ORIGINAL ARTICLE

Knowledge, Risk Perception and Practice Regarding Tuberculosis Transmission among Long Distance Bus Drivers in Addis Ababa, Ethiopia: A Cross Sectional Study

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ABSTRACT

BACKGROUND: Window opening during bus transportation is recommended as a tuberculosis prevention strategy.Yet, drivers are affected by lack knowledge and risk perception of passengers and assistants. Boosting knowledge of and notifying the high risk of tuberculosis transmission for every passenger could be too costly. However, strategies targeting bus drivers as key agents unlike targeting all passengers might be less costly for window opening.

METHOD: Data were collected from November 18/2014 to December 21/2014 in inter-region bus stations of Addis Ababa using cross sectional study design. Samples of 306 participants were selected using simple random sampling, and data were collected through face-to-face interview. Data were entered into Epi-data version 3.1 andanalyzed using IBM SPSS version 21.

RESULT: From a sample of 306 bus drivers, 303 were interviewed. Nine in ten and nearly half of participants believed in the need for opening all windows and avoiding overcrowding of passengers as TB preventive measures respectively. Few bus drivers (7.3%) believed that bus drivers and their assistants could be at risk of tuberculosis. The majority (85.7%) of bus drivers opened side window the whole day without precondition. Hearing tuberculosis related information from radio was a promoting factor for tuberculosis preventive measures among bus drivers.

CONCLUSION: Tuberculosis preventive practices and knowledge of bus drivers seempositive (opportunities), despite their low risk perception (challenge). Using the opportunity, further empowering bus drivers to persuade passengers and assistants to open all the rest of the windows is needed.

KEYWORDS: Tuberculosis, Knowledge, prevention practices, bus drivers, Ethiopia

INTRODUCTION

In the globe, there has been major progress in reducing tuberculosis (TB) cases and deaths due to TB in the past two decades. TB declined at a rate of 2.2% between 2010 and 2011 (1) but at rate of 2% in 2012 (2). However, it remains the highest in Asia and Africa, especially in the South-East Asia regions and Sub-Saharan Africa (3-5). In 2013, of the total burdens of TB in the world, 56% and 25% were in South-East Asia and Western Pacific regions (6) and in Africa (7) respectively. In Ethiopia, tuberculosis is the major cause of death and hospital admission, and the country stands 7th among the 22 highest burden countries (1-4, 7).

Mycobacterium tuberculosis infection might be experienced/caught at home, workplace or during travel and the risk of infection depends on exposure frequency to a source case and the duration of the exposure (6). However, the risk of tuberculosis infection among peoplein congregated settings (like jail, prison, shelter, workplaces, school, child care center, nursing home, social club, rehabilitation facility, residential areas or treatment facilities) is much higher than the risk in the general population setting (8). This can be because of *"Indoors, tubercle bacilli are expelled into a finite volume of air unless there is ventilation and they may remain viable and suspended in the air for a prolonged period of time. Moreover, exposure time and density of infectious droplet nuclei are often, respectively, prolonged and high (6, 9)".*On the contrary, tubercle bacilli outdoors are rapidly dispersed and quickly become nonviable either by sunlight or even sky light, brief outside exposure and by chance (6, 10).

Bus transportation can be considered as congregated setting according to the definition given by World Health Organization (WHO), European Center for Disease Prevention and Control and New Jersey Department of Health and Senior Services (8, 11-13). This indoor congregated setting could highly facilitate tuberculosis, multidrug resistant (MDR-TB) and extensively drug resistant (XDR-TB) transmission, if all windows of the bus are closed and passengers are overcrowded during travel (14). Window opening (adequate ventilation) in confined spaces or congregate settings was recommended to prevent tuberculosis and other infectious diseases transmitted by respiratory mode (15-21). Public ground transportations or bus transportation mode can be considered as one of the typical congregated settings. Window opening can serve as a potential tuberculosis preventive strategy in this case (14) .

Most of the Ethiopian population use mass road transportation modes to travel from one corner of the country to the other. Of these, bus transportation is the most common modality to travel long distances within the country (22-25). Similarly, 47.2% of the federal roads are paved (asphalt) (26), and most of the buses depart from inter-region bus stations of Addis Ababa, the capital city of Ethiopia, to different regions within the country use paved road. Most of the buses in Ethiopia are characterized by lack of automatic ventilation system. They rather have windows which can be manually manipulated by passengers and drivers. Every bus has one window for 2-3 seats for passengers and one side window for the driver. However, passengers do not usually open windows of the buses due to fear of cross breeze (air draft), which needs further investigation. As a result of this challenge, tuberculosis prevention strategies directly targeting at passengers might not be cost effective. Because of the nature of their work, bus drivers and their assistants spend most of their days travelling in such settings, which could facilitate exposure to indoor tubercle bacilli repeatedly and for a prolonged period of time. Hence, they are at higher risk of acquiring TB may be more than that of any passenger. Therefore, if bus drivers and their assistants are aware of the risk, there is a higher possibility that they can do their

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best to convince/force their passengers to keep open all the windows. Such tuberculosis prevention behaviors are mainly influenced by knowledge, risk perception and attitude towards the disease as indicated in many previous community and facility based studies conducted in low and middle income countries among different segments of populations(3, 5, 27-30).

However, current information about long distance bus drivers' knowledge, risk perception and practices towards tuberculosis transmission in such setting were limited in the Ethiopian context. Therefore, the aim of this study was to assess knowledge, risk perception and practice towards tuberculosis transmission among long distance bus drivers in Addis Ababa, Ethiopia. Similarly, this study was aimed at identifying predictors of overall TB preventive practices. The output of this study will help as evidence on the possible opportunities and challenges related to bus drivers' knowledge, risk perception and practice for stakeholders to design and implement TB prevention programmes on bus transportation using bus drivers as key agents.

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METHOD AND PARTICIPANTS

Study setting: Data were collected from November 18/2014 to December 21/2014 in inter-region bus stations of Addis Ababa, the capital city of Ethiopia, with a population of 3,195,000 (31). There were three inter-region bus stations and fifteen public bus transport associations in Addis Ababa. Likewise, there were a total of 2,661 buses departing from/to these and all other stations located in different regions of Ethiopia. There were a total of 649 1st level, 308 2nd level and 49 3rd level functional buses departing from/to the three inter-region bus stations of Addis Ababa during data collection period.

Study design and participants: A cross-sectional design was employed in this study. A sample of eligible drivers of long distance inter-region buses departing from/to the three inter-regional bus stations of Addis Ababa were included in the survey. For a driver to be included to the survey, he/she had to have driven a bus for the last two weeks prior to the data collection.

Sampling procedure: The sample size was calculated using single population proportion formula, by considering estimated proportion of drivers who had practiced prevention practice for TB transmission during travel as 50% (there was no information about drivers practice in the study area),95% confidence level, 5% margin of error (but since the total buses in the three bus stations were 1,006), correction formula was employed. Thus, finally with the addition of 10% non-response a total of 306drivers were required. First, a list of 1,006 functional buses by their vehicle registration plate numbers which were collected from bus owners association was created. Their plate numbers (identification numbers) were entered into SPSS software and then computer generated simple random sampling technique was employed to select 306 buses randomly. Eventually, all the drivers (306) in the randomly selected buses were included in the survey.

Measurement: Bus drivers' tuberculosis prevention practices were assessed by asking questions about side window opening status, frequency and preconditions of side window opening, telling assistants and passengers to open all bus windows. The instrument also contains questions about the types of respiratory infections that can be transmitted during bus transportation, cause, mode of transmission, conditions that favor TB transmission during travel, signs and symptoms, specific preventive measures during travel in bus, general preventive measures, peoples at risk of TB and bus drivers' over all knowledge about TB. Other variables included in the study were socio-demographic and economic characteristics of bus drivers. Overall TB prevention practice was the dependent variable categorized as good and bad. Drivers who keep open the side window of the bus without precondition and told assistants and passengers

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every day to keep open the rest windows of the bus were considered as having good overall TB prevention practice, otherwise bad practice. Driver who keep open the side window of the bus without precondition was coded as '1' otherwise coded as '0'. Driver who told assistants every day to keep open the rest windows of bus was coded as '1' otherwise '0' and driver who told passengers daily to keep open the rest windows of bus was coded as '1' otherwise '0'. These three variables were computed to get an overall TB prevention practice. Drivers who got a score of three for this variables were considered as having good overall TB prevention practice; otherwise, they were considered as having bad practice. The regression analysis to identify predictors for overall TB prevention practice was done based on this categorization. 'Bus driver assistant' was defined as a cashier or technician working in the bus with the driver. Side window is a window located on the left side of the driver, which is designed to have air ventilation, hear motor sound, hear traffic police and for other purposes. Similarly, personal yearly income of bus drivers was classified as: low income (≤388$), lower middle income (388-1,808$], upper middle income (1,808-5,175$] and high income (>5,175$) (32).

The interview questionnaire was prepared in English and translated into Amharic language, the working language of Ethiopia, and thereafter back translation was done by another person to check for consistency. Data were collected through face-to-face interview using interviewer-administered structured questionnaire at a convenient place and time (before their trips) for bus drivers. A total of seven data collectors were recruited from governmental employees working in the transport facilitation and coordinating offices in the three inter-regional bus stations of Addis Ababa. Three BSc nurses were recruited as supervisors, and one supervisor was assigned to each bus station. A one day training was given for both data collectors and supervisors. Next, the questionnaire was pre-tested on 5% of the sample before the actual data collection days on bus drivers departing from/to other 4th smaller non-inter-regional bus station located in Addis Ababa and then necessary correction was made.

Data processing and analysis: Data were edited manually before entry to a computer, entered into Epi-data version 3.1 and analyzed using IBM SPSS version 21 for windows. Descriptive analysis was done to get summary values of tuberculosis prevention practices, knowledge about tuberculosis and socio-demographic and economic status variables and to check for outliers, inconsistencies and missed values. Binary and multivariable logistic regression analysis was undertaken to identify predictors of overall tuberculosis prevention practice. Socio-demographic and knowledge about tuberculosis related factors of bus drivers were considered for adjustment using logistic regression. All variables of these categories that fulfilled chi-square assumptions were entered to multivariable logistic regression for adjustment as indicated in Table 5. Then, variables were considered significant if the p-value was less than 0.05. Finally, the results were presented in the form of tables and texts.

Ethical consideration: Ethical clearance was obtained from the Health Sciences College Institutional Review Board of Jimma University. Trained interviewers informed the participants that participation in the study was voluntary. Participants were also assured about confidentiality of the information to be provided and were informed not to answer any question during the interview if they feel unconfortable . Data were used only for the purpose of the study. Oral consent was obtained from the study participants before the actual data collection. The consent form was developed by the research team and approved by the Ethical Committee of Jimma University.

RESULT

Socio-demographic and Economic characteristics: From a total sample of 306 bus drivers, 303 were participated in the study, which makes a response rate of 99.02%. Nearly 58% and 33% of the drivers were in the age category of 30-44 and above 44 years respectively. With respect

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to educational and marital status, 86.8% and 79.9% of the bus drivers were from grade 1to 12 and married respectively. Similarly, 80.5% of them had children, and 55.4% fellin the upper middle income category (Table 1).

Table 1: Socio-demographic and economic characteristics of long distance bus drivers in bus stations of Addis Ababa, Ethiopia, 2014.

Variable	Categories	Frequency(%)
Residence	Urban	295(97.4)
	Rural	8(2.6)
Age in years	18-29	15(5.0)
	30-44	186(61.3)
	≥45	102(33.7)
Educational status	Illiterate	4(1.3)
	Grade 1-12	263(86.8)
	Above Secondary	36(11.9)
Religion	Orthodox	245(80.8)
	Muslim	25(8.3)
	Protestant	17(5.6)
	Catholic	14(4.6)
	Others	2(0.7)
Ethnicity	Amhara	129(42.6)
	Oromo	84(27.7)
	Guraghe	42(13.8)
	Tigrie	35(11.6)
	Other	12(4.0)
Marital status	Married	242(79.9)
	Single	52(17.2)
	Widowed	9(2.9)
Having Child	Yes	244(80.5)
	No	59(19.5)
Personal yearly income in USD	Lower middle Income (388-1,808)	133 (44.0)
	Upper middle Income (1,808-5,175)	168(55.4)
	High income (>5,175)	2(.6)

Knowledge about tuberculosis: Almost all (98.3%) of the bus drivers had ever heard of respiratory infections transmitted during travel in buses, and all of these mentioned the possibility of transmission of tuberculosis during travel in buses. Besides, nearly all (99.7%) of them had ever heard of the disease 'tuberculosis', out of which nearly half (48.3%) heard the information on the radio. On the other hand, germs were mentioned as the perceived causes of tuberculosis by nine in ten bus drivers, but the rest (10.3%) of the drivers had misconceptions about the cause of TB. Similarly, 93.3% and 56.3% of the bus drivers believed that cough for two weeks or more and Hemoptysis are the symptoms of TB respectively (Table 2).

Knowledge about tuberculosis prevention measures:Poor ventilation, presence of active TB case and overcrowding of passengers were mentioned as conditions which favor tuberculosis transmission during travel in buses, by 72.8%, 53% and 47% bus drivers respectively. Likewise, nine in ten and half of the bus drivers considered opening all windows of bus and avoiding overcrowding of passengers as TB preventive measures during travel in buses respectively (Table 3).

Tuberculosis was considered as a preventable disease by almost all (98.3%) of the bus drivers. On top of this, avoiding overcrowding, safe disposal of sputum, adequate ventilation of living rooms and avoiding coughing in front of people were cited as general TB preventive measures by nearly $1/3^{rd}$ to $9/10^{th}$ of the bus drivers. On the other hand, a non-negligible portion of the bus drivers had misconception on the general prevention measures of tuberculosis: avoid sharing of dishes (25.8%), avoiding sex with TB patients (21.5%) and avoid shaking hands (11.9%) were wrongly considered as TB prevention measures by participants. Although 83.1% of the bus drivers recognized that any person could be at risk of tuberculosis disease, only 7.3% of them believed that bus drivers and their assistants could be at risk of the disease. Furthermore, nearly all (97.7%) of the bus drivers responded that tuberculosis is a curable disease (Table 3).

Tuberculosis prevention practice:Almost all of the bus drivers (99.3%) had ever opened the side windows of buses in the last two weeks prior to data collection. Two hundred fifty eight (85.7%) of them always opened the side windows of buses without any precondition whereas almost all the rest (12.9%) opened the side window of the bus when the air condition becomes hot. Nearly eight

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in ten (81.7%) and almost seven in ten (67.1%) of the bus drivers opened side windows of buses to prevent respiratory diseases and heat respectively (Table 4).

Table 2: Knowledge about tuberculosis diseases among long distance bus drivers in bus stations of Addis Ababa, Ethiopia, 2014.

Variables	Categories	Frequency	Percentage (95%CI)
Heard of respiratory Infections transmitted during bus travel (n=303)			
	Yes	298	98.3(96.7, 99.7)
	No	5	1.7(0.3, 3.3)
Respiratory infections transmitted during bus travel (n=298)			
	Tuberculosis	298	100
	Common cold	171	57.4(51.5, 63.1)
	Influenza	96	32.2(27.0, 37.4)
	Measles	39	13.1(9.4, 17.4)
Heard of tuberculosis infection (n=303)			
	Yes	302	99.7(99.0, 100)
	No	1	0.3(0.0, 1.0)
Source of information for tuberculosis (n=302)			
	Radio	146	48.3(42.4, 53.8)
	Health professionals	97	32.1(26.7, 37.7)
	Television	83	27.5(22.2, 32.8)
	Magazine and news paper	53	17.5(13.2, 22.2)
Perceived cause of TB (n=302)			
	Germs	271	89.7(86.1, 92.9)
	Cold air	10	3.3(1.5, 5.4)
	Other	21	7.0(4.3, 9.9)
Perceived symptoms of TB (n=302)			
	Cough for 2 weeks or more	281	93.3(90.1, 95.8)
	Hemoptysis	170	56.3(50.7, 61.4)
	Fever for 2 weeks or more	89	29.5 (23.8, 35.8)
	Weight loss	86	28.5 (23.2, 33.2)
TB can transmit during travel in bus (n=302)			
	Yes	298	98.7(97.4, 99.7)
	No	4	1.3(0.3, 2.6)

On the top of these, near to eight in ten of the bus drivers ever told their assistants and passengers to open bus windows in the last two weeks prior to data collection, of which nearly seven in ten (70.4%) and half (54.1%) told their assistants and passengers everyday to open bus windows respectively. When asked about the purpose, 83.2% and 64.6% of the drivers told assistants and/ or passengers to open bus windows for the prevention of respiratory diseases and heat respectively. In addition, almost nine in ten (87.8%) of the bus drivers indicated their assistants had ever opened windows of buses in the last two weeks prior to data collection. Similarly, nearly eight in ten (81.5%) of the bus drivers responded as their assistants had ever told passengers to open bus windows (Table 4).

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Table 3: Knowledge about tuberculosis prevention measures among long distance bus drivers in bus stations of Addis Ababa, Ethiopia, 2014.

Variables	Categories	Frequency	Percentage (95%CI)
Conditions which favors TB transmission during bus travel (n=302)			
	Poor ventilation when windows closed	220	72.8(68.4, 77.6)
	Presence of active TB case	160	53(47.0, 59.4)
	Overcrowding of passengers	142	47(41.7, 52.8)
	High temperature	47	15.6(12.1, 19.7)
TB is preventable diseases (n=302)			
	Yes	297	98.3(96.7, 99.7)
	No	2	0.7(0.0, 1.7)
	Not sure	3	1.0(0.0, 2.3)
TB preventive measures during travel in bus (n=302)			
	Opening all windows of bus	273	90.4(86.9, 93.4)
	Avoiding overcrowding of passengers	144	47.7(42.4, 53.4)
	Decreasing temperature during travel in bus	42	13.9(10.3, 18.2)
General preventive measures of TB (n=302)			
	Avoiding coughing in front of people	264	87.4(83.3, 91.4)
	Avoiding overcrowding	110	36.4(30.1, 41.4)
	Adequate ventilation of living rooms	169	56(49.9, 62.1)
	Safe disposal of sputum	163	54(48.9, 59.6)
	Avoid sharing of dishes	78	25.8(20.4, 30.8)
	Avoiding sex with TB patients	65	21.5(16.8, 26.5)
	Avoid shaking hands	36	11.9(8.1, 15.9)
Peoples at risk of TB infection and/disease (n=302)			
	Any person	251	83.1(78.5, 87.1)
	People living with HIV	47	15.6(11.9, 20.0)
	Drug users	26	8.6(6.0, 12.4)
	Drivers and their assistants	23	7.6(4.8, 11.1)
	Prisoners	23	7.6 (4.6, 10.1)
Can TB be cured (n=302)			
	Yes	295	97.7(95.9, 99.3)
	No	7	2.3(0.7, 4.1)

Predictors of overall tuberculosis prevention practice: Bus drivers who heard tuberculosis related information from radio had good TB prevention practice nearly two times as compared to those who didn't heard information from radio (Table 5).

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Table 4: Tuberculosis prevention practices of long distance bus drivers and their assistants in bus stations of Addis Ababa, Ethiopia, 2014.

Variable	Categories	Frequency	Percentage (95%CI)
Side window opening in last 2 weeks (n=303)			
	Yes	301	99.3 (98.3, 100)
	No	2	0.7 (0, 1.7)
Preconditions for side window opening in last two weeks (n=301)			
	Always (with no precondition)	258	85.7 (81.7, 90.2)
	When it is hot	39	12.9 (9, 16.6)
	Others	4	1.4 (0.3, 2.7)
Purpose of opening side window (n=301)			
	To prevent respiratory disease	246	81.7 (77.1, 85.7)
	To prevent heat	202	67.1 (61.5, 72.4)
	To answer the request of other's	43	14.3 (11, 18.3)
	To hear motor sound	22	7.3 (4.7, 10.3)
Number of days told assistants to open window of bus (n=303)			
	Everyday	176	70.4 (52.1, 63.4)
	Most of the days	55	22 (13.9, 22.9)
	Some of the days	10	4 (1.3, 5.3)
	None	53	17.5 (13.2, 22.4)
	Others	9	3.6 (1.0, 5.0)
Number of days told passengers to open window of bus (n=303)			
	Every day	164	54.1 (48.1, 59.7)
	Most of the days	64	21.1 (16.2, 26.1)
	Some of the day	7	2.3 (0.7, 4.1)
	None	60	19.8 (15.7, 23.9)
	Others	8	2.6 (1.0, 4.7)
Purpose of telling assistants and/passengers to open windows (n=268)			
	To prevent respiratory disease	223	83.2 (78.6, 87.3)
	To prevent heat	173	64.6 (59.7, 69.7)
	To answer the request of other's	33	12.3 (8.5, 16.0)
Assistants ever opened window of bus (n=303)			
	Yes	266	87.8 (84.2, 91.1)
	No	37	12.2 (8.9, 15.8)
Assistants ever tell passengers to opened window of bus (n=303)			
	Yes	247	81.5 (76.2, 85.9)
	No	56	18.5 (14.1, 23.8)

DISCUSSION

Our study shows that the majority (85.7%) of the bus drivers opened the side windows of buses without any precondition, indicating a good practice. Similarly, more than half of the bus drivers told everyday their assistants and passengers to open the windows of buses. Opening all windows and avoiding overcrowding of passengers were considered by participants as TB preventive measures. Few bus drivers indicated that bus drivers and their assistants could be at risk of the disease. Hearing tuberculosis related information from radio was a promoting factor for tuberculosis preventive measures. These imply

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Table 5: Predictors of tuberculosis over all prevention practice among long distance bus drivers in bus stations of Addis Ababa, Ethiopia, 2014.

		Over all TB prevention practice				
Variables	Categories	Yes (%)	No (%)	COR (95%CI)	P-value	AOR (95%CI)
Age	18-29	4(3.0%)	11(6.5%)	1	0.168	
	30-44	89(66.4)	96(57.1)	2.55(.78, 8.30)	0.120	
	≥45	41(30.6)	61(36.3)	1.85(.55, 6.20)	0.320	
Children	Yes	107(80)	136(80.8)	1	0.810	
	No	27(20)	32 (19.2)	1.07(0.60, 1.90)		
Source of information for TB						
Radio	Yes	77(57.5)	69(41.1)	1.94(1.22, 3.07)		1.9(1.1,3.2) *
	No	57 (42.5)	99 (58.9)	1	0.005	1
Health professionals	Yes	46(34.3)	51(30.4)	1.20(.74, 1.95)		1.7(0.96, 3.06)
	No	88 (65.7)	117(69.6)	1	0.463	1
Television	Yes	32(23.9)	51(30.4)	1	0.211	
	No	102(76.1)	117(69.6)	1.39(.83, 2.33)		
Germs as perceived cause of	Yes	126(94.0)	145(86.0)	2.50(1.08, 5.78)		2.2(0.92, 5.35)
TB	No	8 (6.0)	23(13.7)	1	.032	1
favorable conditions for TB transmission during travel in bus						
Poor ventilation when	Yes	81(60.4)	139(82.7)	0.32(0.19, 0.54)		
windows closed	No	53(39.6)	29(17.3)	1	0.001	
Presence of active TB case	Yes	82(61.2)	78(46.4)	1.82(1.15, 2.89)		1.6(0.98, 2.75)
	No	52(38.8)	90(53.6)	1	0.001	1
Overcrowding of passengers	Yes	54(40.3)	88(52.4)	0.61(0.39, 0.97)		
	No	80(59.7)	80(47.6)	1	0.037	
TB preventive measures during travel in bus						
Opening all windows of bus	Yes	123(91.8)	150(89.3)	1.34(0.61, 0.95)		
	No	11(8.2)	18(10.7)	1	0.464	
Avoiding overcrowding of	Yes	58(43.3)	86(51.2)	0.73(0.46, 1.15)		
passengers	No	76(56.7)	82(48.8)	1	0.172	
Peoples at risk of TB infection and/disease						
Any person	Yes	119(88.8)	132(78.6)	2.16(1.13, 4.15)		
	No	15(11.2)	36(21.4)	1	0.020	
People living with HIV	Yes	19(14.2)	28(16.7)	0.83(0.44, 1.56)		
	No	115(85.8)	140(83.3)	1	0.554	
Drivers and their assistants	Yes	6(4.5)	16(9.5)	0.42(0.16, 1.09)		
	No	128(95.5)	152(90.5)	1	0.074	
Prisoners	Yes	6(4.5)	17(10.1)	0.45(0.17, 1.17)		
	No	128(95.5)	151(89.9)	1	0.101	

*indicates significant variable at 0.05 level of significance

the presence of a fertile ground for further interventions using bus drivers as key agents to persuade passengers and drivers to open all windows of buses despite their low risk perception.

This study highlighted that more than half of the bus drivers told their assistants and passengers everyday to open the bus windows. This indicates efforts are made by bus drivers to open the rest of the windows. Hence, intervention strategies to open the rest of the bus windows using bus drivers as key responsible persons could be efficient and effective in preventing tuberculosis transmission during travel. Besides, nearly 83% of the bus drivers told their assistants and/or passengers to open windows for the prevention of respiratory

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diseases. This implies a small effort might be needed to inform bus drivers about the purpose of opening bus windows.

Almost all (98.3%) of the bus drivers had ever heard of respiratory infections transmitted during travel in buses, and a similar proportion of them mentioned the possibility of transmission of tuberculosis during travel in buses. This might show that tuberculosis prevention programmes through different Media were also reaching this segment of the population. Besides, nearly half heard about tuberculosis disease from radio, and this was consistent with the finding from a study done in Uganda (50%) (33). However, this was higher than studies done in Tigray (3.2%) (34) and in Gambella (0.95%) (35). This might be due to difference in population characteristics. The bus drivers in this study were almost all literate (98.7%) which could facilitate understanding. Similarly, because of the nature of their occupation, bus drivers could have access to public radio that facilitate listening and gaining information. However, the participants in the previous studies were part of the general population, have low access to radio and less educated.

In addition, germs were mentioned as perceived causes of tuberculosis by almost all bus drivers. However, this was higher than figures from previous studies in Southwest Ethiopia (33.7%) (3), in Tigray (9.6%) (34), in Afar (0.25%) (4), in Gambella (3.3%) (35), and in Uganda (26.7%)(33). This could be the result of difference in literacy status, which could influence understanding of TB related information. Bus drivers in this study were almost all literate unlike those in the previous studies, mentioned earlier. Moreover, most of the drivers lived in Addis Ababa, the capital city of Ethiopia, in which drivers could have access to information through different Media unlike the population in the previous studies. Poor ventilation, presence of active pulmonary TB case and overcrowding of passengers were mentioned as conditions which favor tuberculosis transmission during travel in buses by most of the bus drivers. Likewise, our study indicated that bus drivers considered opening all windows of buses and avoiding overcrowding of passengers as TB preventive measures during travel in buses. This highlights the effectiveness of current tuberculosis prevention programmes in reaching this portion of the population to raise awareness about tuberculosis in this country. This could thus lay a fertile ground for further TB prevention programmes mediated by bus drivers.

On the other hand, our findings highlighted that the majority (83.1%) of the bus drivers mentioned that any person could be at risk of tuberculosis disease. However, this was inconsistent with studies done in Uganda (68.7%) (33) and in Tajikistan (69%) (36). Due to the nature their occupation, bus drivers might have access to public radio to gaining information about tuberculosis but this might not be true in the previous studies. However, only few (7.3%) believed that bus drivers and their assistants could be at risk of TB disease. Because of the nature of their working, bus drivers and their assistants spend most of their days travelling in this congregated setting (bus transportation). As a result, they might be exposed to indoor tubercle bacilli repeatedly and for a prolonged period of time even though their perceived risk of tuberculosis is low. If this remains unresolved, bus transportation might continue to be a potential source of tuberculosis, which in turn challenges the disease prevention and control efforts made in this country. In addition, this low risk perception might be a challenge for stakeholders who could use bus drivers as key agents for the prevention of tuberculosis transmission during bus travel. Additionally, the low risk perception might indicate that current tuberculosis prevention programmes lack disseminating comprehensive information about the disease.

On the other hand, hearing tuberculosis related information on the radio was a promoting factor for overall TB prevention practices. This implies that TB prevention programmes influencing prevention practices during travel in buses could be effective if disseminated through radio.

This study can have its own limitation. The assessment of two weeks' tuberculosis prevention practices might over or under estimate bus drivers' usual practice.

On the other hand, the reported tuberculosis prevention practices were based on self-report of bus

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drivers. This could overestimate the actual practice. Lastly, the practice of opening windows of buses could vary between rainy and non-rainy seasons, but the practices here in this study depict only the fact for the non-rainy season. To minimize possible reporting bias by participants, data collectors persuaded interviewees to report their actual practices by putting emphasis on the objective and policy implication of the study while taking consent.

In conclusion, tuberculosis preventive practices and knowledge of bus drivers seem good (opportunities), despite their low risk perception (challenge). Using the opportunities, a new tuberculosis preventive strategy should be designed to further empower bus drivers thereby persuading passengers and assistants. Because opening all windows of bus persistently the whole day depends on the persuasion of passengers and assistants. Besides, large scale research should be conducted to validate and produce normative data for the overall tuberculosis preventive practices at the bus level whoever the actor is (driver, assistant or passenger).

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