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SCHOOL OF PUBLIC HEALTH

Assessment of chronic respiratory symptoms, reduced lung function and associated factors among traffic police personnel of Addis Ababa, Ethiopia.

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ADDIS ABABA, ETHIOPIA

APPOVAL SHEET

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Assessment of chronic respiratory symptoms, reduced lung function and associated factors among traffic police personnel of Addis Ababa, Ethiopia.

I undersigned agree to accept all responsibilities for the scientific and ethical conduct of this research project and declare that this thesis is my original work in partial fulfilment of the requirement for the Master of Public Health in Epidemiology and Biostatistics.

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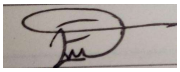
Date: June 9, 2025 Signature: 

Approval of primary advisor

This thesis work has been submitted with the approval as university advisor

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Approval by the Examining Board

This thesis by _____ is accepted in its present form by the board of examiners as satisfying thesis requirement for Degree of Masters of public health in Epidemiology and Biostatistics.

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Abbreviations and Acronyms

AQG:	Air Quality Guideline
AQI:	Air Quality Index
ATS-DLD:	American Thoracic Society Division of Lung Disease
BMI:	Body Mass Index
COPD:	Chronic Respiratory Disease/Disorder
CRD:	Chronic Respiratory Disease
ERS:	European Respiratory Society
FEV_1:	Forced Expiratory Volume in 1 second
FVC:	Forced Vital Capacity
GBD:	Global Burden of Disease
LMIC:	Low and Middle Income Country
NCD:	Non-Communicable Disease/Disorder
PEFR:	Peak Expiratory Flow Rate
PFT:	Pulmonary Function Test
PM:	Particulate Matter
WHO:	World Health Organization

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Abstract

Background: Chronic respiratory disease is a global public health challenge, specifically among occupational groups exposed to environmental pollution. Traffic police, who are frequently exposed to high levels of ambient air pollution, face the risk of developing chronic respiratory diseases. Understanding the prevalence of respiratory symptoms, assessing the lung function of traffic police, and identifying predictor factors for respiratory symptoms among traffic police personnel is crucial for developing effective public health interventions.

Objective: To assess the prevalence of chronic respiratory symptoms, lung function, and predictor factors among field and in-office traffic police personnel in Addis Ababa, Ethiopia.

Methods: A comparative cross-sectional study has been employed. Targeting field and in-office traffic police personnel respectively, as exposed to Vehicular related air pollution and control group. A simple random sampling procedure was applied to enroll 374 traffic police personnel. Data were collected using the ATS/ERS questionnaire and spirometry following the American Thoracic Society guidelines to assess respiratory symptoms and lung function parameters, respectively. Chi-square test, ANOVA, Multivariable logistic, and linear regression were applied to compare prevalence, mean, and measure association.

Result: A total of 374 traffic police personnel; 249 field traffic police and 125 in-office traffic police personnel were involved in the study. Respectively, field traffic police personnel were found to have a significantly higher prevalence of chronic respiratory symptoms than in-office traffic police personnel with 32.93% (27.36 - 39.03) and 18.4% (12.53 - 26.2) ($p<0.003$). Sex, work experience, and job status were significantly associated with developing chronic respiratory symptoms. While sex, age, being a field traffic police, years of employment, and previous occupational exposure to air pollutants demonstrate a negative relationship with lung function parameters (FEV1 and FVC) occupational safety and training on health topics showed a positive association with lung function parameters.

Conclusion: field traffic police personnel have higher odds of developing chronic respiratory symptoms, with lower lung function compared to in-office traffic police personnel. Stricter air quality regulation, Occupational Safety, and Health-focused modifications in the traffic police work environment are recommended. Longitudinal studies should be conducted to investigate further the impact of air pollution on respiratory health among traffic police personnel.

Keywords: Respiratory Symptom, Lung function, FEV1, FVC, traffic police, Ethiopia

1. Introduction

1.1. Background

Chronic respiratory diseases (CRD), such as asthma, Chronic Obstructive Pulmonary Diseases (COPD), and bronchitis, have significant public health challenges globally. Globally, CRD is responsible for approximately 3.9 million deaths. The primary cause of death for CRD patients is COPD, which ranks as the fourth highest cause of mortality. Approximately 90% of COPD under 70 years of age occur in LMIC (1). The prevalence of COPD in Sub-Saharan Africa (SSA) has steadily increased over the past three decades, and progressively become a major public health burden across the region (2).

Respiratory disease accounts for a higher burden of morbidity among occupational groups exposed to environmental pollutants. Among these groups traffic police personnel are one of them. Traffic police personnel of metropolitan cities of Low and Middle-Income Countries (LMICs), such as Addis Ababa, spend their working hours near the roadside. This put them as the most exposed occupational group to ambient air pollutants related to vehicular exhaust, along with drivers, hawkers, roadside vendors, and street sweepers. (3).

Prolonged exposure to those air pollutants has been linked to respiratory health problems among traffic police. Shortness of breath, coughing, phlegm production, wheezing, and reduced lung function are reported in different countries whose ambient air pollution indicators are above WHO air quality guidelines (4,5). However, evidence is lacking, especially in Ethiopia, to determine the extent of the impact on traffic police of Ethiopia.

Pulmonary function test is an objective and reliable indicator of respiratory health. Lung function decline is an important health issue of public concern (6). Spirometry is most useful in the assessment of obstructive airway disease and is usually used to determine the presence and severity of COPD. The three most commonly used metrics are forced expiratory volume per second (FEV1), forced vital capacity (FVC), and FEV1/FVC (7).

1.2. Statement of the problem

Chronic respiratory symptoms and diseases represent a critical public health issue, specifically among occupational groups exposed to environmental pollution components (8,9). Common sources of ambient air pollution are motor vehicles, industrial facilities, and forest fires (10). As one of the main sources of ambient air pollution, transportation raises morbidity and mortality rates among urban population (11,12).

Evidence shows that, like most of Africa's capital cities, Addis Ababa is also having an increment of ambient air pollution markers such as PM, NO_2, and CO. The main contributor of $PM_{2.5}$ in the city are motor vehicles followed by Biomass fuel. The daily overall concentration of ambient air pollution indicators is above the WHO's air quality standard (13–15). Traffic police personnel are at risk of CRD due to their constant exposure to those pollutants.

Studies conducted among different occupational groups such as street sweepers, fuel station workers, paper factory workers, and woodworkers in Ethiopia show chronic respiratory symptoms, such as cough, wheezing, shortness of breath, and lung function reduction (16–19). This suggests that chronic respiratory symptoms and lung function reduction are prevalent among occupational groups exposed to environmental pollutants in Ethiopia. However, those occupational groups have different types of pollutant exposure, level, and duration than traffic police personnel.

Although there are studies conducted on the respiratory morbidity of traffic police in some countries where $PM_{2.5}$ exceeded the WHO Air Quality Guidelines (AQG) standard, those studies are limited. Despite the existing evidence that Ethiopia specifically Addis Ababa's ambient $PM_{2.5}$ level exceeding the WHO standard, studies related to respiratory symptoms and pulmonary function of traffic police personnel in Ethiopia are limited. This research aims to address this gap by providing targeted insights into the respiratory health of traffic police personnel and its predictors. Thereby contributing to more effective health interventions and policy measures for high-risk groups.

1.3. Significance of the study

Traffic police personnel in Addis Ababa, Ethiopia are constantly exposed to high levels of air pollution due to vehicular emissions and urban traffic conditions (20). Given the limited research specifically focusing on this occupational group, it is essential to assess chronic respiratory symptoms and lung function. Understanding the relation between predictor factors and respiratory health indicators such as respiratory symptoms and lung function parameters will help to identify vulnerable individuals and provide evidence for necessary health intervention.

The findings of this study will contribute to generating and suggesting valuable insights into respiratory health and risks associated with their work. Additionally, with a focus on Ethiopian traffic regulation, it will assist environmental and occupational policymakers in creating and enhancing legislation involving ambient air pollution and occupational safety. And may inform public health intervention institutes, aimed at mitigating risks for public health. Additionally, this result will provide research areas that need to be further explored and also serve as a benchmark for other studies.

2. Literature Review

2.1. Overview of chronic respiratory morbidities

Chronic respiratory diseases (CRDs) are diseases of the respiratory airways and lung parenchyma. Asthma, chronic obstructive pulmonary disease (COPD), and occupational lung diseases are usually the most frequent CRDs (21). The prevalence of COPD in East Africa is 13.32% and from those countries in Ethiopia, it is 11.26% based on a systematic review of 43 studies. This shows that one in every 7 people has COPD in East Africa (22).

From 2020 to 2050 COPD is expected to increase by 23% approaching 600 million cases globally. The number of COPD cases in LMIC is expected to be more than double that of high-income countries by 2050. In sub-Saharan Africa (SSA) countries COPD cases are predicted to be 59% if focus is not given to air pollution reduction methods and other underlying risk factors for COPD (23).

According to a systematic review studies conducted among occupational groups exposed to gross and fine particulate matter and different chemicals in Ethiopia show a 13.04 % prevalence of chronic obstructive pulmonary pattern (24). Another cross-sectional study conducted among Street sweepers in Gondar also shows a 35% prevalence of respiratory symptoms. A study focused on fuel station workers in Addis Ababa also indicates, that 48.7 % of the workers have chronic respiratory symptoms (16). This evidence demonstrates that chronic respiratory disease among workers exposed to air pollution is high in Ethiopia.

2.2. Traffic Police and Pulmonary Function Reduction

Different studies revealed that traffic police personnel are at risk of developing different respiratory problems including reduction of pulmonary function parameters such as FVC, FEV1, $FEV_{25-75\%}$, PEFR, and FEV1/FVC (25–27). A comparative cross-sectional study in Chennai city shows that the pulmonary function parameters of the exposed non-smoker traffic policemen have significantly ($p < 0.001$) lower FEV1(2.79 ± 0.51), FEV1/FVC (78.40 ± 7.67), and FEV 25-75% (2.66 ± 0.83) than the non-smoker control groups selected from the general population with less exposure (4).

According to a study conducted in Eastern Nepal among 129 traffic policemen who work at the roadside, the prevalence of abnormal lung function is 75.19%. Out of those, mixed airways disease covers the highest proportion 56.59 then followed by obstructive pulmonary disease and restrictive pulmonary disease covering 14.73% and 3.88% respectively (28). In another study that took place in Dhaka city, obstructive pulmonary pattern prevalence among traffic police is 42%, whereas mixed is 5.1% (29). Even though the studies show different proportions of obstructive and mixed pulmonary disease, overall both studies show a high prevalence of abnormal lung function among traffic police personnel.

2.3. Traffic Police and Respiratory symptoms

A study conducted in Dhaka, Bangladesh, on the respiratory health of traffic police personnel shows more than three-quarters of traffic police have respiratory problems. Among those problems cough is the most common one followed by phlegm, whistling when getting cold, and breathlessness while walking respectively (30). Another conducted in Hyderabad, India, shows a 29.85% prevalence of chronic respiratory morbidity and a 32.5 prevalence of frequent respiratory symptoms among traffic police (25).

In addition, a study in Eastern Nepal also shows that 25.58% of the traffic police who participated complained of coughing, with a mean duration of 2.9 years (±1.85). Presence of phlegm production in 38.76% if traffic police for a mean duration of 2.13 years (±2.1), and noisy breathing among 21.71% of the participants for a mean duration of 2.35 years (±1.5). And 28.68% complained of breathlessness (dyspnea) (28).

2.4. Predicators for Pulmonary Function Reduction and Respiratory Symptoms

2.4.1. Sociodemographic Socioeconomic Factors

Accumulating evidence suggests that the incidence, susceptibility, and severity of several lung diseases are influenced by age, BMI, and gender. A study from Saudi Arabia, to explore the correlation between BMI and lung function test parameters revealed that BMI has a significant impact on mean forced expiratory flow during the middle half of FVC. The study also shows a significant negative correlation between age and FVC, FEV1, FEV1/FVC ratio, and FEF25-75 (31).

In another study from Korea conducted to identify factors associated with pulmonary function, stratified by sex, a positive association was observed between BMI and FEV1 among females (32). A retrospective cohort study conducted to investigate the effect of Waist Circumference and BMI on lung function parameters among outpatients of chest diseases shows that both waist circumference and BMI have a significant negative correlation with FVC and FEV1 (33).

Biomass fuels such as wood, charcoal, dung, or crop wastes contribute to indoor and outdoor air pollution. Respiratory symptoms such as phlegm, cough, and nose irritation are significantly more prevalent among women using biofuels than the ones using liquefied petroleum Gas or electricity. However, the difference in the prevalence of wheezing and breathlessness is not statistically significant (34). Another study conducted in a similar context shows a significant difference in the respiratory symptom prevalence (wheezing, breathlessness, cough, phlegm, and chest pain) among women exposed to biofuel smoke and non-exposed groups in southwest Ethiopia (35).

2.4.2. Environmental and Occupational Factors

After an intensive literature review, most studies show a link between higher level exposure to Particulate matter and a larger likelihood of lung function reduction. $PM_{2.5}$ can impair the lung capacity to contract and expand (6). According to a cross-sectional study conducted in China, there is a statistically significant inverse association between $PM_{2.5}$ and most pulmonary function indicators. An Interquartile range increase of $PM_{2.5}$ concentrations is associated with lower FEV1, FVC, PEF, and $FEF_{25-75\%}$ by declining 19.82 mL, 17.45 mL, 86.64 mL/s, 31.93 mL/s respectively. The association of lung function with FEV1/FVC is weak (36).

Another study conducted to investigate the association of annual concentration of $PM_{2.5}$ and nitrogen dioxide (NO_2) with adult lung function in Shanghai demonstrates that higher exposure to $PM_{2.5}$ and NO_2 has a significant association with lower FVC, VC, and IC. Indicating that air pollution is associated with restrictive pulmonary dysfunction. Nevertheless, the study shows an insignificant association with FEV1 (37). Most studies conducted on traffic police's pulmonary function show a significant decrease in almost all pulmonary function parameters (FVC, FEV1, FEV_{25-75}, PEFR, and FEV1/FVC). This explains that as the year of exposure increases the pulmonary function declines significantly in traffic police personnel (4,26,38).

Conceptual Frame work

The conceptual framework present the association of variables under study. It's prepared after reviewing different literatures (16,31,34,37,39). There independent variables (Socio-demographic profile, work related factors, History of respiratory disease). The outcome variables (Pulmonary Function Reduction and Respiratory symptoms).

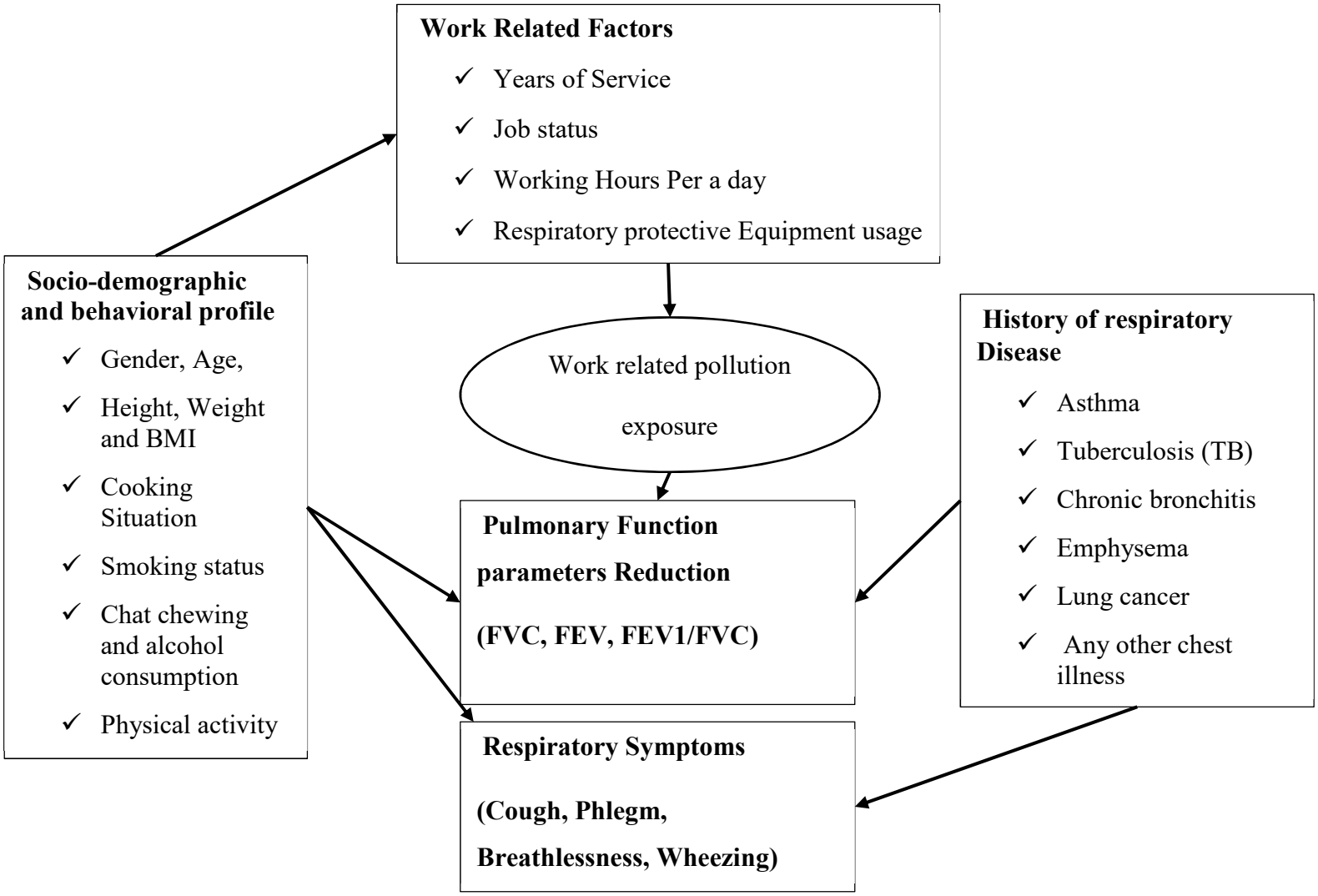

Figure 1: Conceptual Frame work of the study, Adopted and modified after reviewing literatures

3. Objectives

3.1. General Objective

To determine prevalence of chronic respiratory symptoms, lung function reduction and their possible predictor factors among field and in-office traffic police personnel in Addis Ababa, Ethiopia 2025

3.2. Specific Objectives

1. To determine the prevalence of chronic respiratory symptoms among field and in-office traffic police personnel in Addis Ababa
2. To identify the predictors of chronic respiratory symptoms among traffic police personnel of Addis Ababa
3. To examine the relationship between predictor factors and lung function parameters of traffic police personnel of Addis Ababa

4. Methods

4.1. Study area

This study was conducted in Addis Ababa, capital city of Ethiopia. Located at $9^0$1'48' N latitude and 38^0 44'24' E longitudes, at elevation of 2355 meter above sea level. The city the total area of land of the town is 527 Km^2 or 52700 Hectare. In Addis Ababa there is one main traffic police office and one traffic center for each of the eleven sub-cities. In the city there are 1500 traffic police personnel are equally distributed in each sub-city and covers different rounds around the city.

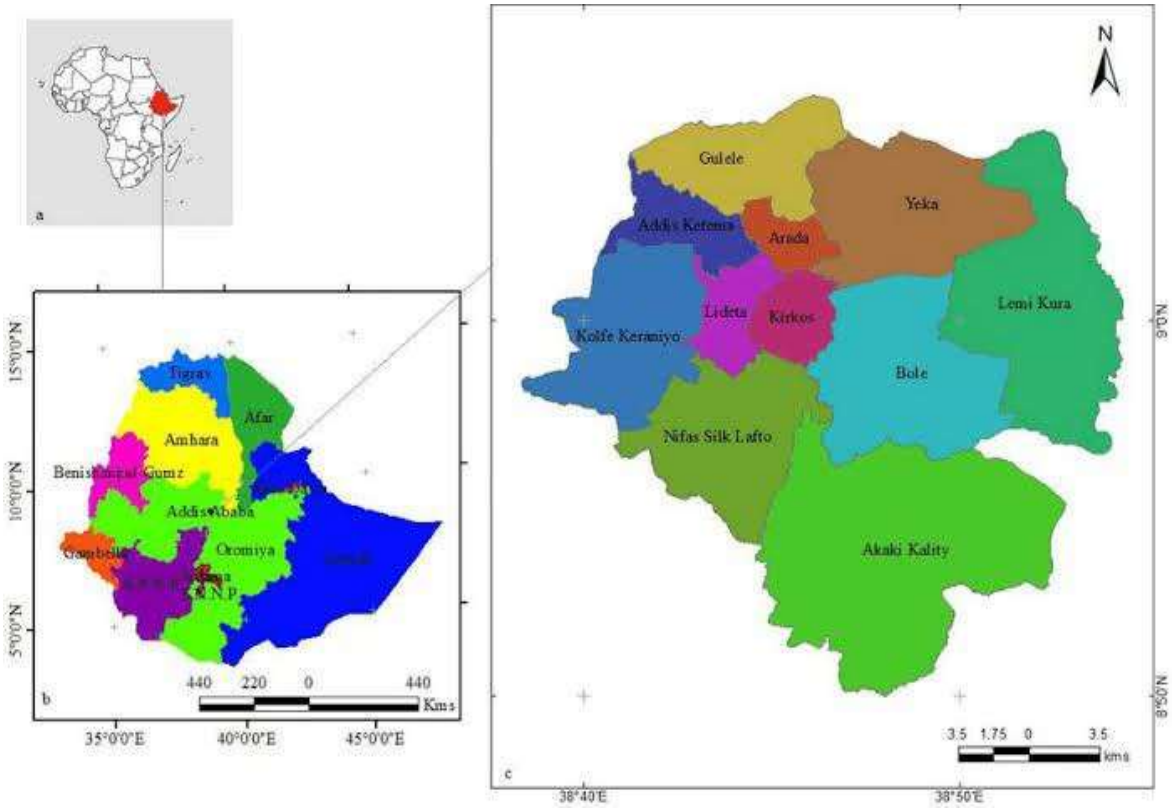

Figure 2: Map of location of 11 sub cities of Addis Ababa, Ethiopia (Ethio GIS 2022)

4.2. Study design and period

A comparative cross-sectional study was conducted among field and in-office traffic police personnel to Assesse and compare chronic respiratory symptoms, lung function reduction and

predictor factors among traffic police personnel of Addis Ababa, Ethiopia. In this study in- office traffic police personnel were selected as control/ reference group, based on the assumption that their exposure to air pollution during their working hour is minimum.

The study was conducted from February to April 2025.

4.3. Population

4.3.1. Source Population

All field and in-office traffic police personnel working in all sub-cities of Addis Ababa traffic police office were the source population of this study.

Field traffic police personnel: traffic police who has been working as traffic flow controller out in the field

In-office traffic police personnel: traffic police who has been in the office as an administrative.

4.4. Eligibility criteria

4.4.1. Inclusion Criteria

Field traffic police personnel who have been working as a field traffic police for at least one year.

In-office traffic police personnel of Addis Ababa traffic police office, who never works as a field traffic police in their life, and have been working in their current position for at least one year.

4.4.2. Exclusion Criteria

Traffic police with contradiction to spirometry test were excluded from the pulmonary function test, and these includes recent abdominal and eye surgery, persons with chest deformity, unstable cardiovascular status (aneurysm, recent heart attack, raised blood pressure) sever respiratory conditions like Pulmonary Tuberculosis, asthma and, lung cancer, pregnant women and women who gave birth within six months.

4.5. Study Population

Field and in-office traffic police Personnel of Addis Ababa, who have fulfilled the eligibility criteria.

4.6. Study variables

4.6.1. Dependent Variable

1. Chronic Respiratory Symptoms
2. Lung function parameters (FEV_1, FVC)

4.6.2. Independent Variable

1. **Sociodemographic Variables:** Age, gender, BMI, Biofuel smoke exposure at home.
2. **Behavioral related variables:** smoking, alcohol drinking, chat chewing, physical activity and respiratory protective equipment use
3. **Work related:** years of service, exposure status, time spent at work,
4. **History of respiratory diseases:** (Asthma, Tuberculosis (TB), chronic bronchitis, emphysema, lung cancer)

4.7. Sample Size Determination and sampling procedure

4.7.1. Sample size determination

Sample size calculation for specific objective one

Since there are limited studies conducted on the respiratory symptoms and lung function of traffic polices in Ethiopia we used study results from other LMIC.

A. A study conducted in Addis Ababa, Ethiopia to assess the prevalence of chronic respiratory symptoms and lung function outcome among fuel station workers shows prevalence of cough which is 19.8 % and 9.1% among the control group (Security workers) where the odds ratio is

2.47 (28). Using this finding and control to exposed ratio of 1:2, the sample size was calculated by double population proportion formula for unequal groups and checked by Epi Data.

$$n_1 = \frac{\left[Z_{\frac{\alpha}{2}} \sqrt{\left(1+\frac{1}{r}\right)P(1-P)} + Z_{\beta} \sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{r}} \right]^2}{(P_1 - P_2)^2}$$

Where:

n_1 = sample size of exposed group (Traffic Police personnel)

n_2 = sample size of unexposed group (in-office traffic police personnel) = rn_1

P_1 = 19.8% (prevalence of cough among fuel station workers)

P_2 = 9.1% (prevalence of cough among security workers)

r = the allocation ratio of control to exposed = 1:2 = 0.5

$p = \frac{P_{1+}\, rP_2}{1+r} = 0.162$

$Z_{\alpha/2}$ = Level of statistical significance 1.96 at confidence level of 95%

Z_{β} = Desired power 80% = 0.84

- The sample size is 432
- Finite population correction for N=1500, and 10% non-response rate the sample size is 369 with:

n_1= 246 and n_2 = 123

Sample size calculation for specific objective three

In order to determine the sample size to measure pulmonary reduction association with predicator factors, we will use the result of a study conducted in Chennai city on traffic police. The study shows that the mean value of FEV1 among exposed group (2.79 ± 0.51) is significantly lower than less exposed general population (2.98 ± 0.62) (4). Based on a study finding sample size was calculated using the following mean difference formula and checked using open Epi.

$n_1 = \frac{(Z\alpha/2 + Z\beta)^2\ (\delta 1^2 + \delta 2^2/\lambda)}{\Delta^2}$ $n_2 = \lambda n_1$

Where:

n = sample size

$Z_{\alpha/2}$ = Level of statistical significance 1.96 at confidence level of 95%

Z_{β} = Desired power 80% = 0.84

δ_1 = standard deviation of exposed group (0.51) and

δ_2 = Standard Deviation of non-exposed (0.62)

Δ = mean difference (mean1 = 2.79, mean2 = 2.98) = 0.19

λ = the allocation ratio of control to exposed = 1:2 = 0.5

- The sample size is 336 (n_1 = 224 & n_2 = 112)
- Finite population correction for N=1500, and 10% non-response rate the sample size is 302, with n_1=201 & n_2=101

Sample size calculation for specific objective two

According to a study conducted in Hyderabad, India to assess the prevalence and associated factors of respiratory morbidity among traffic police personnel, there is a statistically significant difference between respiratory morbidity of traffic police posted to a poor AQI and good AQI area. By showing traffic police located in a poor AQI location have odds of developing Respiratory morbidity about two times more likely than traffic police located in a good AQI location. With OR of 1.92 (1.1-3.4) and prevalence of 36.3% and 22.8% and respectively (25). Based on a study finding sample size was calculated using the following Comparison between two Proportions formula and checked using open Epi.

$$n_1 = \frac{\left[Z_{\frac{\alpha}{2}} \sqrt{\left(1+\frac{1}{r}\right) P(1-P)} + Z_{\beta} \sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{r}} \right]^2}{(P_1 - P_2)^2}$$

Where:

n = sample size ($n_1 + n_2$)

n_1 = sample size of exposed group (Traffic Police personnel)

n_2 = sample size of unexposed group (Administrative workers) = rn_1

r = the allocation ratio of control to exposed = 1:2 = 0.5

$p = \frac{P_{1+} rP_2}{1+r}$

$Z_{\alpha/2}$ = Level of statistical significance 1.96 at confidence level of 95%

Z_{β} = Desired power 80% = 0.84

P_1 = percent of traffic police in a poor AQI area with respiratory symptom (36.3%)

P_2 = percent of traffic police in a good AQI area with respiratory symptom (22.8%)

- The sample size is 440.
- Finite population correction for N = 1500, and 10% non-response rate the sample size is 374, with:

  n_1 = 249 & n_2 = 125

Table A: summary of sample size calculation of the study

Specific Objective 1							
Variable		**Proportion among exposed**	**Proportion among unexposed**	**OR**	**Total sample size**	**n_1**	**n_2**
Cough		19.8	9.1	2.47	369	246	123
Specific Objective 3							
Independent Variable	**Dependent variable**	**Mean & SD among exposed**	**Mean & SD among unexposed**	**Total sample size**	**n_1**		**n_2**
Exposure to ambient air pollution	FEV1	2.79 ± 0.51	2.98 ± 0.62	**302**	**201**		**101**
Specific Objective 2							
Variable		**Proportion among exposed**	**Proportion among unexposed**	**OR**	**Total sampl**	**n_1**	**n_2**
Air Quality Index (AQI)		36.3	22.8	1.9	**374**	**249**	**125**

By considering feasibility and the power of the study we selected the sample size from objective 2 for lung function assessment, which is 302 samples. And for chronic respiratory symptom assessment we selected sample size from objective 2, which is 374 samples.

4.7.2. Sampling Procedure

In Addis Ababa there are 11 Sub-cities, and in each sub-city there is one traffic police office. We used simple random sampling method to select traffic police personnel from all the sub cities. The traffic police pay roll list was used as a sampling frame. After acquiring a list of 1200 traffic police personnel who passed our inclusion criteria from each sub-city traffic police office, we used the list to select samples randomly by computer based simple random sampling. Due to low number of in-office traffic police personnel in traffic police office we used 1:2 ratio of in-office traffic police (control group) to field traffic police personnel (exposed group)

To select study participants, Microsoft excel 2016 was used to generate random numbers from their list. (Figure 3)

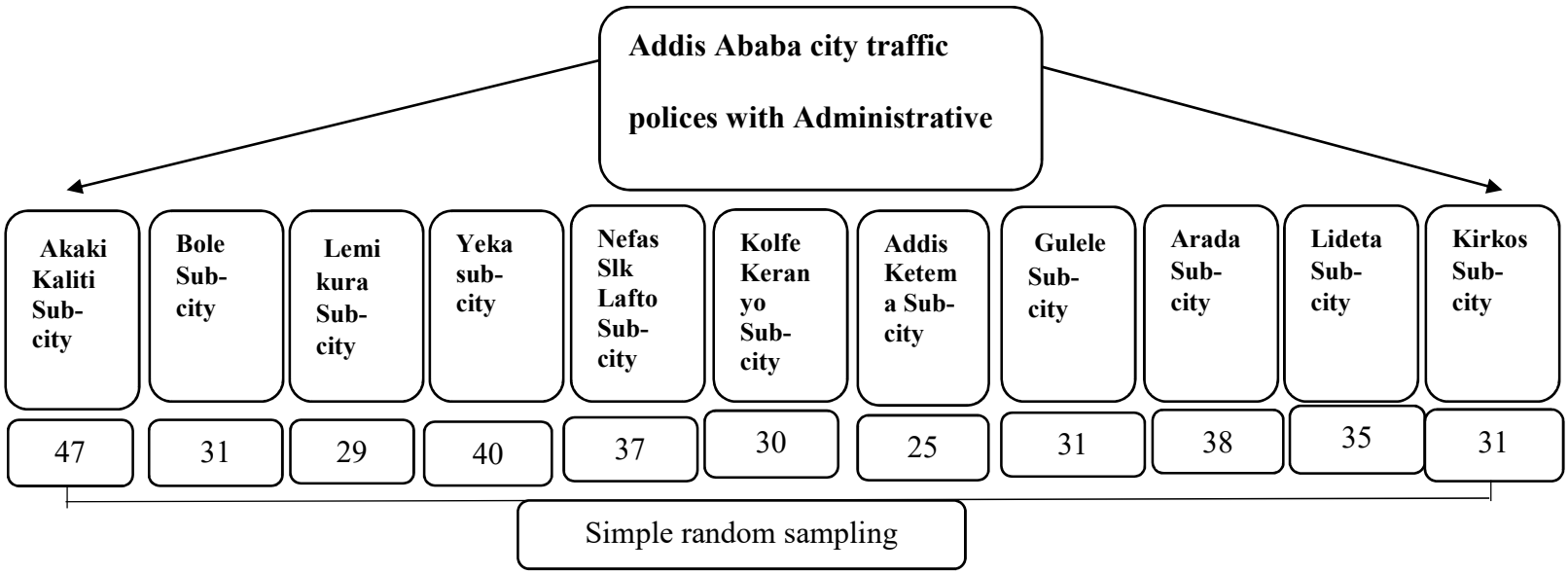

Figure 3: Schematic presentation of stratified sampling procedure for traffic police personnel in Addis Ababa, Ethiopia, 2024/2025

4.8. Data Collection

The data collection had two parts including face-to-face interview and lung function measurement. Four data collectors (2 for questionnaire 2 for spirometry test) with Health Officer and General Practitioner background and two supervisors including the primary investigator was involved in the data collection process. They take training before data collection. Pre-test had been conducted before starting the data collection. The questionnaire part of data collection was conducted using ODK.

Before performing the PFT the participants had been asked about pre spirometry screening questions such as: smoking, drinking alcohol, eating a large meal, recent illness and medication use, pregnancy. Their weight and height was measured without shoes and then conducted the interview. Through this process participant takes a 30 minute rest before performing the pulmonary function test.

4.8.1. Face-to-face interview

Data related to socio-demographic and behavioral factors, occupational factors and respiratory symptoms had been collected by face-to-face interview using a contextualized standard questionnaire of American thoracic society's Division of lung disease (ATS-DLD-78). The questionnaire had been translated to Amharic and cross checked with previously used Amharic questionnaire for other context, to check its consistency, then pre-test was done. The interview had been conducted with lung function test before the traffic police personnel leave to their shift.

4.8.2. Anthropometric measurements

The weights and heights of all study participants had been measured according to a standard protocol. Weight had been measured using a standardized electronic weighing machine with the participant standing and wearing light clothes. Height had been measured with participant standing on a height scale and subtracting 1 cm from their height measurement, for their shoes (Annex VII).

4.8.3. Pulmonary function Measurement

The study used Spirobank II to measure pulmonary parameters (FVC, FEV1, and FEV1/FVC %) following ATS/ERS guideline (7). The test had been done by trained data collectors with clinical background in the station, before traffic police personnel leave for their shift. Each participants performed spirometry maneuvers in a seated position using a disposable mouthpiece. The test continue until three acceptable tests and reproducibility criteria are met or the participant cannot or should not continue. While doing the maneuver, flow to volume and volume to time curves had been examined on the lap top screen for detecting whether participants displayed enough effort during inspiration and expiration. (Annex VII).

4.9. Operational Definition

Chronic Respiratory Symptom: The development of one or more of the symptom/s of chronic cough, chronic phlegm, chronic wheezing, chronic shortness of breath, chronic chest tightness which last/s at least three months in one year (16).

Obstructive pulmonary pattern: FEV1/FVC < 0.7

Chronic Respiratory Disease: respiratory disease like TB, chronic bronchitis, lung cancer, and heart disease that could be developed before and identified by physicians (16).

Chronic cough: Experience of a cough for most days of the week (≥4 days) for at least three months in one year (16).

Chronic Phlegm/ Cough with sputum production: It is sputum expectoration as much as twice a day for most days of the week (≥4 days) for at least three months in one year (16).

Chronic Breathlessness: Is defined as discomfort or difficult to breathe in different activities like walking up a slight hill, when undressing, walking at own pace (16).

Chronic Wheezing: a condition of causing a wheezy or whistling sound heard during inhalation or exhalation (at least three months in a year) (16).

Alcohol consumption (Never): doesn't drink alcohol at all (40).

Alcohol consumption (Sometimes): Drinks alcohol on special occasions (40).

Alcohol consumption (Regular): Drinks alcohol every week (40).

Ever smoker: smoke more than 20 pack of cigarettes in a lifetime

Past smoker: Stop smoking for at least 6 months

Passive Smoker: Participant who have a friend or family who smoke near them or in the house.

Physical exercise: Participant who do physical exercise for more than or equal to 3 day a week.

4.10. Data Management

The data collection questionnaire was prepared using Microsoft excel 2016 in XLS format and it had been exported to Kobo collect software. Then the uploaded form was sent to the data collector's smart phones. During data collection they used their smart phone to access the Questionnaire by retrieving the form from the Kobo Collect website. Data was entered immediately into the Kobo during data collection and directly sent to the cloud, where only the PI had access to it.

Data for the PFT had been recorded using a computer, on which winspiroPRO software had been installed. The daily report were checked by supervisors and daily data had been exported to primary investigator in PDF format. Then after checking for the reliability and quality of the data the three lung function parameters had been added to the participant information in excel using their code.

The data collected through the two methods had been matched in excel and exported to STATA statistical software version 17 for data cleaning and analysis.

4.11. Data Analysis Procedure

Data analysis procedure for objective one (compare the prevalence of chronic respiratory symptoms):

After data was cleaned, Descriptive statistics had been conducted to summarize the data and to determine and compare the prevalence of chronic respiratory symptoms. Mean and Standard

deviation had been provided for lung function parameters and other continuous variables such as age, height and weight. Frequency and proportion were used for categorical data. Chi-square was used explore the difference in prevalence of respiratory symptoms.

Data analysis plan for objective two (identify the predictors of chronic respiratory symptoms):

Binary logistic regression model had been used to assess the association between predictor factors and the development of at least one chronic respiratory symptom. First the Association between predictor factors and chronic respiratory symptom had been analyzed using bivariate logistic regression, variables that showed an association with P-value of less than 0.25 had been included in the final Multi-variable Logistic regression model. For this study we used 95% confidence interval and 80% power, with two tailed P-value of less than 0.05 for an association to be statistically significant in the multi-variable logistic regression.

Data analysis plan for objective three (examine the relationship between predictor factors and lung function parameters):

Lung function parameters (FEV1 and FVC) mean difference among field traffic police personnel and control group after adjusting for covariates, were explored using ANCOVA. Multivariable linear regression analysis were used to examine association between independent variables and lung function parameters (FEV1 and FVC) reduction. Stepwise selection were implemented to include variables with P-value less than 0.25 in the final model. Linear regression assumptions such as normality, homoscedasticity, and multi-collinearity had been evaluated. .

4.12. Data Quality Control

To ensure the Quality of the Data we used Standardized Questionnaire. Before the beginning of the data collection, a two days training had been given to the data collectors and supervisors on the aim of the study, how they assess respiratory symptoms using a questionnaire, how they measure lung function using spirometer, and on how to use ODK. After the training, standard operation procedure had been provided to the data collectors. Then the questionnaire and PFT had been pre-tested on the 5% of the sample size on the Addis Ababa central sub-city traffic police (22

main office of traffic police), to ensure the question measure what it's supposed to measure and they yield consistent result across different respondents. It also help to identify potential barriers in the data collection process and how long it will take to finish one participant's interview and test. After pre-test the tool had been modified with necessary corrections.

During Data collection, for pulmonary function test (PFT) orientation had been given to the study participants to prevent leak and early termination. In order to insure the reliability of the test we followed ATS/ERS standard for Acceptability and repeatability criteria.

Acceptability criteria's for Spiro-grams

1. Start of test criteria: start the test without hesitation or false start evidence.
    - Steep and upright rise to the peak
    - Tall and pointed peak
2. Middle of test criteria: smooth and continuous downward curve.
3. End of test criteria: the flow volume graph should descend gracefully onto x-axis with no drop off and the volume time graph should reach plateau.

Repeatability criteria's of Spiro-grams

- All three graphs should be superimposed.
- The difference between the highest to the next highest should be less than 150 ml or 0.15 L

4.13. Ethical Consideration

Ethical clearance had been taken from the School of Public Health, ethical review committee and an official request for support letter had been written to Addis Ababa Traffic police office. Permission letter was obtained from Addis Ababa Traffic police office to conduct the study and this official letter were distributed to each Sub-cities Traffic police office.

The aim and method of the study and importance of their participation was clearly explained to each study participant. The study participants who fulfill the criteria for the study and agreed to participate, were given Amharic written consent and signed before data collection starts.

Issues of rights, privacy, and confidentiality had been ensured during data collection period. Confidentiality was kept by assuring information will not be accessible to anyone except the research personnel. Privacy had been maintained by arranging a silent and comfortable place to the interviewer and study participants. Participants will had the right to participate or not and to withdraw at any time when they feel discomfort.

The participants will not get a direct benefit like money but they will become a beneficiary in the future from the policy development. The procedures that used in this study doesn't have any risk for the participants. For the participant who have abnormal PFT they had been recommended to visit Hospital for more clinical diagnosis.

4.14. Dissemination of findings

The finding of this study will be disseminated through different platforms to ensure its impact on public health. The result will be submitted to Addis Ababa University, College of Health science and School of Public Health. Additionally the summary report will be shared to Addis Ababa Traffic Police Office and Federal ministry of health, and it will be presented in seminars and conferences. The outcome will also be published in a reputable academic Journal.

5. Results

5.1. Socio-Demographic characteristics of respondents

A total of 374 Traffic police personnel were included in this study across Addis Ababa city, with a proportion of one to two ratio among controls 125 (33.42%) and cases 249 (66.58%). There were 310 (82.89%) men from both groups. The mean age of infield Traffic police personnel was 35.48 years with a standard deviation of 7.15 years. The control group's mean age was 34.10 years with a standard deviation of 6.80 years. Three hundred fourteen (83.96%) were married, 85.94 % among the exposed group, and 80% among control but their difference is not significant.

Forty-five percent cook food at home: of which 153 (90.53%) use electricity as a source of energy to cook food and 16 (9.47%) of them use Biomass fuel (Charcoal and firewood). Ninety-six (38.55%) of the exposed and 35 (28%) of the control group were overweight. The two groups significantly differ in their BMI (Table 1).

Table 1: socio-demographic characteristics of traffic police personnel, Addis Ababa 2025 (n = 374)

Variable	Exposure Status		Total	P-value
	Infield TP (249)	In office TP(125)		
	n (%)	n (%)	n (%)	
Sex				
Male	213 (85.54)	97 (77.60)	310 (82.89)	0.054
Female	36 (14.46)	28 (22.40)	64 (17.11)	
Age				
21 – 30	89 (35.74)	49 (39.20)	138 (36.90)	
31-40	105 (42.17)	54 (43.20)	159 (42.51)	0.576
>40	55 (22.09)	22 (17.60)	77 (20.59)	
Mean (± SD)	35.48 (± 7.15)	34.10(± 6.80)		
Marital Status				
Single	34 (13.65)	23 (18.40)	57 (15.24)	0.228
Married	215 (86.35)	102 (81.60)	317 (84.76)	
Educational status				
Secondary	95 (38.15)	39 (31.20)	134 (35.82)	
Diploma	100 (40.16)	53 (42.40)	153 (40.91)	0.364
Bachelor Degree and Above	54 (21.69)	33 (26.40)	87 (23.26)	
Energy use among home cookers				
Biomass fuel	7 (6.31)	9 (15.51)	16 (9.47)	0.110
Electricity	104 (93.69)	49 (84.48)	153 (90.53)	
Location of residence				
Near to the main road	120 (48.19)	57 (45.60)	177 (47.33)	0.636
Far from the main road	129 (51.81)	68 (54.40)	197 (52.67)	
Place of birth				
Urban	87 (34.94)	36 (28.80)	123 (32.89)	0.233
Rural	162 (65.06)	89 (71.20)	251 (67.11)	
BMI				
Normal	153 (61.45)	90 (72)	243 (64.97)	0.044
Overweight	96 (38.55)	35 (28)	131 (35.03)	

Note: TP = Traffic police, SD = Standard Deviation, BMI = Body Mass Index (chi-square test)

5.2. Behavioral Factors

One hundred sixteen (46.77%) of exposed group and 59 (47.2%) of control group did physical activity outside of their work. Ever smokers among exposed and control groups were 9 (3.61%) and 5 (4%) respectively. Since ever smoker numbers were small, the classification of past and current smokers was not used for further analysis in this study. Of the whole participants, 16.8% were passive smokers. Of which 44 (17.67%) and 18 (14.4%) of them were exposed and control group respectively.

Out of field traffic police personnel, 157 (63.05%) and 74 (59.2%) of the control group were alcohol consumers. Among the exposed group, 232 (93.17%) of them don't use RPE while they are at work, of which 79.74% of the reason for not using RPE is because it's not comfortable for work (Table 2).

Table 2: Behavioral factors among traffic police personnel, Addis Ababa 2025 (n = 374)

Variable		Job Status		Total	P-value
		Infield TP	In office TP		
		n (%)	n (%)	n (%)	
Physical Activity					
Yes		116 (46.77)	59 (47.2)	176 (47.06)	0.938
No		132 (53.23)	66 (52.8)	198 (52.94)	
Alcohol Consumption					
Yes		157 (63.05)	74 (59.2)	231 (61.76)	0.47
No		92 (36.95)	51 (40.8)	143 (38.24)	
Chat Chewing					
Yes		9 (3.61)	3 (2.4)	12 (3.21)	0.701
No		240 (96.39)	122 (97.60)	362 (96.79)	
Ever smoker					
Yes	Current	2 (22.22)	1 (20.00)	3(0.80)	0.923
	Past	7 (77.78)	4 (80.00)	11 (2.94)	
	Total	9 (3.61)	5 (4.00)	14 (3.74)	0.853
No		240 (96.39)	120 (96.00)	360 (96.26)	
Passive Smoker					
Yes		44 (17.67)	18 (14.40)	62 (16.58)	0.422
No		205 (82.33)	107 (85.60%)	312 (83.42)	
Cook food at home					
Yes		111 (44.58)	58 (46.40)	169 (45.19)	0.738
No		138 (55.42)	67 (53.60)	205 (54.81)	
RPE use					
Yes		17 (6.83)			
No		232 (93.17)			
Reasons for not using RPE					
Not available		10 (4.32)			
Not comfortable for work		185 (79.74)			
Believes there is no need for		37 (15.95)			

Note: TP = Traffic Police, RPE = Respiratory Protective Equipment (chi square test)

5.3. Previous respiratory Health History

Of all participants 29 (7.75%) of them had family history of Chronic Respiratory Disease and 21 (5.61%) have been diagnosed to have Chronic Respiratory Disease (Figure 4).

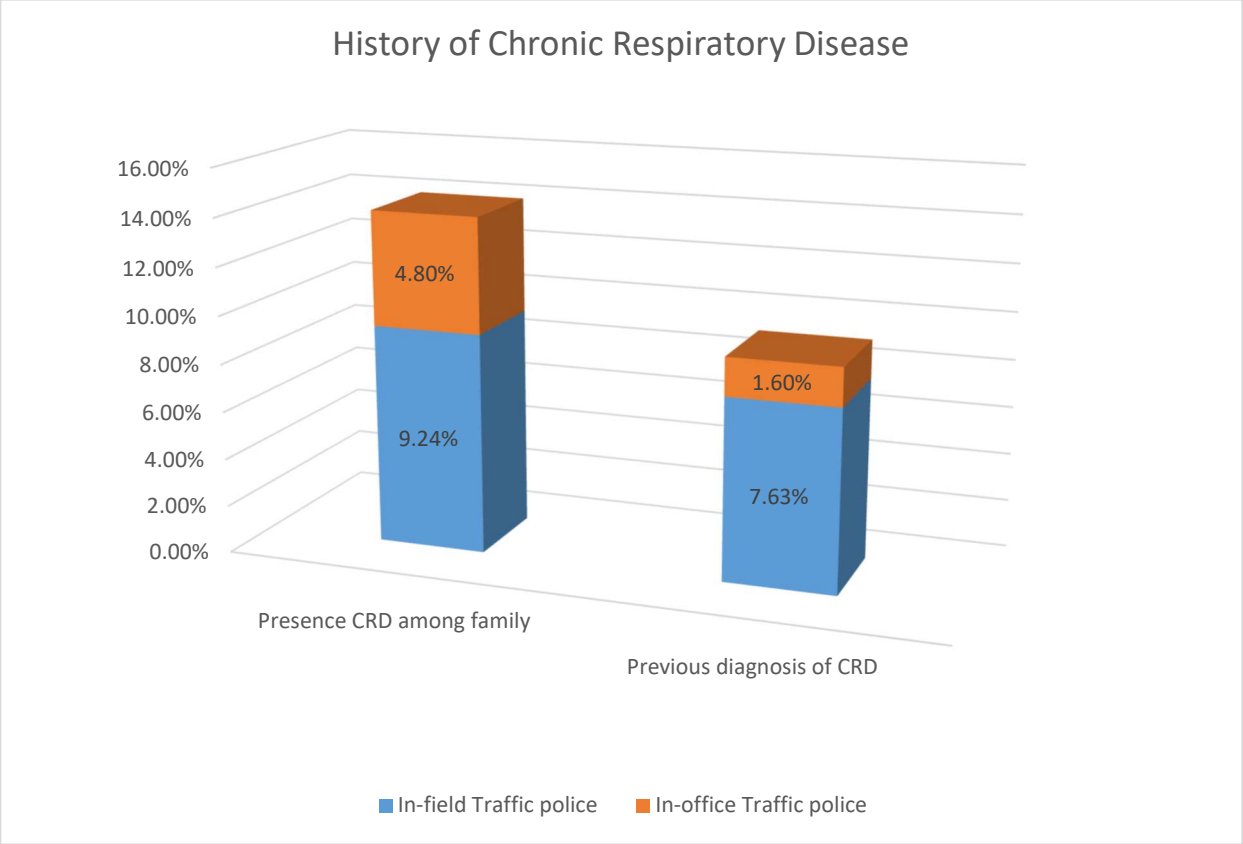

Figure 4: History of Chronic Respiratory Disease among Traffic police personnel, Addis Ababa 2025

5.4. Work related Factors

Of the total participants, 18.07% and 19.2% had work experience of less than or equal to five years, and 18.07% and 16% had greater than 15 years of experience respectively. More than half of controls work six days a week (69.6%) and less than or equal to eight hours a day (51.2%), whereas the majority of field traffic police personnel (96.39% and 82 .33%) work seven days a week and more than eight hours a day. There is a statistically significant difference in working hours per day and working days per week among field traffic police personnel and the control group (Table 3).

Table 3: Work related factors of traffic police personnel, Addis Ababa 2025 (n = 374)

Variable	Exposure Status			P-value
	Field TP(249)	In-office TP (125)	Total	
	N (%)	N (%)	N (%)	
Employment Year				
≤ 5 Years	45 (18.07)	24 (19.2)	69 (18.44)	0.281
6 – 10 Years	90 (36.14)	56 (44.8)	146 (39.04)	
11 – 15 Years	69 (27.71)	25 (20)	94 (25.13)	
>15 Years	45 (18.07)	20 (16)	65 (17.38)	
Working days per week				
6 days	9 (3.61)	87 (69.6)	96 (25.67)	0.001
7 days	240 (96.39)	38 (30.4)	278 (25.67)	
Working hours per day				
≤ 8 hours	44 (17.67)	64 (51.2)	110 (29.41)	0.001
>8 hours	205 (82.33)	61 (48.8)	266 (71.12)	
OSH training				
Yes	31 (12.45)			
No	218 (87.55)			
Work require being physically active				
Yes	249 (100)	77 (61.6)	326 (87.17)	0.000
No	0 (0.00)	48 (38.4)	48 (12.83)	
Previous Exposure				
Yes	29 (11.65)	16 (12.80)	45 (12.03)	0.746
No	220 (88.35)	109 (87.20)	329 (87.97)	

Note: TP = Traffic Police, OSH = Occupational Safety and Health (chi square test)

5.5. Prevalence of Chronic Respiratory Symptoms

We used the chi-square test to compare the prevalence of chronic respiratory symptoms among the two groups. As shown in the table below, 24.5% (95% CI: 19.54-30.24) of field traffic police reported coughing, Phlegm production was present among 14.06% (95% CI: 10.25-18.97) of them. Overall, 32.93 % (95% CI: 27.36-39.03) of field traffic police personnel and 18.40% (95% CI: 12.53-26.2) of the control group reported having at-least one chronic respiratory symptom. The difference in the prevalence of chronic cough, phlegm, and developing at least one chronic respiratory symptom between the two groups was statistically significant (Table 4).

Table 4: Prevalence of chronic respiratory symptoms among In-field and In-office traffic police personnel, Addis Ababa 2025

Variables	Job status		Total Traffic police (374)	P-Value
	Field TP (249)	control (125)		
	n (%, 95% CI)	n (%, 95% CI)	n (%, 95%CI)	
Chronic Cough	61 (24.5, (19.54-30.24))	16 (12.8, (7.98-19.9))	77 (20.59, (16.78-25.01))	0.008
Chronic Phlegm	35 (14.06, (10.25-18.97))	5 (4, (1.67-9.27))	40 (10.7, (7.93-14.28))	0.003
Wheezing	16 (6.43, (3.97-10.25))	5 (4, (1.67-9.27))	21 (5.61, (3.68-8.47))	0.336
Shortness of Breath	17 (6.83, (4.28-10.72))	4 (3.2, (1.2-8.23))	21 (5.61, (3.68-8.47))	0.151
At least one CRS	82 (32.93, (27.36-39.03))	23 (18.40, (12.53-26.2))	105 (28.07, (23.74-32.86))	0.003

Note: TP = Traffic Police, CI = Confidence Interval (chi-square test with CI)

5.6. Occurrence of at least one chronic respiratory symptom and associated factors

5.6.1. Bivariate logistic regression analysis

5.6.1.1. Bivariate analysis of socio-demographic factors and chronic respiratory symptom

In the bivariate logistic regression analysis, age 31 – 40 (COR = 1.56, 95% CI: 1.1 – 3.23) and greater than 40 (COR = 2.35, 95% CI: 1.26 – 4.4) were significantly associated with increased odds of developing chronic respiratory symptom compared to age 21 – 30 years. Similarly living near to the main road found to significantly increase the odds of reporting CRS (COR = 1.73, 95 % CI: 1.1 – 2.73) (Table 5).

Table 5: Bivariate logistic regression analysis of socio-demographic and behavioral factors with the occurrence of at least one CRS among Traffic police of Addis Ababa (n = 374)

Variables	At least one CRS		COR(95%CI)	P-value
	Yes (105)	No(269)		
Sex				
Male	82	228	1	-
Female	23	41	1.56(0.88 – 2.76)	0.126
Age				
21 – 30	27	111	1	-
31 – 40	50	109	1.88(1.1 – 3.23)	0.021
>40	28	49	2.35(1.26 – 4.4)	0.008
Marital status				
Single	12	45	1	-
Married	93	224	1.57(0.79 – 3.08)	0.203
Educational status				
Secondary	43	91	1	-
Diploma	40	113	0.75(0.45 – 1.25)	0.268
BA and above	22	65	0.72(0.39 – 1.31)	0.279
Energy source use				
Biofuel	4	12	0.71(0.22 – 2.31)	0.566

Electricity	49	104	1	-
Location of residence				
Near to the main road	60	117	1.73 (1.1 – 2.73)	0.018
Far from the main road	45	152	1	-
Brought up				
Urban	39	84	1.3(0.81 – 2.09)	0.274
Rural	66	185	1	-
BMI				-
Normal	56	187	1	-
Overweight	49	82	1.99 (1.26 – 3.17)	0.003

Note: COR = crude odds ratio, CI = Confidence Interval, CRS = Chronic Respiratory Symptom, BMI = Body Mass Index, BA = Bachelor Degree, 1 = Reference Group (Binary logistic regression)

5.6.1.2. Bivariate logistic regression analysis of behavioral factors and history of CRD with development of CRS

In the bi-variate logistic regression analysis of behavioral and history of CRD with development of CRS all variables association were not statistically significant (p-value > 0.05) (Table 6).

Table 6: Bivariate logistic regression of behavioral factors and CRD with occurrence of at least one CRS among traffic police Addis Ababa, 2025 (n = 374)

Variable	At least one CRS		COR (95 % CI)	P-value
	Yes (105)	No (269)		
Physical Activity				
Yes	47	128	1	-
No	58	140	1.13(0.72 – 1.78)	0.602
Alcohol consumption				
Never	33	110	1	-
Sometimes	72	159	1.51 (0.94 – 2.44)	0.092
Ever Smoker				
Yes	4	10	1.03(0.32 – 3.35)	0.966
No	101	259	1	-
Passive Smoker				
Yes	23	39	1.65(0.93 – 2.94)	0.086
No	82	230	1	-
Family history of CRD				
Yes	11	14	2.13(0.94 – 4.86)	0.072
No	94	255	1	-
Previous diagnosis of CRD				
Yes	5	6	2.19(0.65 – 7.34)	0.203
No	100	263	1	-

Note: COR = crude odds ratio, CI = Confidence Interval, CRS = Chronic Respiratory Symptom, CRD = Chronic Respiratory Disease, 1 = Reference Group (binary logistic regression)

5.6.1.3. Bivariate analysis of work related factors and development of CRS

In the bivariate logistic regression of work related factors, traffic police with Work experience of greater than 10 years found to have higher odds of developing CRS compared to those who have work experience less than 10 years (COR = 2.7, 95% CI: 1.7 – 4.3). In addition field traffic police have 2.18 (95% CI: 1.29 – 3.68) odds of demonstrating at least one CRS compared to controls (Table 7).

Table 7: Bivariate logistic regression analysis of work related factors and the occurrence of at least one CRS among Traffic police of Addis Ababa

Category	At least one CRS		COR (CI)	P-value
	Yes	No		
Work experience				
<= 10 years	42	173	1	-
>10 years	63	96	2.7(1.7 – 4.3)	**<0.001**
Job status				
Field TP	82	167	2.18(1.29 – 3.68)	**0.004**
In-office TP	23	102	1	-
Working days per week				
6 days/ week	26	70	1	-
7 days/ week	79	199	1.07(0.64 – 1.8)	0.802
Working days per day				
<= 8 hours	30	78	1	-
>8 hours	75	191	1.02(0.62 – 1.68)	0.935
OSH training				
Yes	10	33	1	-
No	33	236	1.33(0.63 – 2.81)	0.456
Work require being physically active				
Yes	90	236	1	-
No	15	33	1.19(0.62 – 2.3)	0.6
RPE use				
Yes	9	14	1	-
No	96	255	0.59(0.25 – 1.4)	**0.228**
Previous exposure to OR air pollution				
Yes	17	28	1.66(0.87 – 3.19)	**0.125**
No	88	241	1	-

Note: COR = crude odds ratio, CRS = Chronic Respiratory Symptom, OSH = Occupational Safety and Health, RPE = Respiratory Protective Equipment, 1 = Reference Group (binary logistic regression)

5.6.2. Multivariable Logistic regression analysis

Variables that had an association with the outcome variable at $p < 0.25$ in bivariate logistic regression were included in the multivariable logistic regression model, where three variables; sex, work experience and job status had become statistically significant, with p-value < 0.05.

Sex was significantly associated with the occurrence of at least one chronic respiratory symptom. The odds of developing at least one CRS among female traffic police were 3.03 times higher than male traffic police personnel (AOR: 3.03, 95% CI (1.416 – 6.361)). Job status was also

significantly associated with the occurrence of at least one CRS among traffic police personnel. Field traffic police personnel were found to have 2.17 higher odds of developing at least one CRS compared to the control group (AOR: 2.17, 95% CI (1.124 – 3.8)). Traffic police who have been working for more than 10 years had 2.3 higher odds of developing at least one CRS than those who have been working less than 10 years (AOR: 2.27, 95% CI(1.19 – 4.46)) (Table 8). The model fitness was ensured using goodness of fit (P-value > 0.101). Multi-collinearity between independent variables was also checked; the mean VIF of all independent variables was 1.32 and each independent variable's VIF value was < 0.25.

Table 8: Multivariable logistic regression analysis of associated factors and the occurrence of at least one CRS among traffic police of Addis Ababa (n = 374)

Category	At least one CRS		COR (CI)	AOR (CI)	P-value
	Yes (105)	No(269)			
Sex					
Female	82	228	1.56 (0.88 – 2.76)	3.03 (1.47 – 6.27)	0.003**
Male	82	228	1	1	-
Age					
21-30	27	111	1	1	-
31-40	50	109	1.88 (1.1 – 3.23)*	1.63 (0.78 – 3.43)	0.197
>40	28	49	2.35 (1.26 – 4.39)*	1.1 (0.43 – 2.81)	0.841
Marital status					
Single	12	45	1	1	-
Married	93	224	1.57 (0.79 – 3.08)	1 (0.46 – 2.17)	0.997
Location of residence					
Near to the main road	60	117	1.73 (1.1 – 2.73)*	1.6 (0.97 – 2.63)	0.063
Far from the main road	45	152	1	1	-
BMI					
Normal	56	187	1	1	-
Overweight	49	82	1.99 (1.26 – 3.17)*	1.32 (0.78 – 2.24)	0.297
Alcohol consumption					
Never	33	110	1	1	-
Sometimes	72	159	1.51 (0.94 – 2.44)	1.58 (0.92 – 2.71)	0.096
Passive Smoker					
Yes	23	39	1.65(0.93 -2.94)	0.97(0.55 – 2.06)	0.847
No	82	230	1	1	-
Family history of CRD					
Yes	11	14	2.13(0.94 – 4.86)	1.25(0.51 – 3.06)	0.624
No	94	255	1	1	-
Previous diagnosis of CRD					
Yes	5	6	2.19(0.65 – 7.34)	2.49(0.63 – 9.79)	0.192
No	100	263	1	1	-
Employment years					
<= 10 years	42	173	1	1	-
>10 years	63	96	2.7(1.7 – 4.3)*	2.3(1.19 – 4.46)	**0.013****
Job status					
In-field TP	82	167	2.18(1.29 – 3.68)*	2.17 (1.24 – 3.8)	**0.007****
In-Office TP	23	102	1	1	-
RPE use					
Yes	9	14	1	1	-
No	96	255	0.59(0.25 – 1.397)	0.85(0.32 – 2.27)	0.739
Previous exposure to OR air					

Yes	17	28	1.66(0.868 – 3.186)	1.77(0.86 – 3.66)	0.123
No	88	241	1	1	-

Note: COR = crude odds ratio, AOR = Adjusted Odds Ratio, * = COR p-value < 0.05, ** = AOR P-value < 0.05, CRS = Chronic Respiratory Symptom, CRD = Chronic respiratory Disease, BMI = Body Mass Index, RPE = Respiratory Protective Equipment, TP = Traffic Police 1 = Reference Group (binary logistic regression)

5.7. Spirometry Measurement

Of the total 300 Traffic police personnel who have performed lung function tests using a spirometer, 259 (86.33%) fulfilled the acceptability and repeatability criteria of ERS/ATS. Among them, 172 (66.41%) were Traffic police personnel, and 87 (33.59%) control group. Of the field traffic police personnel, 86.05% of them were male, among the control group 81.61% were male. The difference between the two groups in the sex proportion was not significant ($p > 0.05$).

The distribution of lung function parameters (FEV1 and FVC) among participants based on job status stratified by sex and adjusted for covariates such as age, height, and weight are summarized in Table 9. There was a significant FEV1 adjusted mean difference among men field traffic police personnel (3.45 (3.38 – 3.52)) and the control group (3.78 (3.68 – 3.89)) ($p < 0.001$). Similarly, female Control groups have a significantly higher adjusted mean of FEV (3.19 (3.01 – 3.37)) than female Field traffic police personnel 2.75 (2.61 – 2.9). Among females, the covariates (age, height, and weight) were not statistically significant. Meanwhile, among males, age and height were statistically significant.

The adjusted mean FVC between field traffic police personnel and the control group was significantly different among both females and males. The adjusted mean of FVC among female field traffic police personnel (3.46 (3.29 – 3.63)) was significantly lower compared to female control groups (3.87 (3.66 – 4.09)) ($p < 0.005$) (Table 9). Among females, the covariates (age, height, and weight) were not statistically significant for both FEV1 and FVC, but among males age and height were statistically significant (Annex X (Table 11)).

The assumptions of ANCOVA such as Normality, Homogeneity of variance, and linearity were tested. The model fulfills all the assumptions of ANCOVA

Table 9: Lung function parameters distribution based on job status classification of Traffic police stratified by sex using ANCOVA, Ethiopia 2025

Dependent variable	Sex Strata	Job Status of TP	Adjusted mean (SE)	95% CI	P-value
FEV1 (L)	Male	In-field TP (148)	3.45 (0.035)	3.38 – 3.52	< 0.001
		In-office TP (71)	3.78 (0.051)	3.68 -3.89	
	Female	In-field TP (24)	2.75 (0.072)	2.61 – 2.9	<0.001
		In-office TP (16)	3.19 (0.088)	3.01 – 3.37	
FVC (L)	Male	In-field TP (148)	4.23 (0.042)	4.15 – 4.31	<0.001
		In-office TP (71)	4.58 (0.06)	4.46 – 4.7	
	Female	In-field TP (24)	3.46 (0.086)	3.29 – 3.63	0.005
		In-office TP (16)	3.87 (0.105)	3.66 – 4.09	

Note: "Age, height and weight" were included as a covariate in the analysis. FEV1 = Forced Expiratory Volume in 1 second, FVC = Forced Vital Capacity, SE = Standard Error (ANCOVA)

5.7.1. Factors associated with lung function parameters among traffic police personnel

The multiple linear regression model examined the relationship between predictor factors and lung function parameters (FEV1 and FVC). A stepwise selection method was used to include variables with p-values less than 0.25. Sex, age, height, job status, employment years, OSH training, and previous exposure to occupational-related air pollution were significantly associated with reduced lung function parameters.

Female traffic police had a -0.64 L (SE: 0.077) change in FEV1 compared to male traffic police personnel ($p < 0.002$). Age also had a statistically significant negative association with FEV1, with a coefficient of -0.019 L (SE: 0.006, $P < 0.001$), which indicates as age among traffic police increase by one year their FEV1 decreases by 0.019L. As height among traffic police increases by 1 cm, FEV1 also increases by 0.024 L (SE: 0.004, $p <0.001$). This shows a positive relationship between height and lung function parameters among traffic police personnel.

Field traffic police lung function parameters were significantly lower by 0.352 L (SE: 0.053, $p < 0.001$) for FEV1 and 0.368 L (SE: 0.063, $P < 0.001$) for FVC compared to control groups. Years

of employment also showed a significant negative association with lung function parameters. As years of employment increase by one, lung function parameters also reduces by 0.016 L (SE: 0.008, P < 0.04) for FEV1 and 0.02 L (SE: 0.009, P < 0.035) FVC L among traffic police personnel. In addition, being previously exposed to occupation-related air pollutants such as dust, fumes, and chemicals was also negatively associated with lung function parameters. Meanwhile, taking OSH training related to air pollution demonstrate a positive relationship with both FEV1 and FVC (Table 10).

Assumptions of linear regression such as linearity, Homoscedasticity, Normality of residuals, and no multicollinearity were checked, and the model fulfill all the Assumptions.

Table 10: Multivariable linear regression analysis of associated factors and lung function parameters of traffic police personnel, Addis Ababa 2025

Dependent Variable: FEV1, (n = 259)			
Independent Variables	**β (SE)**	**95% CI**	**p-value**
Sex (Female)	-0.64 (0.077)	(-0.792, -0.489)	< 0.001
Age in years	-0.019 (0.006)	(-0.031, -0.007)	0.002
Height in cm	0.024 (0.004)	(0.016, 0.032)	<0.001
Married	0.108 (0.076)	(-0.041, 0.258)	0.155
Brought up in urban area	0.081 (0.058)	(-0.033, 0.196)	0.164
Passive smoker	0.083 (0.068)	(-0.052, 0.218)	0.228
Field Traffic police	-0.352 (0.053)	(-0.457, -0.247)	<0.001
Employment years	-0.016 (0.008)	(-0.032, -0.001)	0.04
OSH training	0.25 (0.079)	(0.095, 0.405)	0.002
Previous OR air pollution	-0.208 (0.073)	(-0.352, -0.063)	0.005
Dependent variable: FVC,			
Independent Variable	**β (SE)**	**95 % CI**	**P-value**
Sex (Female)	-0.718 (0.091)	-0.896, -0.539	<0.001
Age in years	-0.023 (0.007)	-0.037, -0.009	0.002
Height in cm	0.033 (0.005)	0.023, 0.043	<0.001
Married	0.199 (0.089)	-0.024, 0.375	0.206
Brought up in urban area	0.107 (0.068)	-0.027, 0.242	0.118
Field traffic police	-0.368 (0.063)	-0.492, -0.244	<0.001
Employment years	-0.02 (0.009)	-0.038, -0.001	0.035
OSH training	0.296 (0.092)	0.115, 0.477	0.001
Previous OR air pollution	-0.251 (0.085)	-0.419, -0.083	0.003

Note: FEV1 = Forced Expiratory Volume in 1 second, FVC = Forced Vital Capacity, β= Regression Coefficient, CI = Confidence Interval, OSH = Occupational Safety and Health (stepwise logistic regression), OR = Occupation-Related

6. Discussion

This study was conducted among traffic police personnel of Addis Ababa to assess and compare chronic respiratory symptoms, reduction in lung function parameters, and factors influencing those respiratory health indicators among field and in-office traffic police personnel. This study shows that there is a significantly higher prevalence of chronic respiratory symptoms among field traffic police personnel who are occupationally more exposed to vehicular-related ambient air pollution compared to in-office traffic police personnel (control group). After controlling other factors; sex, work experience, and exposure status are found to be associated with developing at least one chronic respiratory symptom among traffic police personnel.

This study also showed that there is a significant difference in lung function of infield and in-office traffic police personnel. The lung function parameters (FEV1 and FVC) are significantly lower among field traffic police compared to in-office traffic police personnel. After controlling other factors sex, age, height, Occupational safety and health training, current Job status and previous occupational exposure to air pollution show a significant correlation to FVC and FEV1 reduction. Also we discovered that there is a significant difference in lung function parameters (FEV1 and FVC) among field traffic police personnel with different years of experience.

The prevalence of at least one chronic respiratory symptom among traffic police in this study is 32.93%, (CI (27.36-39.03)), This result go in line with study conducted in Hyderabad with 29.8 % prevalence and another study conducted in central, north and south Kolkata with 27.2%, 35% and 29.5% respectively (25,38). However this result shows lower prevalence compared to a study conducted in Dhaka and Bangladesh with respect to specific symptoms (cough, phlegm, wheezing and shortness of breath) (29,41). This might be due to higher number of smoker participants in the previous two studies, in both studies more than 50% of the study participants are ever smokers while in the current study only 3.74% of participants are ever smoker.

As mentioned above the prevalence of developing at least one chronic respiratory symptom is significantly higher among field traffic police personnel. This finding is consistent with a study conducted in Addis Ababa, Ethiopia among gas station workers compared to security service workers (16). In the current study chronic cough and phlegm are significantly higher among field traffic police personnel. Even though, wheezing and shortness of breath are higher among field

traffic police personnel their difference is not significant, but in the previous study its vise-versa. This inconsistency might be due to the difference in the composition of air pollution they are exposed to.

This study indicate that traffic police with greater than 10 years of service have 2.3 times higher odds of developing at least one chronic respiratory symptom than traffic police with less than or equal to 10 years of service. Another study conducted in Ethiopia among paper factory also shows that the odds of developing chronic respiratory symptom is 3.1 times higher among worker with more than 10 years of experience than less than 10 years of experience (42). This might be due to their constant exposure to air pollutants.

Additional factor which is associated with developing CRS is job status. This finding suggests that the odds of demonstrating at least one CRS among field traffic police personnel is 2.17 times higher than in-office traffic police personnel. This is may be due to their higher exposure to vehicular exhaust during the work hour. A study conducted in traffic police of Hyderabad shows that the odds of developing CRS is 1.97 higher among traffic police personnel who works in more polluted areas (25).

In this study lung function parameters such as FEV1 and FVC were lower among field traffic police personnel compared to control group. Similarly lower FEV1 was reported among traffic police personnel on a study conducted in central Karnataka and Chennai (4). Other study conducted in Gujarat also shows lower FVC among traffic police personnel (43). However when we compare the lung function parameter between those studies, our study reported higher FEV1 and FVC level. This difference might be due to ethnicity difference. A study conducted in Ethiopia among fuel station works shows a lower FVC and FEV1 level compared to security service workers, and the lung function parameters are close to the current study (16).

This study discovered that both FEV1 and FVC are lower among female traffic police, decrease with age and increase with height. These findings are supported by other studies. Men atomically having bigger lungs in size than female's accounts for the difference in lung function parameter among sex (44). FEV1 and FVC keep increasing until the age of 25 years, then remain stable until 30 /35 after that it will start declining. This declining is due to loss of elasticity of lung tissues with

age(44–46). The positive correlation of height with FEV1 and FVC is due to the lung size increasing with height which means the lung capacity will also increase (46).

We also discovered that FEV1and FVC are lower among field traffic police personnel and traffic police personnel with previous occupational exposure to dust, chemicals and vehicular related exhausts, after controlling other factors. This study is consistent with study conducted in rural area of china which shows a negative correlation of occupational exposure (dust, chemical solvents, gas and fumes) with FEV1 and FVC. Another study conducted on COPD patients in Germany to identify impacts of previous exposure on lung function and quality of life among patients with COPD indicate that exposure to gas and fume have a significant impairment on FEV1(47). So the negative correlation of being field traffic police personnel and previous occupational exposure with lung function parameters might be due their constant exposure to vehicular exhaust related air pollution.

Finally, this study shows that as years of employment increases lung function parameters (FEV1 and FVC) level decreases. This finding is supported by comparative study conducted in Chennai and Gujarat. these studies shows lower FEV1 and FVC among traffic police personnel who works more than 15 years compared to those who works for less than 15 years (4,43). This lung function reduction might be due to longer exposure to vehicular related exhaustion such as PM, CO, NO_2 and Volatile organic compounds.

7. Strength and limitation of the study

7.1. Strength of the study

To the extent of our knowledge this study is a first study focusing on traffic police respiratory health (chronic respiratory symptom and lung function) in Ethiopia. Most of the studies conducted among traffic police in other countries were only descriptive study. In this study lung function test was performed by trained professional, which gives a good insight into their respiratory health while reducing information bias. In addition this study also used a control group to insure the internal validity.

7.2. Limitation of the study

Since the study used interview to assess respiratory symptom, age, cigar smoking practice, alcohol consumption and chat chewing behavior, this might introduce recall bias and social desirability bias. The cross-sectional nature of the study restricted from establishing cause and effect relationship between risk factors and outcomes. The result might be underestimated due to the healthy worker's effect. This study only used the absolute values result for the lung functions test, since there is no reference equation for the Ethiopia population to use predicted values. However this study include all sub-city of Addis Ababa and the results are more likely to be representative.

8. Conclusion and recommendation

8.1. Conclusion

This study indicated that 32.93% of field traffic police personnel have at least one chronic respiratory symptom. Most of the respiratory symptoms are significantly higher among field traffic police personnel. This study shows a significant difference in lung function parameters among field traffic police and in office traffic police personnel. Working as field traffic police, increment of years of employment, and previous occupational exposure to gas, fumes and dust have negative association with lung function parameters while taking Occupational, Safety and Health training shows a positive association with lung function parameters of traffic police in Addis Ababa. Over all, the finding shows that traffic police personnel constant possible exposure to vehicular exhaust due to their work without taking necessary OSH training and using protective equipment pose a serious risk to respiratory health including lung function.

8.2. Recommendation

For Policy Makers:

- ✓ Implement and strengthen policies which promote cleaner transportation to create safer work and living environment for traffic police and the community.
- ✓ Installing more air pollution monitoring device throughout the city to monitor the air pollution level which helps to implement appropriate interventions.

For traffic police office:

- ✓ We recommend to develop and implement ergonomic respiratory protective equipment that allows full facial visibility at the same time protecting respiratory health of traffic police personnel.
- ✓ Provide more training regularly focusing on impacts of air pollution on health and ways to mitigate.

For health practitioners:

- ✓ Regular health examination should be conducted to detect early sign of respiratory disease among traffic police personnel.

For researchers:

- ✓ This is the first study to assess respiratory health of traffic police personnel in Ethiopia. However, since this study is a cross-sectional study we weren't able to establish cause and effect relationship, so we recommend a longitudinal study which include air pollutant level measurement and lung function test.

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Annex

Annex I: participant Information sheet

My name is _____. I am working as a data collector for the study conducted among traffic police personnel by Eyerusalem Tesfaye who is studying for her Master's degree at Addis Ababa University, Collage of Health Science, and School of Public Health. I kindly request you to give me your attention to explain you about the study and study participant.

The study title: Assessment of chronic respiratory symptoms, lung function reduction and predictor factors among traffic police personnel of Addis Ababa, Ethiopia.

Purpose of the study: The main aim of this study is to write a thesis as a partial fulfillment of a Master's degree in public health for the principal investigator. After completion of this study the result will be used as evidence and input to reduce the potential health risk of exposure to ambient air pollution.

Procedure and duration: I will be assessing chronic respiratory symptoms by using Questionnaires, pulmonary function by using Spirometer that needs your full cooperation and this may take 30 to 45 minute.

Risks and benefits: Risk of participating in this study is none since the study does not have invasive procedure and need collecting any samples. There would have no any direct benefits for being study participant. But indirectly the findings from this research will be important for improving occupational health safety practice, reducing ambient air pollution and information for the traffic police and for scientific knowledge.

Confidentiality: All information collected kept confidential and names will not be written.

Rights: Giving permission for this study is voluntary. You have the right to permit or not for this study. If you decide to permit the study, you have the right to terminate the study at any time if you consider something related to the study is wrong.

Contact address: If you have any question, which is not clear, you can contact the investigator.

Investigator: Eyerusalem Tesfaye Wolde

Mob: 0945892589, Email: eyutesfaye109@gmail.com

Advisor: Dr. Ayele Belachew, 0913306792

Addis Ababa University, College of Health Science, school of public health

Annex II. Informed consent form

Detail information about the study is explained to me. I have understood that the objective of this study is to assess the prevalence of chronic respiratory symptoms, obstructive pulmonary pattern among traffic police personnel of Addis Ababa, Ethiopia.

In addition, I understand about how the data collection is proceeding and the time it takes to complete the data collection. I also understand that the research imposes no risk on me. I assured that there would be confidentiality of my response and collected data used only for the study. It also explained to me that I have the right to stop participation at any time.

Furthermore, I understood that participating in this study is important for scientific knowledge and base for further study. Therefore, I have now consented to participate in the study by signing this form.

Signature of participants_____ date _____

Name and signature of data collector_____ date _____

Annex IV: English Version Questionnaire

Addis Ababa University Health Science Collage, School of Public Health A questionnaire designed to assess chronic respiratory symptoms, pulmonary function and associated factors among Traffic police personnel in Addis Ababa Ethiopia, 2025.

Data Collector's name: _____

Data collection date: _____

100. Work place (Sub-city) code _____

102. ID number of subjects_____

Part I. Socio-demographic information of respondents

No	Question	Answer	Remark
103	How old are you? (in years)	_____ year	
104	Gender	1) Male 2) Female	
105	What is your marital Status?		
106	What is your weight? (measure)	_____ Kg	
107	What is your height? (measure)	_____ meter	
108	BMI	_____	
109	Do you normally cook food at home?	1) Yes 2) No	If no skip to 112
110	Where is cooking normally take places in your home?	1) Inside the house 2) Outside the house (in open area) 3) In the kitchen	
111	What type of energy source mostly do you use for food preparation?	1) Charcoal 2) Firewood	

		3) Kerosene 4) Electricity 5) LPG(liquefied petroleum gas) 6) Other (specify)_____	
112	Have you ever smoked cigarettes in your life time? ("No" means less than 20 pack of cigarettes in a lifetime or less than 1 cigarette a day for one year.)	1) Yes 2) No	If "No" skip to 220
113	Do you now smoke cigarettes (as of one month ago)?	1) Yes 2) No	
114	How old were you when you first started cigarette smoking regularly?	_____ years old	
115	Have you stopped smoking cigarette completely?	1) Yes 2) No	If "No" skip to 117
116	How old were you when you stopped smoking?	_____years old	
117	How many cigarette do you smoke per day now?	_____ pieces	
118	On the average of the entire time you smoked, how many cigarette did you smoke per day?	_____pieces	
119	Have you ever smoked cigarette regularly? (yes means more than one cigarette a week for a year)	1) Yes 2) No	
120	Is there current smoker in your house?	1) Yes 2) No	If "NO" skip to 201
121	Does they smoke in the house?	1) Yes 2) No	

Part II: Occupational history and safety

No	Question	Answer	Remark
201	For how long have you been working in this working area?	_____year and month	
202	For how many working hour per day do you work at roadside?	_____hours/day	
203	For how many working days per a week do you work at roadside?	_____days/week	
204	Do you usually wear respiratory protective devices while at work?	1) Yes 2) No	If "No" skip to 206, if "yes" skip Q 206
205	Which of the following type of protective devices did you use? (choose all that you apply in your working area)		
206	Select the most appropriate reasons for not using respiratory protective equipment.	1) Not available 2) Not comfortable for work 3) Not provided by institution 4) Believes there is no need to use RPE 5) Others specify_____	
207	Do you ever have occupational health and safety training?	1) Yes 2) No	
208	Do you ever been supervised at work place on occupational safety issues?	1) Yes 2) No	

Part III: respiratory symptoms of respondents

"I would like to ask you some questions that pertains mainly to your chest. Please answer yes or no if possible. (Interviewer Note: if the participant is in doubt about whether his/her answer is 'yes' or 'no' record 'no'. ")			
No	Question	Answer	Remark
Cough related questions			

301	Do you usually have a cough? (exclude clearing of throat)	1) Yes 2) No	
302	Do you usually cough as much as four to six times a day, four or more days of the week?	1) Yes 2) No	
303	Do you usually cough at all on getting up, or first thing in the morning?	1) Yes 2) No	
304	Do you usually cough at all during the rest of the day or at night?	1) Yes 2) No	if there is no a "yes" from 301-304 skip to 307
305	Do you usually cough like this on most days for five consecutive months or more during the year?	1) Yes 2) No	
306	For how many years did you have this cough?	_____years	
Phlegm related questions			
307	Do you usually bring up phlegm from your chest? (exclude phlegm from nose)	1) Yes 2) No	
308	Do you usually bring up phlegm like as much as twice a day, four or more days of a week?	1) Yes 2) No	
310	Do you usually bring up phlegm at all getting up, or first thing in the morning?	1) Yes 2) No	
311	Do you usually bring up phlegm at all during the rest of the day or at night?	1) Yes 2) No	if there is no a "yes" from 307-311 skip to 314

312	Do you usually bring up phlegm like this on most days for three consecutive months or during the year?	1) Yes 2) No	
313	For how many years have you had trouble with phlegm	_____years	
Wheezing related questions			
314	Does your chest ever sound wheezy or whistling when you have a cold?	1) Yes 2) No	
315	Does your chest ever sound wheezy or whistling occasionally apart from colds?	1) Yes 2) No	
316	Does your chest ever sound wheezy or whistling most days or nights?	1) Yes 2) No	if there is no a "yes" from 314-316 skip to 322
317	For how many years has this been present	_____years	
318	Have you ever has an ATTACK of wheezing that has made you feel short of breath?	1) Yes 2) No	If "no" skip to 322
319	How old were you when you had your first such attack?	_____ years old	
320	Have you had 2 or more such episodes?	1) Yes 2) No	
321	Have you ever required medicine or treatment for the (se) attack(s)?	1) Yes 2) No	
Breathlessness related questions			
322	Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill?	1) Yes 2) No	

323	Do you have to walk slower than people of your age on level because of breathlessness?	1) Yes 2) No	
324	Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on the level?	1) Yes 2) No	
325	Do you ever have to stop for a breath when walking at your own pace on the level?	1) Yes 2) No	
326	Are you too breathless to leave the house or breathless on dressing or undressing?	1) Yes 2) No	

Part IV: history of respiratory illness

No	Question	Answer	Remark
401	Did you have any lung trouble before the age of 16?	1) Yes 2) No	
402	Have you ever had attacks of **bronchitis**?	1) Yes 2) No	If "no" skip to 403
A	Was it confirmed by a doctor?	1) Yes 2) No	
B	At what age was your first attack?	_____years	
403	Have you ever had pneumonia (include bronchopneumonia)?	1) Yes 2) No	If "no" skip to 404
A	Was it confirmed by a doctor?	1) Yes 2) No	
B	At what age do you first have it?	_____years	
404	Have you ever had a hay fever?	1) Yes 2) No	If "no" skip to 405
A	Was it confirmed by a doctor?	1) Yes 2) No	
B	At what age did it start	_____years	

405	Have you ever had chronic bronchitis?	1) Yes 2) No	If "no" skip to 406
A	Do you still have it?	1) Yes 2) No	
B	Was it confirmed by a doctor?	1) Yes 2) No	
C	At what age did it start?	_____years	
406	Have you ever had emphysema?	1) Yes 2) No	If "no" skip to 407
A	Do you still have it?	1) Yes 2) No	
B	Was it confirmed by a doctor?	1) Yes 2) No	
C	At what age did it start?	_____years	
407	Have you ever had asthma?	1) Yes 2) No	If "no" skip to 408
A	Do you still have it?	1) Yes 2) No	
B	Was it confirmed by a doctor?	1) Yes 2) No	
C	At what age did it start?	_____years	
D	If you no longer have it, at what age did it stop?	_____years Still have it	
408	Have you ever had any other chest illness?	1) Yes 2) No	If "no" skip to 409
A	Specify it	_____	

409	Have you ever had any chest operations?	1) Yes 2) No	If "no" skip to 410
A	Specify it	_____	
410	Have you ever had any chest injuries?	1) Yes 2) No	If "no" skip to 40
A	Specify it	_____	

Part V: pre spirometry screening questionnaire

No	Question	Answer	Remark
501	Have you had a chest trauma or any major surgery in the last six weeks involving the eye, ear, chest, abdomen, brain, nose or throat?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
502	Have you been hospitalized in the last six weeks?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
503	In the last 4 weeks have you had any cardiac complaint (unstable angina, cerebrovascular accident, or aneurysm) or suffered from a heart attack?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
504	Have you recently or are you currently coughing up any blood?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
505	Have you recently had or currently had an acute retinal detachment?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
506	Are you under a doctor's care for high blood pressure?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.

507	Have you had respiratory infection (such as flu, pneumonia, bronchitis, or a chest cold) in the last 3 weeks?	1) Yes 2) No	
508	Within the last 2 hours have you eaten a full meal?	1) Yes 2) No 3) Continue without waiting	If "yes" wait an hour if the participant is willing. otherwise, continue without waiting, then remark on "3"
509	Have you used a short acting inhaled bronchodilator (SAB) (Ventoline, Venteeze, Asthavent, Duovent) in the last 4 hours?	1) Yes 2) No	
510	Have you used a long acting inhaled bronchodilator (LAB) in the last 4 hours?	1) Yes 2) No	
511	Have you used any other medication in the past 24 hours?	1) Yes 2) No	
512	Are you in any pain that could limit you from blowing with effort?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
513	Are you currently suffering from an acute diarrhea, vomiting or nausea that may limit you from blowing with effort?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
514	Have you consumed alcohol in the past 4 hours?	1) Yes 2) No	If "yes" don't include this participant in the spirometry test.
515	Have you had more than 2 cups of caffeinated coffee, tea, or cola in the last 6 hours?	1) Yes 2) No	
516	Are you wearing any tight clothing that interferes with your ability to breathe deeply?	1) Yes 2) No	If "yes" inform them that it will reduce the accuracy of the test, then ask them to loosen or remove

517	Are you wearing dentures?	1) Yes 2) No 3) Continue without improving	If “yes” inform them that it will reduce the accuracy of the test. If they are willing ask them to remove it, if they are not continue the test, then put a remark on “3”

Annex V: Amharic version participant Information sheet

ስሜ_____ይባላል። እዚህ የተገኘሁት በአበባ ዩኒቨርሲቲ፣ በጤና ሳይንስ ኮሌጅ እና በህብረተሰብ ጤና ትምህርት ቤት ሁለተኛ ዲግሪያቸውን በመከታተል ላይ በሚገኙት በአየሩሳሌም ተስፋዬ በትራፊክ ፖሊስ አባላት መካከል ለሚካሄደው ጥናት መረጃ ሰብሳቢ ሆኜ ነው። ስለ ጥናቱ እና የጥናቱ ተሳትፎ ለእርስዎ ለማስረዳት ትኩረትዎን እንዲሰጡኝ በአክብሮት እጠይቃለሁ።

የጥናት ርዕስ፡- Prevalence of respiratory morbidities and association of PM2.5 with lung function among traffic police personnel of Addis Ababa, Ethiopia.

የጥናቱ አላማ፡- የዚህ ጥናት ዋና አላማ ለዋና መርማሪ በህዝብ ጤና የማስተርስ ዲግሪ ከፊል ማሟያ ሆኖ ወረቀት (ምርምር) መፃፍ ነው። ይህ ጥናት ከተጠናቀቀ በኋላ ውጤቱ ለአካባቢ አየር ብክለት ሊጋለጥ የሚችለውን የጤና ስጋት ለመቀነስ እንደ ማስረጃ እና ግብአት ጥቅም ላይ ይውላል።

የአሰራር ሂደቱ እና የቆይታ ጊዜ፡- መጠይቆችን በመጠቀም የመተንፈሻ አካላት በሽታ ምልክቶችን እገመግማለሁ; ሙሉ ትብብርዎን የሚፈልገውን Spirometer በመጠቀም የሳንባ ተግባር ምርመራ አደርጋለሁ ። እና ይህ አጠቃላይ ሂደት ከ 45 እስከ 60 ደቂቃዎች ሊወስድ ይችላል ::

ስጋቶች እና ጥቅሞች፡ በዚህ ጥናት ውስጥ በመሳተፍ የሚመጣ ምንም አይነት ስጋት የለም። የጥናት ተሳታፊ ለመሆን ምንም አይነት ቀጥተኛ ጥቅሞች አይኖሩም። ነገር ግን በተዘዋዋሪ ከዚህ ምርምር የተገኙት ግኝቶች ለትራፊክ ፖሊስ ሰራተኞች የስራ ጤና ደህንነትን ለማሻሻል ጠቃሚ ይሆናሉ. የአካባቢ አየር ብክለትን ለመቀነስ እና ሳይንሳዊ እውቀትን ለማበርከት ጠቃሚ መረጃ ይሆናል።

ምስጢራዊነት፡- ሁሉም የተሰበሰቡ መረጃዎች በሚስጥር ተጠብቀው እና ስሞች አይጻፉም።

መብቶች፡- በዚህ ጥናት ውስጥ መሳተፍ በፈቃደኝነት ላይ የተመሰረተ ነው። ለዚህ ጥናት ፈቃድ የመስጠት ወይም የመስጠት መብት አልዎት። ተሳትፎዎን ለማቋረጥ ከፈለጉ በማንኛውም ጊዜ ጥናቱን የማቋረጥ መብት አለዎት።

ስለ ጥናቱ ግልጽ ያልሆነ ማንኛውም ጥያቄ ካለዎት, መርማሪውን ማነጋገር ይችላሉ.

መርማሪ፡ እየሩሳሌም ተስፋዬ ወልዴ, 0945892589, Email: eyutesfaye109@gmail.com

አማካሪ፡- ዶ/ር አየለ በላቸው, 0913306792

አዲስ አበባ ዩኒቨርሲቲ፣ የጤና ሳይንስ ኮሌጅ፣ የሕዝብ ጤና ትምህርት ቤት

Annex VI. Informed consent form

የስምምነት መዋዋያ ቅጽ

ስለ ጥናቱ ዝርዝር መረጃ ተብራርቶልኛል. የዚህ ጥናት ዓላማ በአዲስ አበባ፣ ኢትዮጵያ የትራፊክ ፖሊስ አባላት መካከል የአተነፋፈስ ችግሮችንና መንስኤዎቻቸውን ማጥናት መሆኑን ተረድቻለሁ።

በተጨማሪም፣ የመረጃ አሰባሰብ ሂደት እንዴት እንደሚካሄድ እና የመረጃ አሰባሰብን ለማጠናቀቅ ስለሚወስደው ጊዜ ተረድቻለሁ። ጥናቱ በእኔ ላይ ምንም አይነት ስጋት እንደማይፈጥርም ተረድቻለሁ። የእኔ ምላሽ እና የተሰበሰበ መረጃ ለጥናቱ ብቻ ጥቅም ላይ የሚውል ሚስጥራዊ እንደሚሆን አረጋግጣለሁ። በማንኛውም ጊዜ ተሳትፎን የማቆም መብት እንዳለኝም ገልፆልኛል።

በተጨማሪም፣ በዚህ ጥናት ውስጥ መሳተፍ ለሳይንሳዊ እውቀት እና ለቀጣይ ጥናት መሰረት አስፈላጊ መሆኑን ተረድቻለሁ። ስለዚህ፣ አሁን ይህንን ቅጽ በመፈረም በጥናቱ ለመሳተፍ ተስማምቻለሁ።

የተሳታፊ ፊርማ _____ ቀን _____

መረጃ ሰብሳቢ ስምናፊርማ _____ ቀን _____

Annex VII: Amharic Version Questionnaire

አዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ፣ የህብረተሰብ ጤና ትምህርት ቤት

የህ መጠይቅ በ2024/25 ዓ.ም የአዲስ አበባ የትራፊክ ፖሊስ አባላትን የመተንፈሻ አካል ችግርና መንስኤዎቻተውን ለማጥናት የተዘጋጀ መጠይቅ ነው።

መረጃ ሰብሳቢ ስም: _____

የመረጃ መሰብሰቢያ ቀን: _____

100. የስራ ቦታ (ክፍለ ከተማ) ኮድ _____

101. የቡድን ኮድ _____

102. የተሳታፊ መታወቂያ ቁጥር _____

ክፍል I. የምላሾች ማህበራዊ-ስነ-ሕዝብ መረጃማህበራዊ ሁኔታ መስፈርት

ተ. ቁጥር	ጥያቄ	መልስ	አስተያየት
103	እድሜዎ ስንት ነው? በሙሉ አመት	_____ አመት ነው	
104	የተሳታፊው ፆታ ምንድነ?	1) ወንድ 2) ሴት	
105	የጋብቻ ሁኔታዎ እንዴት ነው?	1) ያላገባ(ች) 2) ያገባ(ች) 3) ተለያይተው የሚኖሩ 4) የፈታ(ች) 5) የሞተበት(ባት)	
106	ክብደትህ ስንት ነው? (መለካት)	_____ ኪ.ግ	

107	ቁመትህ ስንት ነው? (መለካት)	_____ ሜትር	
108	BMI	_____	
109	በመደበኛነት ቤት ውስጥ ምግብ ያበስላሉ?	1) አዎ 2) አይደለም	መልሱ "አይደለም" ከሆነ ወደ 112 ይለፉ
110	በቤትዎ ውስጥ ብዙውን ጊዜ ምግብን የት ያበስላሉ?	1) በቤት ውስጥ 2) ከቤት ውጭ (ክፍት ቦታ) 3) በኩሽና ውስጥ	
111	ምግብ የሚያበስሉት ምን በመጠቀም ነዉ ?	1) ከሰል 2) እንጨጥ 3) ጋዝ 4) የኤሌትሪክ ሃይል 5) የሲሊንደር ጋዝ 6) ሌላ ካለ ይግለፁ_____	
112	ቤትዎ ውስጥ አጫሽ አለ?	1) አለ 2) የለም	መልሱ "የለም" ከሆነ ወደ 201 ይለፉ
113	ቤት ውስጥ ያጨሳሉ?	1) አዎ ያጨሳሉ 2) አያጨሱም	

ክፍል II፡የስራ ታሪክ እና ደህንነት

ተ. ቁጥር	ጥያቄ	መልስ	አስተያየት
201	በዚህ የስራ ቦታ ለምን ያህል ጊዜ ሰሩ?	_____ አመት እና ወር	

202	በቀን ስንት የስራ ሰአት ነው የምትሰራው?	_____ ሰዓት / ቀን	
203	በሳምንት ስንት የስራ ቀናት ነው የሚሰሩት?	_____ ቀናት / ሳምንት	
204	በሥራ ላይ እያሉ የመተንፈሻ መከላከያ መሳሪያዎችን ይለብሳሉ?	1) አዎ 2) አይ	መልሱ "አይ" ከሆነ ወደ 206 ይለፉ, መልሱ "አዎ" ከሆነ 206 ይለፉት
205	ከሚከተሉት አይነት የመተንፈሻ መከላከያ መሳሪያዎች የትኛውን ይጠቀዋል? (በስራ ቦታዎ ላይ የሚያመለክቱትን ሁሉ ይምረጡ)		
206	የመተንፈሻ መከላከያ መሳሪያዎችን ላለመጠቀም በጣም ተስማሚ የሆኑትን ምክንያቶች ይምረጡ.’	1) ጭራሽ ስለሌለ 2) ለመልበስ ስለማይመች 3) በማስሪያ ቤት ስለማይቀረብ 4) የመተንፈሻ መከላከያ መሳሪያ መጠቀም አያስፈልግም ብዬ አምናለሁ 5) ሌላ ካለ ይጥቀሱ _____	
207	የሙያ ጤና እና ደህንነት ስልጠና ወስደው ያውቃሉ?	1) አዎ 2) አይ	

ክፍል III: የአተነፋፋስ ስርዓት ምልክቶችን የተመለከቱ ጥያቄዎች

በዋነኛነት ከደረትዎ ጋር የተያያዙ አንዳንድ ጥያቄዎችን ልጠይቅዎት እፈልጋለሁ። እባክዎ ከተቻለ አዎ ወይም አይደለም ብለው ይመልሱ። (የጠያቂው ማስታወሻ፡ ተሳታፊው/ሷ መልሱ ‘አዎ’ ወይም ‘አይ’ ስለመሆኑ ከተጠራጠረ ‘አይ’ ብለው ሪኮርድ			
ተ. ቁጥር	ጥያቄ	መልስ	አስተያየት

ከሳል ጋር የተያያዙ ጥያቄዎች			
301	ብዙውን ጊዜ ሳል አለብዎት? (የጉሮሮ ማጽዳትን ሳይጨምር)	1) አለ 2) የለም	
302	ብዙውን ጊዜ በቀን ከአራት እስከ ስድስት ጊዜ፣ በሳምንቱ አራት ወይም ከዚያ በላይ ቀናት ያሳልሳሉ?	1) አዎ 2) አይ	
303	ብዙውን ጊዜ በሚነሱበት ጊዜ ወይም በመጀመሪያ ጠዋት ላይ ሳል አለብዎት?	1) አዎ 2) አይ	
304	በቀሪው ቀን ወይም በሌሊት ብዙውን ጊዜ ሳል አለብዎት?	1) አዎ 2) አይ	ከ301-304 “አዎ” የሚል መልስ ከሌለ ወደ 307 ይለፉ
305	በአብዛኛዎቹ ቀናት እንደዚህ አይነት ሳል በተከታታይ ለአምስት ወራት ወይም በዓመት ውስጥ ብዙ ጊዜ ታሳልፋለህ?	1) አዎ 2) አይ	
306	ይህ ሳል ለምን ያህል አመታት ቆይቷል?	_____ አመታት	
ከአክታ ጋር የተያያዙ ጥያቄዎች			
307	ብዙውን ጊዜ ከደረትዎ አክታ ያመጣሉ? (የአፍንጫ ውስጥ አክታን አይጨምር)	1) አዎ 2) አይ	
308	ብዙውን ጊዜ በቀን ሁለት ጊዜ ፣ በሳምንት አራት ወይም ከዚያ በላይ ቀናት ውስጥ አክታን ያመጣሉ?	1) አዎ 2) አይ	
310	ብዙውን ጊዜ ጠዋት ከእንቅልፍዎ ሲነሱ መጀመሪያ ላይ አክታን ያመጣሉ?	1) አዎ 2) አይ	

311	ብዙውን ጊዜ በቀሪው ቀን ወይም ምሽት ላይ አክታን ያመጣሉ?	1) አዎ 2) አይ	if there is no a “yes” from 307-311 skip to 314
312	ብዙውን ጊዜ እንደዚህ አይነት አክታን በአብዛኛዎቹ ቀናት ለሦስት ተከታታይ ወራት ወይም በዓመት ውስጥ ያመጣሉ?	1) አዎ 2) አይ	
313	ለስንት አመታት በአክታ ችግር አጋጥሞዎታል	_____ ዓመታት	
Wheezing related questions			
314	ጉንፋን ሲይዝ ደረትዎ ያፏጫል?	1) አለው 2) የለውም	
315	ደረትዎ ከጉንፋን በስተቀር አልፎ አልፎ ያፏጫል ወይም ያፏጫል?	1) አዎ 2) አይ	
316	ደረትዎ ብዙ ቀናት ወይም ምሽቶች ያፏጫል?	1) አዎ 2) አይ	ከ314-316 “አዎ” የሚል መልስ ከሌለ ወደ 322 ይለፉ
317	ይህ ለምን ያህል ዓመታት ቆይቷል	_____ ዓመታት	
318	የትንፋሽ ማጠር እንዲሰማዎ የሚያደርግ የትንፋሽ ጥቃት አጋጥሞዎት ያውቃሉ?	1) አዎ 2) አይ	መልሱ “አይ” ከሆነ ወደ 322 ይለፉ
319	ለመጀመሪያ ጊዜ እንዲህ አይነት ጥቃት ሲደርስህ ስንት አመትህ ነበር?	_____ አመት	
320	2 ወይም ከዚያ በላይ እንደዚህ አይነት ክስተት አጋጥሞዎታል?	1) አዎ 2) አይ	

321	ለ(ሴ) ጥቃት(ዎች) መድሃኒት ወይም ህክምና ፈልገህ ታውቃለህ?	1) አዎ 2) አይ	
ከትንፋሽ እጥረት ጋር የተያያዙ ጥያቄዎች			
322	በደረጃው ላይ ሲጣደፉ ወይም ትንሽ ኮረብታ ሲወጡ በትንፋሽ እጥረት ይቸግረሉ?	1) አዎ 2) አይ	
323	ከትንፋሽ ማጠር የተነሳ ከእድሜዎ ሰዎች ይልቅ በዝግታ መሄድ አለቦት?	1) አዎ 2) አይ	
324	በደረጃው ላይ ወደ 100 ያርድ (ወይም ከጥቂት ደቂቃዎች በኋላ) ከተራመዱ በኋላ ለመተንፈስ አስፈልጎህ ያውቃል?	1) አዎ 2) አይ	
325	በራስህ ፍጥነት በደረጃ ስትራመድ ለትንፋሽ ማቆም አስፈልጎህ ያውቃል?	1) አዎ 2) አይ	
326	ልብስ ስትለብስ ወይም ከቤት ለመውጣት የትንፋሽ ማጠር ተሰምቶህ ያውቃል?	1) አዎ 2) አይ	

ክፍል IV: የመተንፈሻ አካላት በሽታ ታሪክ

ተ. ቁጥር	ጥያቄ	Answer	Remark
401	ከ16 ዓመት እድሜ በፊት የሳንባ ችግር አጋጥሞዎታል?	1) አዎ 2) አይ	
402	የብሮንካይተስ በሽታ አጋጥሞዎት ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 403 ይለፉ
A	በሀኪም የተረጋገጠ ነው?	1) አዎ 2) አይ	

B	የመጀመሪያ ጥቃትህ ስንት አመት ላይ ነበር?	_____ አመት	
403	የሳንባ ምች (ብሮንሆፕኒሞኒያን ጨምሮ) አጋጥሞዎት ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 404 ይለፉ
A	በሀኪም የተረጋገጠ ነው?	1) አዎ 2) አይ	
B	At what age do you first have it?	_____ አመት	
405	ሥር የሰደደ ብሮንካይተስ ይዝዎት ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 406 ይለፉ
A	አሁንም አለብህ?	1) አዎ 2) አይ	
B	በሀኪም የተረጋገጠ ነው?	1) አዎ 2) አይ	
C	በስንት ዓመትህ/ሽ ነው የጀመረህ/ሽ?	_____ አመት	
406	ኤምፊዚማ ይዝዎህ/ሽ ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 407 ይለፉ
A	አሁንም አለብህ/ሽ?	1) አዎ 2) አይ	
B	በሀኪም የተረጋገጠ ነው?	1) አዎ 2) አይ	
C	በስንት ዓመትህ/ሽ ነው የጀመረህ/ሽ?	_____አመት	

407	አስም ይዝዎህ/ሽ ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 408 ይለፉ
A	አሁንም አለብህ/ሽ?	1) አዎ 2) አይ	
B	በሀኪም የተረጋገጠ ነው?	1) አዎ 2) አይ	
C	በስንት ዓመትህ/ሽ ነው የጀመረህ/ሽ?	_____አመት	
D	ከአሁን በኋላ ከሌለብህ/ሽ በየትኛው ዕድሜ ላይ ነው የተወህ/ሽ?	_____አመት Still have it	
408	ሌላ የደረት ሕመም አጋጥሞህ ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 409 ይለፉ
A	ይግለጹ	_____	
409	የደረት ቀዶ ጥገና አድርገህ ታውቃለህ/ሽ?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 410 ይለፉ
A	ይግለጹ	_____	
410	በደረት ላይ ጉዳት አጋጥሞህ ያውቃል?	1) አዎ 2) አይ	መልሱ "አይደለም" ከሆነ ወደ 501 ይለፉ
A	ይግለጹ	_____	

ክፍል V፡ የቅድመ ስፒሮሜትሪ ማጣሪያ መጠይቅ

ተ. ቁጥር	ጥያቄ	መልስ	አስተያየት
501	ባለፉት ስድስት ሳምንታት ውስጥ የደረት ጉዳት ወይም አይን፣ ጆሮን፣ ደረትን፣ ሆድን፣ አንጎልን፣ አፍንጫን ወይም ጉሮሮን የሚያጠቃልል ከባድ ቀዶ ጥገና አጋጥሞዎታል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
502	ባለፉት ስድስት ሳምንታት ውስጥ ሆስፒታል ገብተሃል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
503	ባለፉት 4 ሳምንታት ውስጥ ምንም አይነት የልብ ህመም አጋጥሞዎታል (ያልተረጋጋ angina፣ cerebrovascular accident፣ ወይም አኑኢሪዝም) ወይም የልብ ድካም አጋጥሞዎታል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
504	በቅርብ ጊዜ አለዎት ወይንስ በአሁኑ ጊዜ ደም እያስሉ ነው?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
505	በቅርብ ጊዜ አጣዳፊ የሬቲና በሽታ አጋጥሞዎት ያውቃል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
506	ለከፍተኛ የደም ግፊት በሀኪም ቁጥጥር ስር ነዎት?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
507	ባለፉት 3 ሳምንታት ውስጥ የመተንፈሻ አካላት ኢንፌክሽን (እንደ ጉንፋን፣ የሳምባ ምች፣ ብሮንካይተስ ወይም የደረት ጉንፋን ያሉ) አጋጥሞዎታል?	1) አዎ 2) አይ	

508	ባለፉት 2 ሰዓታት ውስጥ ሙሉ ምግብ በልተሃል?	1) አዎ 2) አይ 3) Continue without waiting	"አዎ" ከሆነ ተሳታፊው ፈቃደኛ ከሆነ አንድ ሰዓት ይጠብቁ. ያለበለዚያ ሳይጠብቁ ይቀጥሉ እና “3” ላይ አስተያየት ይስጡ
509	በአለፉት 4 ሰአታት ውስጥ ለአጭር ጊዜ የሚሰራ ብሮንካዶላይተር (SAB) (ቬንቶሊን፣ ቬንተዜ፣ አስታቬንት፣ ዱኦቬንት) ተጠቅመዋል?	1) አዎ 2) አይ	
510	ባለፉት 4 ሰዓታት ውስጥ ለረጅም ጊዜ የሚሰራ ብሮንካዶላይተር (LAB) ተጠቅመዋል?	1) አዎ 2) አይ	
511	ባለፉት 24 ሰዓታት ውስጥ ሌላ ማንኛውንም መድሃኒት ተጠቅመዋል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
512	በደንብ ከመንፋት ሊገድብዎት የሚችል ህመም ላይ ነዎት?	1) አዎ 2) አይ	
513	በአሁኑ ጊዜ በአጣዳፊ ተቅማጥ፣ ማስታወክ ወይም ማቅለሽለሽ እየተሰቃዩ ነው ይህም በጥረት መተንፈስ ሊገድብዎት ይችላል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
514	ባለፉት 4 ሰዓታት ውስጥ አልኮል ጠጥተዋል?	1) አዎ 2) አይ	መልሱ "አዎ" ከሆነ ይህንን ተሳታፊ በ spirometry ምርመራ ውስጥ አያካትቱ.
515	ባለፉት 6 ሰአታት ውስጥ ከ2 ኩባያ በላይ ካፌይን ያለበት ቡና፣ ሻይ ወይም ኮላ ጠጥተዋል?	1) አዎ 2) አይ	
516	በጥልቀት የመተንፈስ ችሎታዎን የሚረብሽ ማንኛውንም ጥብቅ ልብስ ለብሰዋል?	1) አዎ 2) አይ	"አዎ" ከሆነ የምርመራውን ትክክለኛነት እንደሚቀንስ

			ያሳውቋቸው, ከዚያም እንዲፈቱ ወይም እንዲያወልት ይጠይቋቸው
517	የጥርስ መደገፍያ ለብሰዋል?	1) አዎ 2) አይ 3) Continue without improving	መልሱ "አዎ" ከሆነ የምርመራውን ትክክለኛነት እንደሚቀንስ ያሳውቋቸው. ፈቃደኛ ከሆኑ እንዲያስወግዱት ጠይቃቸው። አለበለዚያ ምርመራውን ይቀጥሉ እና በ "3" ላይ አስተያየት ይስጡ

Annex X: Supplementary tables

Table 11: ANCOVA supplementary table Lung function parameters comparison among job status classification of Traffic police stratified by sex and adjusted for Age, Height and Weight, Ethiopia 2025

Dependent variable	Sex Strata	Source	Partial SS	df	MS	F	P > F
FEV1 (L)	Male	Model	19.427	4	4.857	27.12	<0.001
		Group	5.013	1	5.013	27.99	< 0.001
		Age	4.953	1	4.953	27.65	< 0.001
		Height	4.941	1	4.941	27.59	< 0.001
		Weight	0.155	1	0.016	0.09	0.769
		Residual	38.327	214	0.179		
	Female	Model	2.661	4	0.64	5.17	0.002
		Group	1.815	1	1.815	14.65	< 0.001
		Age	0.235	1	0.235	1.9	0.177
		Height	0.299	1	0.299	2.42	0.129
		Weight	0.011	1	0.011	0.09	0.771
		Residual	4.336	35	0.123		
FVC (L)	Male	Model	27.973	4	6.993	27.71	< 0.001
		Group	5.683	1	5.683	22.52	< 0.001
		Age	7.208	1	7.208	28.57	< 0.001
		Height	9.119	1	9.119	36.14	< 0.001
		Weight	0.082	1	0.082	0.32	0.57
		Residual	54.001	214	0.252		
	Female	Model	2.662	4	0.665	3.78	0.012
		Group	1.626	1	1.626	9.23	0.005
		Age	0.154	1	0.154	0.87	0.357
		Height	0.725	1	0.725	4.11	0.05
		Weight	0.034	1	0.034	0.2	0.661

		Residual	6.163	35	0.176		