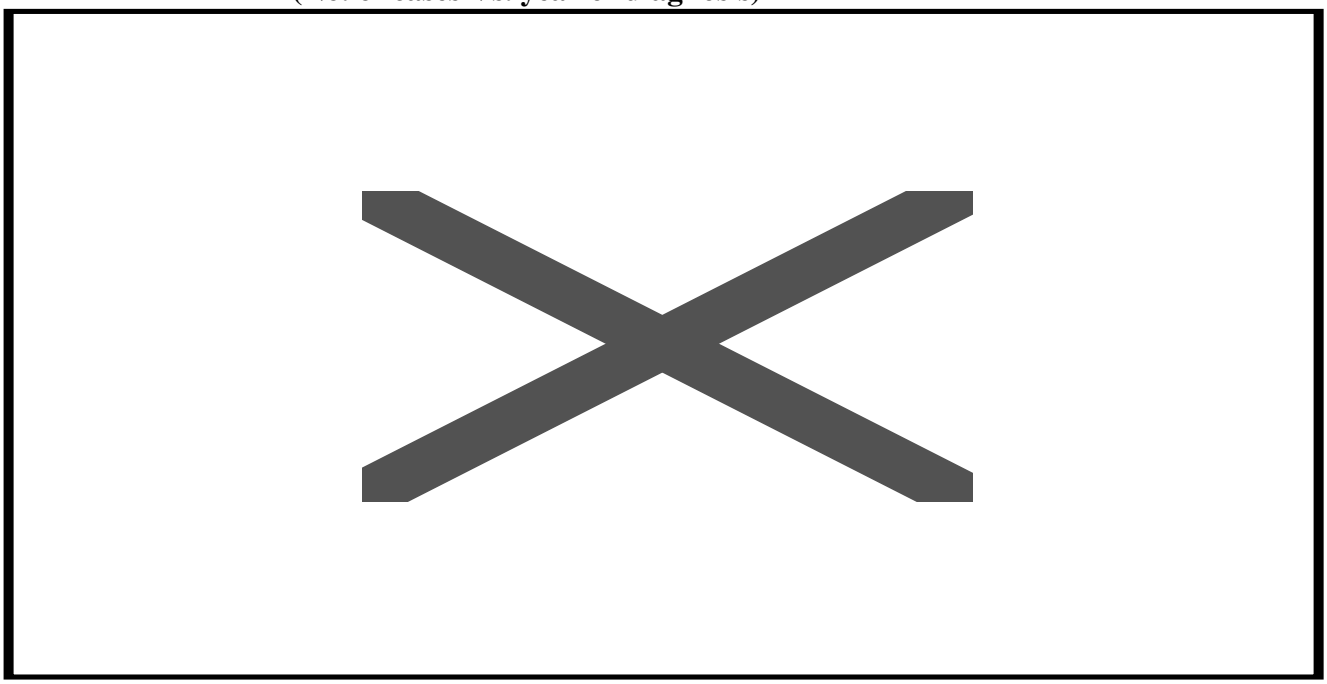
Table 5. Multivariate analysis between the presence of previous TB and different socio-demographic characteristics.

Variables	**Total (%)**	**OR**	**95% C.I.**	**P-Value**
Age Group				
19 – 35	33 (55.0)	1.46	073 – 2.90	0.29
36 – 60	27 (45.0)	1.00	1.00	
Sex				
Male	41 (68.3)	1.00	1.00	
Female	19 (31.7)	0.98	0.44 – 2.20	0.95
Ethnicity				
Amhara	10 (16.6)	1.00	1.00	
Oromo	4 (0.07)	1.80	0.99 – 3.30	0.06
Others	2 (0.03)	1.10	0.51 – 2.30	0.80
Marital status				
Married	8 (13.3)	1.00	1.00	
Single	7 (11.7)	0.81	0.40 – 1.63	0.55
Others	1 (0.02)	1.65	0.54 – 5.00	0.38
Occupation				
Bus drivers	29 (48.3)	1.00	1.00	
Cash collectors	31 (51.7)	1.10	0.48 – 2.70	0.76
Contact with a known TB Patient				
Yes	18 (30.0)	1.35	0.75 – 2.43	0.31
No	42 (70.0)	1.00	1.00	

Twenty five (41.7%) cases were diagnosed before January1/1999 G.C, 8(13.3%) between January 1/1999 to December 31/1999, 4(6.7%) between January 1/2000 to December 31/2000, 10(16.7%) between January 1/2001 to Deember31/2001, 7(11.7%) between January 1/2002 to December 31/2002, and 6(10.0%) between January 1/2003 to December 31/2003 (line graph). These cases included all types of tuberculosis.

The trend of all types of previous tuberculosis cases over the last five years

(No. of cases Vs. year of diagnosis)



Year of Diagnosis

Forty-nine (81.7%) had sputum test, out of which 22(44.9%) were told to have AFB in their sputum, 22(44.9%) were not told their sputum result, and 5(10.2%) did not remember. Twenty two of them (36.7%) had smear-positive pulmonary tuberculosis (PTB+), 17(28.3%) smear-negative pulmonary tuberculosis (PTB-) i.e. they were told that tuberculosis was diagnosed based on Chest X-ray findings, 6(10.0%) lymph node TB, 8(13.3%) other types of extra-

pulmonary TB(EPTB), 1(1.6%) defaulter, 2(3.3%) relapse and 2(3.3%) disseminated TB (Table 6). The type of TB for 2(3.3%) subjects with previous TB was unknown. The cost of clinical, laboratory exam and treatment before the patients were diagnosed for TB was covered by the patient in 22(36.7%) of the subjects, by the organization in 25(41.7%), and others in 13(21.7%). Detailed cost analysis to look for an impact of TB on the organization was beyond the scope of this study.

Table 6. Distribution of previous TB cases by type of tuberculosis.

Variables	**Frequency**	**%**
PTB+	22	44.9
PTB-	17	28.3
Lymph node TB	6	10.0
Other types of EPTB	8	13.3
Defaulter	1	1.6
Relapse	2	3.3
Disseminated TB	2	3.3
Unknown	2	3.3
Total	**60**	**100.0**

There were 12(0.3%) existing cases of tuberculosis, i.e. those who were taking anti-TB treatment. Seven (58.3%) were bus drivers and 5(41.7%) were cash collectors, (95% C.I, 0.37 - 4.86; OR=0.57). With regard to sex, seven (58.3%) were males and 5(41.6%) females, (95% C.I, 0.16-2.11; OR= 0.57). The majority, 7(58.3%) were married, followed by cases who were single,

4(33.3%), and only 1(8.3%) case was divorced (P-value>0.05). Three (25%) of them gave history of contact with a known TB patient or a chronically coughing person (P-value>0.05). The largest proportion [9(75%)] of the cases were educated between 7-12th grade with the remaining cases being between 1-6th grade and above 12th grade nearly at equal proportion [2(16.7%) Vs 1(8.3%) respectively] (P-value>0.05). With regard to signs and symptoms, 11(91.7%) cases presented with cough for greater than three weeks, all had fever and night sweats, 11(91.7%) had weight loss, 8(66.7%) chest pain, and 2(16.7%) cases had neck swelling. Sputum test was done for 8(66.7%) of the cases. Three cases (25.0%) had smear-positive pulmonary tuberculosis (PTB+), 6(50.0%) had smear-negative pulmonary tuberculosis (PTB-), 2(16.7%) Lymph node TB, and 1(8.3%) was a relapse case. With regard to the number of days away from work due to the illness, the majority of the cases, 6(50.0%) were away from work for 60-90 days followed by cases who were away from work for 30-60 days [(4(33.3%)]. The cost of clinical, laboratory tests and treatment was covered by the patient in 3(25.0%) of the cases, by the organization in 8(66.7%) and by others in 1(8.3%) of the cases. All of the cases were following their treatment from health centers having Directly Observed Treatment, Short Course (DOTS) (P<0.05). The reported DOTS coverage in Ethiopia in 2001 was 70%.

A total of sixteen, 7(43.7%) bus drivers and 9(56.3%) cash collectors, were found to have symptom complexes or signs of tuberculosis. Among these cases: 1(6.25%) had smear-positive pulmonary tuberculosis (PTB+), 2(12.50%) had smear-negative pulmonary tuberculosis (PTB-) and 1(6.25%) had extra-pulmonary tuberculosis (EPTB) specifically right-sided pleural effusion. One female who was suspected for lymph node TB was found to have Ectopic thyroid by fine needle aspiration. All of the suspected PTB cases had undergone sputum test and chest X-ray and

those cases that were not diagnosed to have PTB improved with broad spectrum antibiotic treatment. The identified existing cases of TB and the newly diagnosed ones comprise the point prevalent cases of tuberculosis (Table 7).

Table 7. Socio-demographic characteristics of prevalent cases of tuberculosis

Variables	Total	OR	95% C.I	P-Value
Age group				
19-35	7	0.78	0.26 – 2.31	0.81
36-60	9	1.00	1.00	
Sex				
Male	9	0.52	0.18 – 1.57	0.30
Female	7	1.00	1.00	
Occupation				
Bus drivers	8	0.94	0.32- 2.77	0.90
Cash collectors	8	1.00	1.00	
Marital status				
Married	8	1.00	1.00	
Others	8	1.66	0.56 – 4.92	0.44
Contact with a known TB Patient				
Yes	4	1.08	0.29 – 3.65	0.54
No	12	1.00	1.00	

The proportion of smear-positive pulmonary tuberculosis patients among Addis Ababa city bus drivers and cash collectors was 4/903 (443/100,000) as compared with the proportion of smear-

positive pulmonary TB cases in Wereda 16 (189/100,00) (P-value>0.05). These cases include the three ongoing cases and the one who was newly diagnosed during the data collection process.

The proportion of all types of tuberculosis among Addis Ababa city bus drivers and cash collectors was 16/903(1772/100,000) as compared with the proportion of all types of tuberculosis notified in Addis Ababa in 2003 (372/100,000) (P-value<0.05).The proportion of pulmonary TB cases among all other types of tuberculosis was 12/16(75.0%) (P> 0.05). In Addis Ababa this proportion was 8718/13,015(66.9%).

The proportion of PTB+ among all pulmonary cases was 4/13(30.8%) as compared with the proportion of PTB+ cases notified in Addis Ababa in 2003 (46.9%) (P > 0.05). The proportion of PTB- among all other types of pulmonary TB cases was 8/13 (61.5%) as compared with the proportion of PTB- cases notified in Addis Ababa in 2003 [4378/8718 (53.02%)] (P> 0.05). The proportion of EPTB cases among all types of tuberculosis was 3/16 (18.8%) as compared with the proportion of notified extra-pulmonary cases in Addis Ababa, [4297/13,015(33.01%)] (P-value>0.05).The proportion of relapse cases among all other types of tuberculosis cases was 1/16 (6.25%) compared to the proportion notified cases in Addis Ababa, 394/13,015(3.25%); (P>0.05).

The trend of PTB+, PTB-, and extra-pulmonary tuberculosis over the last five years could not be analyzed because of the small number of cases identified. So, the trend was analyzed starting from 1989 – 2003/04 G.C. (Table 8).

Table 8. The trend of the different types of Tuberculosis from 1989 - 2003/04 G.C.

year of Dx (G.C.)	PTB+	PTB-	EPTB	Others	Total
1989-1993	2	1	2	-	5
1994-1998	5	4	3	2	14
1999-2003/04	12	19	11	3	45
Total	19	24	16	5	64

Chi-square test for trend for smear-positive pulmonary TB patients was 1.86 ($P > 0.05$), for smear-negative PTB patients = 1.26 ($P > 0.05$) and for EPTB patients it was 0.0635 ($P > 0.05$).

11. Discussion

A total of 903 bus drivers and cash collectors were screened for tuberculosis, resulting in a non-response rate of 45.7%. It would have been good if all the bus drivers and cash collectors were willing to participate in the study.

The results of our survey indicated that the prevalence of smear-positive tuberculosis was 4/903 (443/100,000). A rapid survey to determine the prevalence of smear-positive pulmonary tuberculosis in Addis Ababa, Wereda 16, in May, 2001 indicated that the prevalence of PTB+ was 189/100,000 (2). Thus, our finding was consistent with this finding. Nevertheless our comparison which was a community based survey was not an appropriate one and the fact that we might have missed some cases who were either on treatment or who were symptomatic might have underestimated the true magnitude of smear-positive pulmonary tuberculosis. If the undiscovered cases of smear-positive tuberculosis were high, they might be additional cases that might be the source of infection to others.

It was difficult to analyze association of smear positivity with different socio-demographic factors because of the small number of cases identified.

The proportion of smear-positive pulmonary tuberculosis among all other types of PTB cases was 4/12 (33.3%). There was no difference from the proportion of smear-positive pulmonary tuberculosis cases notified in Addis Ababa in 2003, 3879/8718(44.5%) (25). During the pre-HIV era 85% of post-primary TB cases were pulmonary disease, with the remaining 15% being extra-pulmonary. Less than half of the total cases were highly contagious, i.e. smear-positive pulmonary tuberculosis (11, 15).

The proportion of all types of tuberculosis among Addis Ababa city bus drivers and cash collectors was 16/903(1772/100,000). This was comparably higher than the proportion in Addis Ababa in 2003, 13,015 out of 3.5 million populations (372/100,000) (25). Again, lack of appropriate comparison group might affect our findings. Otherwise, the reason why this finding was significant needs to be investigated.

The proportion of smear-negative pulmonary tuberculosis among all TB cases in our survey was 8/16(50.0%). This was a consistent finding in comparison with the proportion of smear-negative pulmonary TB cases notified in Addis Ababa, 4378/8718(50.2%). The limitation here was that diagnosis of smear-negative pulmonary tuberculosis was a challenge. This is true especially in areas where there is lack of diagnostic facilities like bronchoscope and broncho-alveolar lavage in addition to skilled man power. Due to this, there might be over diagnosis of smear-negative pulmonary tuberculosis.

In our survey, the proportion of extra-pulmonary tuberculosis cases among all other types of TB was 3/16 (18.8%). Thus, there was no difference between our finding and the proportion of extra-pulmonary tuberculosis cases notified in Addis Ababa in 2003, 4297/13,015(33.02%) (25). Studies have shown that the magnitude of extra-pulmonary tuberculosis is increasing due to HIV infection. A health institution based cross sectional study that was carried out in Shashemene town, southern Ethiopia between September, 1993, and January, 1994, to determine the sero-prevalence and the clinical impact of HIV among newly diagnosed tuberculosis patients indicated that the HIV positivity rate was higher for extra-pulmonary than pulmonary form of tuberculosis (OR = 3.80; CI: 1.49 - 9.7) (12).

The proportion of relapses among all other types of tuberculosis cases was 1/16(6.25%). Though, this figure was higher than the proportion of relapse cases notified from Addis Ababa, 394/13,015(3.03%), (25), there was no statistical difference between the two findings.

No other types of tuberculosis cases were identified during the data collection process. This could be due to the high non-response rate where we might have identified additional cases if all the study population was participating in the survey.

The trend of tuberculosis over the last five years was not possible to analyze because of the small number of cases identified. The trend was analyzed starting from 1989 G.C. up to 2003G.C. including the data collection phase, i.e. the first quarter of 2004 G.C. The trend was analyzed for smear-positive pulmonary tuberculosis (PTB+), smear-negative pulmonary tuberculosis (PTB-), and extra-pulmonary tuberculosis (EPTB). All other cases were excluded from the analysis. The results indicated that there were neither increasing nor decreasing trend of all types of tuberculosis.

The result also showed that there was no statistically significant association between the presence of previous history of tuberculosis (smear-positive, smear-negative and extra-pulmonary tuberculosis) and the various socio-demographic characteristics: age, sex, marital status, educational status, ethnic group, etc. It was also evident that there was no association between the diagnosis of all types of tuberculosis among the ongoing (existing) cases and the newly diagnosed ones and the various socio-demographic factors, but because of the small number of ongoing and newly diagnosed TB patients, the result might not be conclusive.

All the prevalent cases were followed-up at their respective health institutions where there was DOTS program, i.e. the registration rate was 100%. The reported DOTS coverage in Ethiopia was 70% ($P<0.05$).

Three ongoing cases were sent to Betezata clinic for voluntary counseling and testing.

In general, our comparison group was not appropriate because of the fact that our survey was done in one occupational group where as the comparison group was community based. The prevalence of tuberculosis is a useful epidemiological index for measuring the magnitude of the TB problem. It provides useful information for planning a rational control program and for monitoring progress. However, in developing countries such information is lacking; the reporting system is poorly developed, diagnostic criteria are usually non-standardized and many cases go undetected. Ethiopia is no exception; notification of pulmonary tuberculosis is poor, the diagnostic criteria vary and nation wide incidence rates are not available (2). As the case detection rate of TB in developing countries represents only a small fraction of the true incidence rates, Styblo explored an alternative way of estimating incidence, by examining the relationship between the ARI and the incidence of smear-positive pulmonary tuberculosis from many developing and industrialized countries. He found a linear-relationship between the ARI and the incidence of smear-positives that gives an estimate of 49 smear positive TB per 100,000 population for every 1% annual risk of infection (95% CI 39 – 59) (2).

Thus, it would have been appropriate if we got studies done in the same occupational group or other related occupational groups for a better comparison.

12. Strengths of the study

- There was an easy access to facilities like laboratory reagents and laboratory fee especially for chest x-ray.
- In this study the investigators have used a wide range of screening tests to diagnose the different types of tuberculosis.
- Statistical analysis for the proportions of the different types of tuberculosis was easy to manipulate even without using computer packages.

Limitations of the study

- Higher non-response rate could not be avoided which might have affected the validity of the study.
- Diagnosis of Smear-negative pulmonary tuberculosis requires specialized diagnostic facilities like bronchoscope and broncho-alveolar lavage which was impossible in this study.
- Our comparison group which was a community based survey was not an appropriate one.

13. Conclusions and Recommendation

- The prevalence of Smear-positive PTB was not significant.
- The prevalence of all types of TB was significantly high.
- The proportions of PTB-, EPTB, Relapse and defaulters were not high.
- There was not an increasing or decreasing trend of the different types of tuberculosis over the years.
- The DOTS coverage for TB patients was excellent with in the organization.
- It is recommended that this study will be helpful as a baseline for future studies as there was no study done among this occupational group in the past and our comparison group was not appropriate.

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Annex I.

Questionnaire and clinical format for study subjects on tuberculosis among Addis Ababa city bus drivers and cash collectors

1. Code Number _____Age_____
2. . Address: Region _____Wereda _____Kebele _____

House No._____

Section 1. Socio-demographic characteristics

No.	Questionnaire	Coding characteristics	Response
001	Sex	**1**. Male **2**. Female	
002	Ethnicity	**1** Amhara **2**. Oromo **3**. Gurage **4**. Tigrai **5**. Others	
003	Marital status	**1**. Married **2**. Single **3**. Divorced **4**. Widowed	
004	Educational status	**1.** Illiterate **2**. Read and write **3**. 1-6th grade **4**. 7-12th grade **5**. Above 12	
005	Type of work	**1** Bus driver**.** **2**. Cash collector	
006	Duration of employment	**1**. <1 year **2**. 1-4 years **3**. 5 years and above	
007	Where are you living?	**1**. My own house **2**. Rented house **3**. Government house (e.g. kebele)	
008	Number of rooms in the house	**1**. One **2**. Two **3**. Three and above	
009	Number of family members including yourself	**1**. Single **2**. Two **3**. Three **4**. Four and above	
010	Contact with chronic cougher or a known TB patient	**1**. Yes **2**. No	

Section 2. Identification of previous history of TB.

Name _____Health institution_____
Card No. (Registration Number)_____
Treatment follow up at_____
TB Registration Number_____
Treatment started on _____D _____M _____year

For questions 002-008, confirm with record review.

No,	Questionnaire	Coding characteristics	Response
011	Previous history of TB	**1.** Yes **2**. No	
	If yes, fill 012-020		
012	Year of diagnosis	**1.** .Jan 1/03 –Dec 31/03 **2.** Jan1/02 – Dec.31/02 **3**. .Jan.1/01 – Dec 31/01 **4. .**Jan.1/00 – Dec.31/00 **5. .**Jan.1/99 – Dec.31/99 **6.** .Before Jan. 1/99	
013	Did you have sputum test?	**1**. Yes **2**. No **3**. Don't remember	

014	If yes to Q. 013, AFB in the sputum	**1**. Yes **2**. No **3**. Not done **4**. Don't remember	
015	Did you have chest x-ray	**1**. Yes **2**. No **3**. I don't remember	
016	If yes to Q.015, involvement of the lungs	**1**. Right **2**. Left **3**. Both. **4**. None. 5. not known	
017.	Presence of cavities	**1**. Yes **2**. No **3**. not known	
018	For how long did you take the drugs?	**1** Eight months **2**. One year **3**. Six months **4**.defaulted **5**. I don't remember	
019	Type of tuberculosis	**1**. PTB (+) **2**. PTB (-) **3**. Lymph node TB **4**. Other EPTB **5**.defaulter. **6**. relapse **7**. Treatment failure	
020	Cost of clinical, laboratory exam and treatment covered by	**1**. The patient **2**. The organization **3**. Others	
021	Number of days away from work since the time of illness (including sick leave)	**1**. 1-29 days **2**. 30-59 days **3**. 60-90 days **4**. >90 days	

Section 3. Identification of ongoing (Existing) cases

Name_____ Diagnosis made at_____

Health institution_____

Card No. (Registration Number)_____

Treatment follow up at_____

TB Registration Number _____

Treatment started on _____D _____M _____year (Record review compulsory for 002 - 014).

No.	Questionnaire	coding characteristics	*Response*
022	Are you taking anti-TB drugs currently	**!.** Yes **2**. No	
	Symptom and signs before starting treatment		
023	Persistent cough for >3 weeks	**1**. Yes **2**. No	
024	Fever	**1**. Yes **2**. No	
025	Weight loss	**1**. Yes **2**. No	
026	Night sweats	**!.** Yes **2**. No	
027	Chest pain	**1**. Yes **2**. No	
028	Neck swelling	**1**. Yes **2**. No	
029	Others	**1**. Yes **2**. No	
030	Was sputum test done	**1**. Yes **2**. No	
031	If yes to Q. 030, AFB in the sputum	**1**. Yes **2**. No	
032	Was Chest X-ray done?	**1**. Yes **2**. No	
033	If yes to Q. 032, involvement of the lungs	**1**. Right **2**. Left **3**. Both **4**. None **5**. X-ray not available	
034	Presence of cavities	**1**. Yes **2**. No **3**. X-ray not available	
035	When did you start treatment?	_____	
036	Type of Tuberculosis (record review)	**1**. PTB(+) **2**. PTB(-) **3**. Lymph node TB **4**. Other EPTB **5**. Defaulter **6**. Relapse **7**. Treatment failure	
037	Number of days away from work due to	**1**. 1-29 days **2**. 30-59 days	

	illness including sick leave	**3**. 60-90 days **4**. >90 days _____	
038	Cost of clinical, laboratory exam and treatment covered by	**1**. Patient **2**. The organization **3**. Others	

Section 4. Identification of Suspected cases by history and physical examination.

No.	Questionnaire	Coding characteristics	*Response*
039	Cough for three weeks or more	**1**. Yes **2**. No	
040	Hemoptysis	**1**. Yes **2**. No	
041	Fever	**1**. Yes **2**. No	
042	Chest pain	**1**. Yes **2**. No	
043	Weight loss	**1**. Yes **2**. No	
044	Night sweats	**1**. Yes **2**. no	
045	Any body swelling	**1**. Yes **2**. No	
	Physical Examination		
046	Lymph node swelling on the neck	**1**. Yes **2**. No	
047	Other lymph node swellings	**1**. yes **2**. No	
048	Chest findings	**1**. Yes **2**. No	
049	Mass or fluid in the abdominal cavity	**1**. Yes **2**. No	
050	Localized bone swelling	**1**. Yes **2**. No	

N.B. Section 5 has no Amharic version since laboratory results are dealt by the physician only

Section 5. Laboratory results for suspected cases.

No.	Laboratory request	Coding characteristics	*Response*
051	Sputum smear for AFB	**1.** Positive **2**. Negative	
052	Chest X-ray findings (involvement of the lungs)	**1**. Right **2**. Left **3.** Both **4**. None	
053	Presence of cavities	**1**. Yes **2**. No	
054	FNA of swelling	**1**. Suggestive of TB **2**. Not suggestive	
055	Sputum culture for AFB	**1**. Positive **2**. Negative	
056	Drug resistance	**1**. To INH **2**. To Rifampicine **3**. Rifampicine **4**.Single drug other than INH and Rifampicine **5**. Others	

Name of the physician _____
Date of Interview_____
Signature of Interviewer_____