ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
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ASSESSMENT OF CHRONIC RESPIRATORY SYMPTOMS AND LUNG FUNCTION PARAMETERS AMONG LARGE SCALE WOOD FACTORY WORKERS IN ADDIS ABABA, ETHIOPIA. A COMPARATIVE CROSS-SECTIONAL STUDY

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A RESEARCH THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF PUBLIC HEALTH IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF PUBLIC HEALTH

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As thesis research advisor, I hereby certify that I have read and evaluate this thesis prepared under my guidance by Belayneh Jabur entitled ‘‘Assessment of chronic respiratory symptoms and lung function parameters among large scale wood factory workers in Addis Ababa, Ethiopia” a comparative cross-sectional study is recommended to be submitted as fulfilling the thesis requirement and regulations of the University and meets the accepted standards with respect to originality and quality.

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ACRONYMS AND ABBREVIATIONS

AAU	Addis Ababa University
AOR	Adjusted Odds Ratio
ANOVA	Analysis of Variance
ATS	American Thoracic Society
COPD	Chronic Obstructive Pulmonary Disease
COR	Crude Odds Ratio
FEV_1	Forced Expiratory Volume in one second
FVC	Forced Vital Capacity
HSE	Health and Safety Executive
ILO	International Labor Organization
KGs	Kilograms
PR	Prevalence ratio
RPD	Respiratory Protective Device
SPSS	Statistical Packages for Social Science
WHO	World Health Organization

ABSTRACT

Background: Occupational exposure to wood dust could cause numerous health problems including chronic respiratory symptoms and reduction of lung function parameters. However, information regarding prevalence of chronic respiratory symptoms and lung function parameters among large scale wood factory workers in Ethiopia is limited.

Objective: The aim of this study was to assess prevalence of chronic respiratory symptoms, lung function parameters and associated factors among large scale wood factory workers in Addis Ababa, Ethiopia, 2019.

Methods: An Institution based comparative cross-sectional study was conducted from February to April 2019. A total of 464 (232 wood workers and 232 Moha soft drink industry workers as control group) were included in the study. Chronic respiratory symptoms assessment was conducted in all participants from both groups while lung function test was conducted on 50 participants from each wood factory and soft drink industry. Stratified and simple random sampling was used to select wood workers and controls respectively. Chronic respiratory symptom was assessed using modified American Thoaracic Socity (ATS) questionnaire while lung function test was done using Easy on-pc spirometer. The data was entered in to a computer using Epi-data software version 4.4.2 then exported to SPSS version 23 and analyzed. Poisson regression, Multiple linear regressions and Multivariable logistic regression were performed.

Results: In this study the prevalence ratio of overall chronic respiratory symptoms (PR = 2.17, 95% CI: 1.51–3.12) was significantly higher among wood workers (65.7%) compared to controls (23.3%). Moreover, sex, previous respiratory disease, not use of respiratory protective device and working department were associated with chronic respiratory symptoms. The wood workers had significantly lower FVC and FEV_1 compared with controls.

Conclusion: The wood workers had a higher prevalence of chronic respiratory symptoms and lower lung function parameters compared with controls, these reducing lung capacity. Therefore, respiratory protective devices should be provided to take preventive measures.

Keywords: Wood dust, Chronic respiratory symptoms, Lung function test, Workers,

1. INTRODUCTION

1.1 Background of the study

Wood is one of the most important renewable natural resources in the world and annually at least 17000 million cubic meters of forests are harvested for industrial use (1). Worldwide 12 000 tree species exist and more than 1000 of these are used for commercial purposes (2) Industries where high amount of wood dust are produced include sawmills, dimension mills, furniture industries, cabinetmaking and carpentry (2). It is estimated that at least two million workers are regularly exposed to wood dust in the work place in the world and 3.6 million workers in the European Union (2, 3).

Dust is small dry solid particles range from one to hundred micrometers in diameter size and generated by natural forces or human made processes and there are two major types of dust organic and inorganic (4). The location and accumulation of dust particles has been depend on size, shape and density of air flow available (5) and dust particles accumulated in the nose and respiratory track when the particles are larger or smaller than 5 microns respectively (6). Wood dust is a complex mixture consists mainly of cellulose, hemicellulose and lignin might release a range of biologically active compounds such as quinones, terpenes, stilbenes, phenols, tannins, and flavonoids during wood processing (2, 7).

Wood manufacturing is a big business involves a large number of workers and considered as labor intensive industries (8) were categorized into two sub-types: composite industries which includes chip wood factory, plywood factories and hard board factory and furniture industries such as large, medium and small scale. In Ethiopia, there are around 17,992 wood industries in all scales and 5022 of them are located in Addis Ababa (9). The majority of wood factories in Addis Ababa uses timber species such as Medium-Density Fiberboard, Austrian Pine, Plywood, Cordia africana, Olea europea-cuspidata, Hagenia abyssinica and podocarpus falcatus both in solid and panel form (9, 10).

Despite the increasing production of furniture manufacturing in Ethiopia (11) little is known about prevalence of chronic respiratory symptoms and reduction of lung function parameters among large scale wood factories workers which involves large number of workers and producing huge amount of wood products.

Therefore, the aim of this study was to assess the prevalence of chronic respiratory symptoms, measure lung function parameters and associated factors among large scale wood factory workers in Addis Ababa, Ethiopia and to compare the results with a control groups from Moha soft drink industry workers with low dust exposure.

1.2 Statement of the problem

World health organization (WHO) estimated that 2.78 million deaths every year being attributed to work related factors across the globe. Among these respiratory disease accounts for 17% next to circulatory disease (31%) and malignant neoplasm (26%) (12). Respiratory diseases are leading causes of death and disability in the world. About 65 million people suffer from chronic obstructive pulmonary disease (COPD) and 3 million die from it every year which makes COPD the third leading cause of death worldwide (13). Moreover**.** occupational respiratory diseases accounts for up to 30% of all registered work related death with up to 50% prevalence among workers in high risk sectors such as mining, construction and dust generating works (14). In developed nations like Great Britain there are around 12,000 death annually due to occupational respiratory disease of which about two-third of the death were due to dust related disease (15). Processing of wood result production of wood chips and dust, the dust partially suspended in the air may then be inhaled by the workers. The International Agency for Research on Cancer classified wood dust as human carcinogenic (2). Moreover, prolonged exposure to wood dust leads respiratory problems such as lung cancer (16, 17) and asthma (18, 19).

In third world countries, where effective air contamination reduction strategies are inadequately available, workers are regularly exposed to dust particles which have both short and long term health problems. Available evidences showed that occupational exposure to wood dust could cause numerous health problems including chronic respiratory symptoms like cough, breathlessness and chest pain (20), wheezing and Chest tightness (21), irritation and allergic symptom (22) and reduction of lung function parameters (23-26). These health effects from exposure to wood dust are due to chemicals in the wood or chemical substances in the wood created by bacteria, fungi, or moulds (27). Studies in Africa also indicated that workers exposed to wood dust had high prevalence of chronic respiratory symptoms such cough, sputum production, wheeze, chest tightness, chest pain and breathlessness (28, 29) and reduction of lung function parameters (30, 31).

A recent study conducted in small scale wood industries and particleboard workers in Ethiopia found that workers exposed to wood dust had lung function impairments and respiratory symptoms than controls (32, 33). To the best of my knowledge, studies done in Ethiopia did not investigate respiratory symptoms, lung function parameters and associated factors together and focus on small scale wood factories and particleboard production using eucalyptus tree as raw material. The workers in large scale wood factories have been exposed to other types of timber species and produce huge amount of wood products. Therefore, more knowledge on respiratory symptoms, lung function parameters and associated factors among large scale wood factory worker is needed to take preventive measures in Ethiopia.

1.3 Rational and Significant of the study

Previous studies done about the prevalence of chronic respiratory symptoms among wood workers vary greatly. For instance, prevalence of overall chronic respiratory symptoms reported in Republic of Macedonia and Benin City, Nigeria varies from 43.2% to 87.3% (29, 34). Reduction of lung function parameters among wood workers is reported in studies done in Iran, and Sweden (35, 36) while other studies done in Denmark and Poland did not show any effect on lung function reduction (37, 38). Thus, there is a controversial result among published literatures concerning the respiratory health for wood workers, and a study among large scale wood factory workers in Ethiopia is needed.

Despite the increasing production of furniture in Ethiopia (11) little is known about safety measures and occupational health in these workplaces (39). Three studies from the Ethiopian wood factories were published in 2014 and 2019, but these studies had very few exposure measurements. As most previous studies worldwide in wood factories, the two Ethiopian studies were studying small and medium scale wood factories and one study was on Particleboard factories using Eucalyptus tree as raw material. Studies on large scale wood factory workers are largely missing. Therefore, in Ethiopia, information on prevalence of chronic respiratory symptoms, lung function parameters and associated factors among large scale wood factory workers is clearly needed. Moreover, the result of study will help the policy makers, practitioners, employers and employees in designing appropriate prevention and control strategies towards dust in wood factories. Finally, the results of the study will serve as base line data for further studies in the field.

2. LITERATURE REVIEWS

2.1 Wood dust and its health effect

Wood is one of the most important renewable natural resources in the world and it is our most useful commercial products (2). Wood dust is a byproduct formed during wood processing (40). The major woodworking processes are debarking, sawing, sanding, milling, lathing, drilling, veneer cutting, chipping and mechanical defibrating (2). For industrial purposes, wood is classified as hardwoods (derived from deciduous trees, for example Eucalyptus) and softwoods (derived from coniferous trees, for example pine). People have always worked with wood and most of them considered wood and wood dust to be relatively harmless, but it is not (40).

The health effect of Workers exposed to wood dust is due to chemicals in the wood or chemical substances in the wood created by bacteria, fungi or moulds. For instance, plicate acid from western red cedar is responsible for asthma reaction and allergic effect associated with the wood dust (27) A systematic review in Denmark concluded that wood dust exposure is a risk factor for development of asthma, chronic bronchitis, rhino-conjunctivitis and chronic impairment of lung function (18). A ten year follow up study in Norway also concluded that reduced exposure to mold spores likely results in a reduced risk of serious long term lung function impairment in sawmill workers (41). Recent study in East Thailand showed that workers exposed to formaldehyde and Medium Density Fiberboard (MDF) dust were responsible to develop respiratory irritation and allergic symptoms (22). Other systematic review and meta-analysis showed that workers exposed to wood dust exhibited higher rates of nasal adenocarcinoma (42).

Furthermore, wood workers are potentially exposed to various chemicals used in the different stages of the production process in the furniture industry, including glues (during assembling), dyes, solvents, dryers (in the finishing stage for painting), varnishes (in the finishing stage for polishing) and hardeners (43) and wood contains microorganisms such as bacteria, fungus and they may significantly affect human health. It is recognized that those agents may cause significantly higher prevalence of chronic respiratory symptoms, reduction of lung function and respiratory irritation and allergic symptoms (22, 35).

2.2 Prevalence of chronic respiratory symptoms

Occupational exposure to wood dust can lead workers to high prevalence of chronic respiratory symptoms. Studies from developed countries showed that workers exposed to wood dust can develop high prevalence of respiratory symptoms. The study in Macedonia reported significantly high prevalence of respiratory symptoms like cough (29.7%). Phlegm (16.2%), breathlessness (10.8%), wheezing (8.1%) and chest tightness (13.5%) among wood workers compared to office workers. But statistical significant was not observed in at least on respiratory symptoms among wood workers (43.2%) compared to 24.3% office workers (34). Furthermore, study from Iraq where found running nose (50%), irritation of eyes (25%) and oral cavity (4%) among sawmill workers than control (44). Other study from Iran in 2018. also showed significantly higher prevalence of respiratory symptoms such as wheezing (37%), cough (28%), phlegm (24%) and breathlessness (74%) among workers exposed to wood dust as compared to control groups (35).

Previous literature's from low and middle income countries also revealed that workers exposed to wood dust can develop chronic respiratory symptoms like cough, breathlessness and chest pain (21, 45), irritations and allergic symptoms (22). The study from Northeast Thailand also found high prevalence of respiratory symptoms such as coughing (18.79%), sputum (15.66%) and sneezing (15.07%) among wood furniture factories (46). Similarly in Nigeria, cough (19.2%), sneezing (44.8%), wheezing (2,2%), shortness of breath (6.4%), and sputum production (12.0%) were reported among workers exposed to wood dust (47). Moreover, study in South Nigerian revealed that workers exposed to wood dust had prevalence of respiratory symptoms like cough (46.7%), phlegm (50.2%), wheeze (5.3%), chest tightness (10.1%), chest pain (5.7%), breathlessness (7.5%) and cough with phlegm production(8.9%) among comparison groups. This study also reported that 68.3% sawmill workers reported at least one respiratory symptom compared 10.1% in the comparison group (28). Another study in Benin city, Nigeria showed significantly higher prevalence of Sputum production (54.7%), cough (34.7%), breathlessness (9.3%), wheeze (4%) and Chest pain (42%) among wood workers compared with control groups. The study also reported high prevalence of at least on respiratory symptoms among wood workers (87.3%) compared to 18,7% in control groups (29). A recent studies done on 2019, in Ethiopian wood factories found that the prevalence of all recorded chronic respiratory symptoms was significantly higher among the exposed than the controls (32, 33)

2.3 Reduction of Lung function parameters

A range of respiratory diseases can be caused by exposures in the workplace. According to Health and Safety Executive (HSE) (2017), Chronic Obstructive Pulmonary Disease (COPD) is a serious long-term lung disease in which the flow of air into the lungs is gradually reduced by inflammation of the air passages and damage to the lung tissue. A wide range of vapors, dusts, gases and fumes potentially contribute to causing the disease (15).

Available evidence from developed world found that workers exposed to wood dust cause a significant reduction of lung function parameters like FVC, FEV_1. But the ratio of FEV_1/FVC was not significant among sawmill workers compared to controls (41, 44). Study done in Macedonia found that for the exception of FVC all lung function parameter were significantly lower in workers exposed to hardwood as compared to the office workers (34). Other study also found statistical significant reduction in lung function parameters of FVC, FEV_1 and FEV_1/FVC among workers in the chipboard factories compared to controls (47). However, recent study done in Sweden reported that there was no statistical significant difference in reduction of lung function parameters obtained between exposed and controls groups (36). Similarly, study in Poland did not found any significant reduction in lung function parameters among workers exposed to wood dust (38). However, study from Turkey showed that FEV_1 and FVC in the furniture workers were significantly lower than those in the control groups. But the ratio of FEV_1/FVC were higher (48) Likewise, study in Iraq reported significantly reduced in FVC, and FEV_1 among wood workers compared to controls (35).

Published studies from third world nation showed that workers exposed to wood dust associated with reduction in lung function such as FVC, FEV_1, and FEV_1/FVC (21). Furthermore, Studies in different states of India found that workers exposed to saw dust have lower value of FVC, FEV_1 and FEV_1/FVC compared with control groups (20, 24, 45, 49, 50). Studies from Africa also reported that the mean value FEV_1, FVC and FEV_1/FVC were significantly reduced in the wood workers relative to the control groups (28, 30, 31). A recent Published study in Ethiopia among small scale wood workers in Jimma town found higher lung function impairment among wood workers compared to controls (32). But another recent study conducted on 2019, among particleboard workers and water bottling factories did not found significant difference in lung function reduction (33).

2.4 Factors associated with chronic respiratory symptoms

2.4.1 Socio demographic factors and chronic respiratory symptoms

There are socio demographic factors contributing for development of chronic respiratory symptoms among workers exposed to wood dust. Published literature revealed that being female was independently associated with chronic respiratory symptoms (23). However, other study found that males are more likely to develop chronic respiratory symptoms than females (51). Furthermore, the socio economic status of workers particularly income, educational level and occupation can affect their health. Available evidence showed that low education and low household income were associated with chronic respiratory health problems. According to this study as educational level low the risk of developing asthma and Chronic Obstructive Pulmonary Disease (COPD) increased and low household income increased the risk of asthma and COPD (52). Another study showed that worker's education level grade 8 or below were more likely to have chronic respiratory symptoms than those whose education level was diploma and above (51).

2.4.2 Indoor air pollution and chronic respiratory symptoms

A study conducted in Nepalese found that unprocessed solid biofuels such as cow dung, crop residue, and wood for cooking and heating have higher risk for serious health outcomes compared with those who use cleaner fuels such as kerosene and biogas in the exposed population (53). Moreover, Study done in Serbia showed strong association between indoor air pollution and chronic respiratory symptoms (54).

2.4.3 Previous/ family history of diseases and Behavioral factors and chronic respiratory symptoms

A study showed that workers who had previous chronic respiratory disease experienced chronic respiratory symptoms more likely than workers who were free from previous chronic respiratory disease (51) Similarly, other study reported that Previous history of chronic respiratory diseases and family history of chronic respiratory diseases were the determinants for the development of chronic respiratory symptoms (55). Another study found that sleeping disorder and past illness were predictors for the development of chronic respiratory symptoms (56).

Smoking habit and uses of RPD are behavioral factors for the development chronic respiratory symptoms and reduction of lung function parameters. Studies showed that smoking can develop chronic respiratory symptoms and reduction of lung function parameters among wood factories workers (28, 48, 55, 57, 58). Another study found that not using RPD on duty was statistically association with the development of chronic respiratory symptoms (46, 56). However, other study found that not using RPD was not statistically association with the development of chronic respiratory symptoms (51).

2.4.4 Work related factors and chronic respiratory symptoms

Existing evidences showed that workers exposed to dusty working condition and chemical or gas before being an employee in wood factory develop chronic respiratory symptoms (55).There is close relationship between reduction of lung function parameter's and duration of workplace exposure to wood dust (34). Moreover, study in Poland found that duration of exposure significantly reduces lung function parameters (38).

Previous studies from developing nation also found various determinants of chronic respiratory symptom and reduction of lung function parameters among wood factories workers which includes duration of exposure to wood dust (20, 24, 25, 45, 49). Studies in Africa also reported that duration of exposure and working departments are significantly associated factors for the reduction of lung function (30). Study in south Nigerian found that duration of exposure was significantly associated with chronic respiratory symptoms and reduction of lung function (28). Another study from south east Nigeria found that significant increase in prevalence of rhinitis and asthma with increasing length of wood dust exposure (59).

The available studies in Ethiopia showed that Service years and working department were determinants of chronic respiratory symptom (57). Another study also found that working department, work experience and training were determinants for the development of chronic respiratory symptoms (51).

Conceptual framework of the study

The conceptual framework for this study was developed after reviewing different literatures about factors that determine the development of chronic respiratory symptoms and reduction of lung function parameters among wood factory workers. It showed how the particular variables in study connect with each other and identifies the variables required in the research investigation. It serves as a road map in pursuing the investigation.

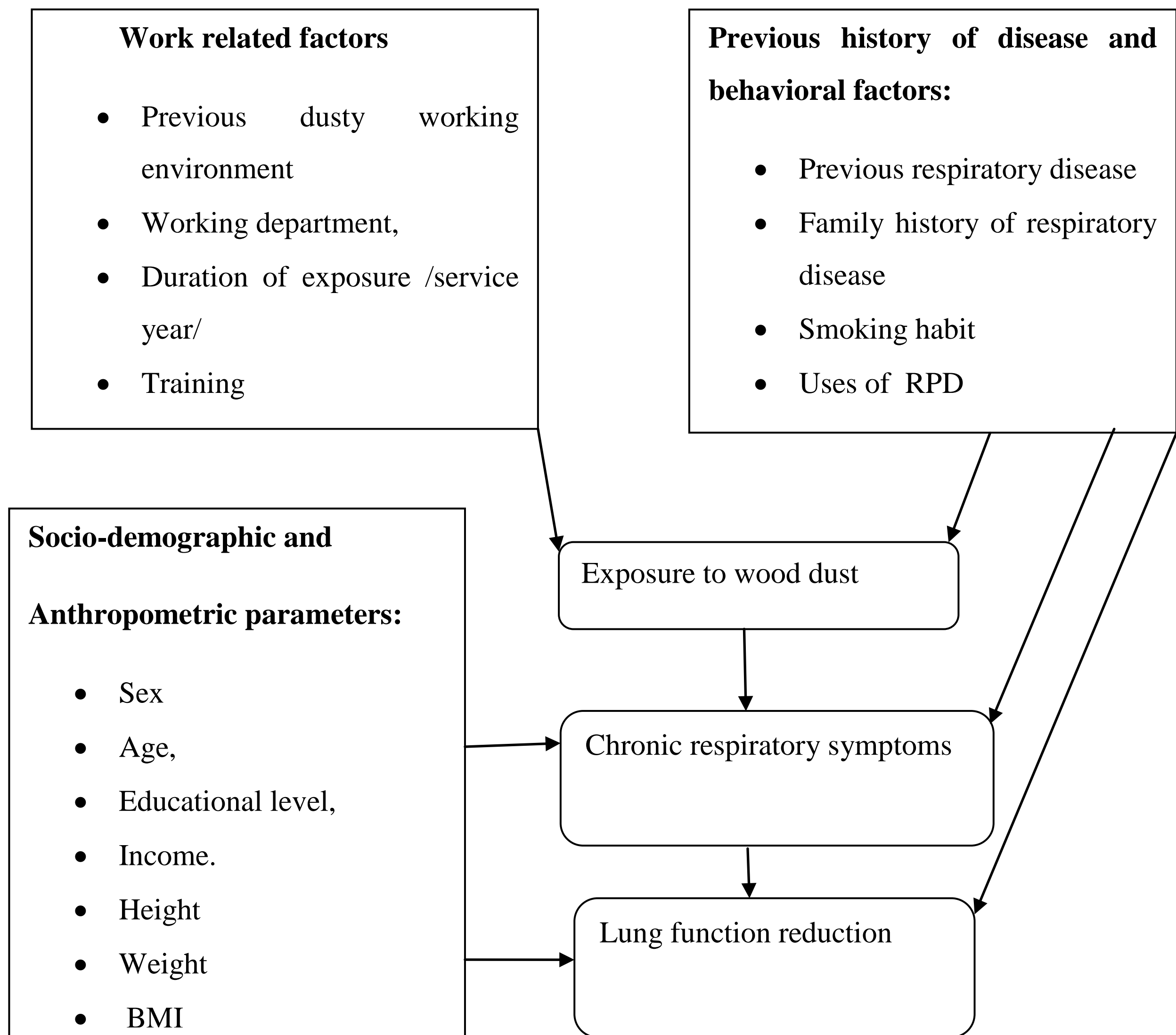

Figure 1: Conceptual framework developed by reviewing different literatures

Research questions

- What is prevalence of chronic respiratory symptoms among large scale wood factory workers compared to controls?
- What is the status of lung function parameters among large scale wood factory workers compared with controls?
- What are the associated factors for the development of chronic respiratory symptoms?

3. OBJECTIVES

3.1 General objective

To assess prevalence of chronic respiratory symptoms, lung function parameters and associated factores among large scale wood factory workers in Addis Ababa, Ethiopia, 2019.

3.2 Specific objectives

To determine the prevalance of chronic respiratory symptoms among large scale wood factory workers and controls.

To measure lung function parameters among large scale wood factory workers and controls.

To identify factors that determine the development of chronic respiratory symptoms.

4. MATERIALS AND METHODS

4.1 Study area

The study was conducted in Addis Ababa which is the capital and largest city of Ethiopia. It is not only the seat of the Ethiopian federal government but also it is where the Africa Union has its headquarters. Addis Ababa is located at altitude of 2,400 meters above sea leve. For administrative purpose the city divided in to 10 sub city and 117 woredas. There are 78 large and medium wood factories in Addis Ababa. Of these, eight of them are large scale wood factories which producing huge amount of wood productes.

4.2 Comparative group

The workers from Moha soft drink industry was selected as a comparative group. Moha soft drink industry was selected as their workers exposed to less dust at work place. There are three Moha soft drink industries in Addis Ababa.

4.3 Study design and period

An institutional based comparative cross-sectional study was conducted from February to April 2019.

4.4 Source population

The source population was all workers in the production process of large scale wood factories and MOHA soft drink industries in Addis Ababa, Ethiopia.

4.5 Study population

All production workers in the selected large scale wood factories and Moha soft drink industry

4.5.1 Study Groups: Workers randomly selected from production of large scale wood factories.

4.5.2 Comparative Groups: Workers randomly selcted from production of Moha soft drink industry.

4.6 Eligibility criteria

Inclusion criteria: All Workers who were directly involvment in the production of wood and soft drink for at least one year, age range from 18 to 60 year in the selected factories were included in the study.

Exclusion criteria: Workers who had recent abdominal or chest surgery, pregnant women, heart failure, accute illness were excluded from the study.

4.7 Sample size determination

4.7.1 Sample size determination for objective one (Prevalence respiratory symptoms)

The required sample size for this objective was calculated using both double population proportion formula and Epi info version 7 statistical software by taking into consideration prevalence of chronic respiratory symptoms (Cough with sputum production) with 1:1 exposed to control ratio, 95% confidence level and 80% Power. The prevalence of cough with sputum production for exposed (47.0%) and control group (30.3 %) was taken from previously study done among wood workers and controls in Tanzania (60).

$$n = \frac{Z\alpha/2 + Z\beta)^{2} * (P1(1-P1)+P2(1-P2))}{(P1-P2)^{2}}$$

Where,

n= Sample size

P1= proportion of respiratory symptom (cough) among exposed group

P2 = proportion of respiratory symptoms (cough) among control group

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

$Z\beta$ = Desired power of 80% =0.84

$$n \text{ (each group)} = \frac{(1.96+0.84)^{2} (0.470(1-0.470) + (0.303(1-0.303)}{(0.470-0.303)} = \mathbf{145}$$

Adding 10 % non response rate it become **160** for each groups and which was **320**

4.7.2 Sample size determination for objective two (Lung function test)

The required sample size for this objective was calculated using both mean difference formula and Open Epi software (http://www.openepi.com/SampleSize/SSMean.htm) sample mean difference by taking into consideration forced Vital Capacity (FVC) as main output of interest with 1:1 exposed to control ratio, 95% confidence level and 80% Power. The Forced Vital Capacity (FVC) for workers exposed to wood dust (3.02 ± 0.68 L) and control group (3.39 ± 0.56 L) was taken from previously study done among sawmill workers in centeral India (61).

$$n = \frac{(Z\alpha/2 + Z\beta)^2(\delta_1^2 + \delta_2^2)}{(d)^2}$$

Where,

n = sample size

$\delta 1$ = standard deviation of the characteristics exposed groups (0.68)

$\delta 2$= standard deviation of the characteristics control groups (0.56)

$Z\alpha/2$ = Level of statistical significance 1.96 at confidence level of 95% and

$Z\beta$ = Desired power of 80 % =0.84

d = mean difference (Mean 1 = 3.02 and Mean 2 = 3.39)

$$n\ (each) = \frac{(1.96 + 0.84)^2 * (0.68 + 0.56)}{(3.02 - 3.39)^2} = \mathbf{45}$$

Adding 10 % non response rate it become 50 for each exposed and control groups

<u>Total sample size 100 was obtained</u>

4.7.3 Sample size determination for objective three (Factors associated with chronic respiratory symptoms)

The required sample size for this objective was calculated using both double population proportion formula and Epi info version 7 statistical software by taking into consideration proportion of development of chronic respiratory symptoms (ever smokers) with 1:1 exposed to unexposed ratio, 95% confidence level and 80% Power. The proportion of development of chronic respiratory symptoms ever smoker among exposed (7.3%) and control groups (1.3%) was taken from previously study done among pharmacetical factory workers in Addis Ababa, Ethiopia (55).

$$n = \frac{Z\alpha/2 + Z\beta)^{2} * (P1(1-P1)+P2(1-P2))}{(P1-P2)^{2}}$$

Where,

n= Sample size

P1= proportion of development of respiratory symptom ever smoker among exposed

P2 = proportion of development of respiratory symptoms ever smoker among control

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

$Z\beta$ = Desired power of 80% =0.84

P_{1}- P_{2}= Proportion difference

$$n \text{ (each group)} = \frac{(1.96 + 0.84)^{2} (0.073 (1-0.073) + (0.013(1-0.013)}{(0.073-0.013)^{2}} = \mathbf{211}$$

Adding 10 % non response rate it become **232** from each exposed and control groups

Total sample size of 464 was obtained.

From the three determination of sample size objective three (Factors associated with chronic respiratory symptoms) had maximum sample size that was **464**.

Therefore, 232 wood factory workers and 232 Moha soft drink industry workers as control group were selected for assessment of chronic respiratory symptoms while lung function test was performed on 50 participants from each wood factory and Moha soft drink industry workers.

4.8 Sampling procedure

In Addis Ababa, there are eight large scale wood factories. From these, 50% of wood factories were selected randomely. The wood workers were selected using stratified sampling technique, assuming that workers in defferent departments would have different level of wood dust exposure. The calculated sample size was allocated to each factories and stratum (Figure 2) and selected by simple random sampling. In addition, in Addis Ababa, there are three Moha soft drink industries. From this, one Moha soft drink industry was selected randomly and participants were selected by simple random sampling technique using their payroll, which was obtaned from their finance office

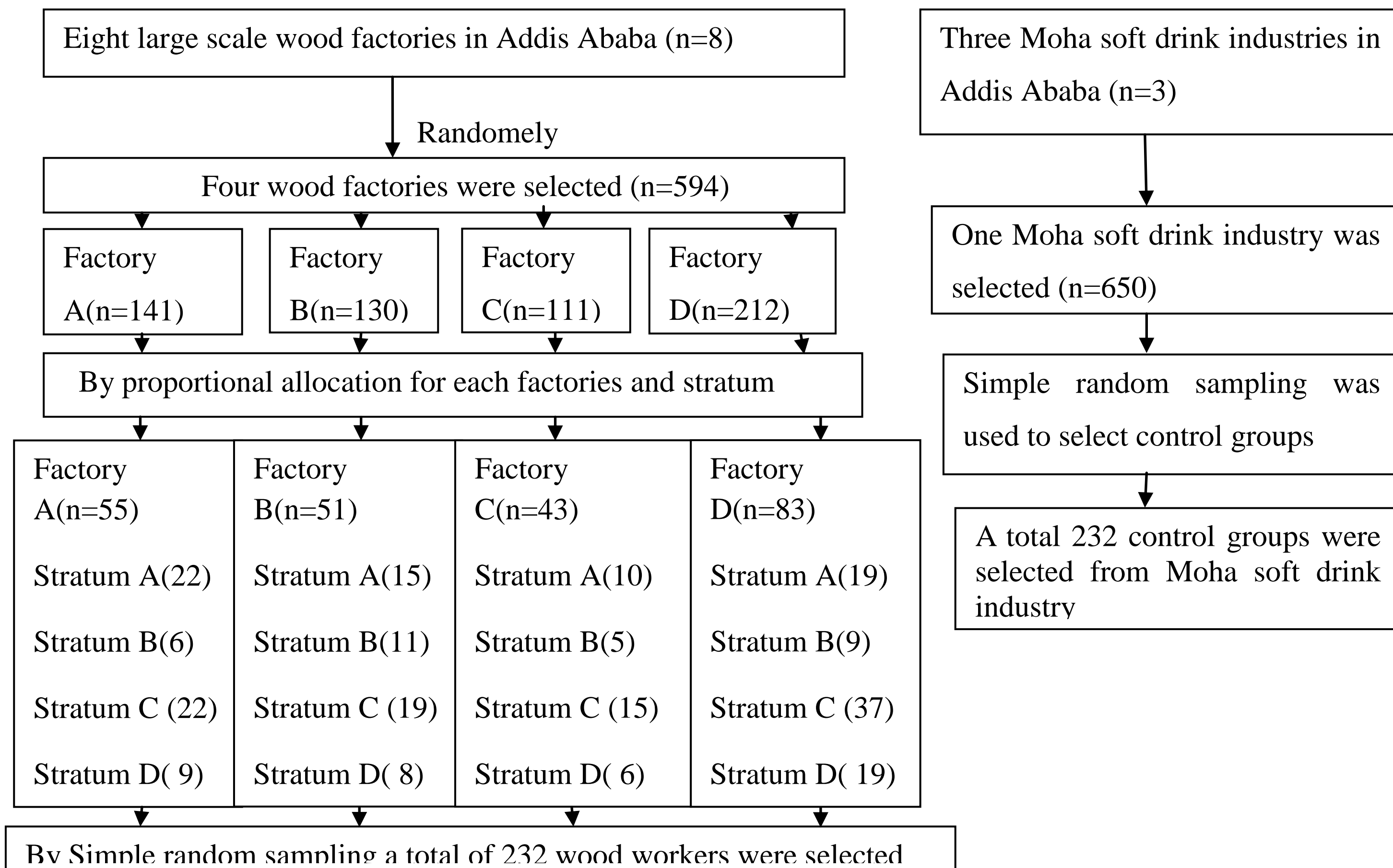

Figure 2:Schematic presentation of sampling procedures

4.9 Data collection procedure

4.9.1 Questionnaire for chronic respiratory symptoms assesment

Interview questions used to asses chronic respiratory symptoms were adopted from standardized questionnaire for assessing respiratory symptoms in adults from American Thoaracic Society (ATS) questionnaires (62). The questionnaire had four parts, which includes socio-demographic data, respiratory symptoms, previous and family history of respiratory diseases, behavioral factors and work related factors. The questionnaire was translated from English to Amharic version and later translated back to English using a standard translation procedure to keep its consistency.

Before performing the actual data collection the questionnaire was pretested on 5% workers in Wanza wood factory which was outside the selected wood factories. Based on the pretest necessary modification was done on the questionnaire and participants who were involved in the pretest was excluded in the actual data analysis. Data was collected by two professionals who have bachelor degree in Enviromental and Occupational health and one supervisor with MPH degree after giving two day training using pretested and structured Amharic version questionnaire using face to face interview in the working hours and at the work place.

4.9.2 Observational Checklist

An observational checklist was prepared to cheek working environment (ventilation), uses of Respiratory Protective Device (RPD) by workers, availability of RPD and safety instructions at the work place. It was observed by two professionals who have bachelor degree in Enviromental and Occupational health.

4.9.3 Lung function test

Before performing Lung function test, participant age and sex were recoreded and weight (kg) and standing height (cm) were measured using a standardized electronic weighing machine and stadiometer with portable field survey scales as recommended by American Thoaracic Socity (ATS) (63) and Body mass index (BMI) was also calculated by using ndd medical technologies software. The lung function test were done with subjects in a sitting and upright position using Easy on-pc spirometry connected to a Laptop following American Thoracic Society guidelines

(63) by employed one trained professional. Prior to performing the actual lung function test, the required maneuver was demonstrated for each participants and supervised throughout the test. The participant was instructed to breath in fully until their lung filled maximally, avoid leakage from mouth pieces and expire air forcefully and as fast and complete as possible until there is no more air left to expel. To maintan repetability of testing the difference of the two largest values for both FVC and FEV_1 was within 150 ml and to assure quality of testing unhesitating start, a complete exhalation and lasting until the volume-time curve has clearly reached aplateau was assured. The test was continue until a minimum of three trials at least two of which were repetable. Finaly from the trial best result was taken for analysis. The lung function parameters considered were FVC, FEV_1 and FEV_1/FVC ratio. The FEV_1/FVC ratio $< 70\%$ was the cutoff point for air flow limitations as stated by Global Initiative for Chronic Obstructive Lung Disease (64).

4.10 Study Variables

4.10.1 Outcome variables

Chronic respiratory symptoms (cough, phlegm, wheezing, breathlessness and chest pain)

Lung function parameter (FVC, FEV_1 and FEV_1/FVC)

4.10.2 Exposure variables

Socio-demographic characteristics**:** Sex, Age, education level and income.

Anthropometrics parameters**:**, Height (meter),Weight (Kg) and BMI.

Previous history of disease and behavioral factors**:** Previous and family history of respiratory disease, smoking habit and uses of RPD.

Work related factors**:** Previous dusty working environment**,** working department, duration of exposure time /service year/and training.

4.11 Operational definiton

Chronic respiratory symptoms: Development of one or more of the symptoms of chronic cough, chronic phlegm, chronic wheezing, chronic breathlessness and chronic chest pain which lasts at least three months in one year (51).

Chronic cough: Participants were considered to have chronic cough if they answered "yes" to at least one of the following four questions;cough first thing in the morning, cough during the day or night, cough as much as four to six times a day in a week or cough for most days as much as three consecutive months during the year (65).

Chronic phlegm: Participants were considered to have chronic Phlegm if they answered "yes" to at least one of the following four questions; Phlegm first thing in the morning ,Phlegm during the day or night, phlegm as much as four to six times a day in a week or phlegm for most days as much as three consecutive months during the year (65).

Chronic breathlessness: Participants were considered to have chronic breathlessness if he/she was troubled by a shortness of breath when hurrying on level ground or walking up a slight hill, or get shortness of breath when walking at his/her own pace on the level ground (65).

Current smokers: Are those who smoked at the time of the study or who had stopped smoking less than one year ago and ex–smoker are those who had quit at least one year before study (58).

Ever smoker: Worker who has smoked at least 100 cigarettes during the course of his/her life and includes current smokers and ex-smokers (55).

Large scale wood factory: Wood factories which involves more than 100 workers

Previous respiratory diseases: One or more of respiratory diseases like chronic bronchitis, tuberculosis(TB), heart disease, asthma, and lung cancer that could be developed before the current working position and identified by physicians (55).

Forced vital capacity (FVC): Is the maximum volume of air exhaled from the position of maximal inspiration by means of rapid and forced expiratory effort (66).

FEV_1 : Is the volume of air exhaled during the first second of the FVC manoeuvre (66).

4.12 Data management

After the completion of data collection, the data was coded, edited and entered in computer using Epi-data software version 4.4.2 then exported to SPSS version 23. Data was cleaned in SPSS version 23 by analyzing frequencies and percentages to identify missing variable. In addition, continuous variables were coded and some pre coded variables were recoded and handled by saving in different folders in the computer and flash disk as well email.

4.13 Data analysis procedure

Data was analyzed using SPSS version 23. Descriptive statistics were done to summarize characteristics and anthropometric parameters of the participants. Categorical responses of the difference between wood workers and controls were tested by using Pearson Chi-square test or Fisher's exact test (if the expected value was less than 5) while Independent t-test was used to compare means of continuous variables between exposed and controls. For objective one (Prevalence of chronic respiratory symptoms) Poisson Regression modle with Robust estimator was used to estimate prevalence ratio (PR) while controlling for confounders; education, previous and family history of disease, RPD use, year worked in other dusty factories, training and work place supervision. Prevalence ratio (PR) was chosen instead of prevalence odds ratio (POR) due to the high chronic respiratory symptom prevalence in this study (67). For objective two (Lung function test) Multiple linear regression was performed to analyze differences in lung function between the wood workers and controls while adjusting for age, weight, height, education and smoking .The one way Analysis of Variance (ANOVA) was also done to compare means of lung function parameters of wood workers among different service years. For the last objective (Associated factors with chronic respiratory symptoms) Binary Logistic Regression was applied to check the indpendent variable associated with outcome variable by determine the COR at 95% Confidence Interval. Variables which had an association with the outcome variables at bivarate level $p < 0.05$ were added to Multivariable Logistic Regression model to control the possible effect of confounders and variables with $p< 0.05$ at 95% convidence interval were reported as significant pridictor variables for the development of chronic respiratory symptoms. The 95% confidence interval and p-value <0.05 was used to declare the presence of significant association with the outcome variable.

4.14 Data quality assurance

Chronic respiratory symptoms were assessed using standardized questionnaire in adults from American Thoaracic Society (ATS) (62) questionnaires. The questionnaire was translated from English to Amharic version and later translated back to English using standard translation procedure to keep its consistency. Two day training was given for both data collectors and supervisor. Prior to the actual data collection the questionnaire was pretested on 5% workers in Wanza wood factory which was outside the the selected wood factories. Based on the pretest necessary modification was done on the quesionnaire.. In addition, the supervisor was conduct site supervision each day. The completed questionnaires was handled properly and checked daily for completeness, clarity and logical consistency by the principal investigator and supervisor. For lung function test one trained professional was employed. The apparatus was calibrated before starting lung function test on daily and weekly basis. Demonstration was given to the study participants to prevent leak and early termination.

4.15 Ethical consideration

The study was conducted after obtaining Ethical clearance from AAU, School of Public Health Institutional Review Board (IRB). Letter was obtained from AAU, School of Public Health and submitted to the managers of each factories before starting the study. The objective of the study were explaining for each participants and agreement was obtained from each participants by signing on consent form before data collection. Furthermore, Disposable mouth piece or spirette was used for each participants and the mouth piece was dispose safely at Black line hospital. In addition, if the study participant show any contraindication for spirometer test such as recent abdominal or chest surgery, pregnant women, heart failure and accute illness they were excluded from the study. The information obtained from the study participants was handled confidencialy by omitting their names and personal identification during analysis. If picture was needed verbal consent has been taken.

4.16 Dissemination plan

The results of the study will be submitted to Addis Ababa University, College of Health Sciences, School of Public Health, Ministry of Labor and Social Affairs (MOLSA), Ministry of Industry and wood factories. Attempt will be made to publish the results to reach the scientific

5. RESULTS

5.1 Characteristics of the study Participants

In this study a total of 230 wood workers and 227 Moha soft drink industry workers were participated, making 98.5% response rate. From these, 187 (81.3) of wood workers and 169 (74.4) of controls in the study were males. The wood workers and controls had similar age. But the wood workers had a lower educational level than the controls (Table 1). In addition, 188 (81.7%) of wood workers and 177 (78.0%) of controls were orthodox and 131(57.0%) of wood workers and 121 (53.3%) of controls were married (Table 1). The wood workers had more previous and family history of respiratory disease when compared to the controls. There were significant difference between wood workers and controls regarding weight, height, smoking, previous dust exposure, safety training and work place supervision.. However, regarding service year worked, BMI, monthly income, sex and uses of biomass fuel for cooking there were no difference between the two groups (Table 1).

Table 1: Characteristics and anthropometric parameters among wood workers and controls in Addis Ababa, Ethiopia, May, 2019.

Continuous Variables	Wood workers (n=50)	Controls (n=50)	p-value
Weight(Kg) : AM(SD)	59.2(8.5)	62.7(6.70)	0.026[a]
Height (cm) : AM(SD)	163(0.06)	166(0.05)	0.002[a]
BMI(Kg/m^2): AM(SD)	22.33(2.9)	22.62(2,4)	0.582[a]
Continuous and Categorical variables	**Wood workers (n=230)**	**Controls (n=227)**	**p-value**
Age (in year): AM(SD)	32.9(9.6)	31.5 (7.9)	0.093[a]
Service year worked: AM(SD)	9.6 (8.8)	8.5 (7.4)	0.166[a]
Monthly income(in birr):Median	3137.50	4017	0.727[a]
Sex			
Female; n (%)	43 (18.7)	58 (25.6)	0.077[b]
Male; n (%)	187 (81.3)	169 (74.4)	
Religion			
Orthodox; n (%)	188(81.7)	177 (78.0)	
Muslim and others; n (%)	42(18.3)	50 (22.0)	0.316[b]
Marital status			
Married; n (%)	131(57.0)	121 (53.3)	
Single and others; n (%)	99 (43.0)	106 (46.7)	0.432[b]
Educational level			
Primary school and below; n (%)	79 (34.3)	30 (13.2)	
Secondary school and above; n (%)	151 (65.7)	197 (86.8)	0.0001[b]
Previous respiratory disease			
Participants who have had at least one of the respiratory diseases, n (%)	47(20.4)	28(12.3)	0.019[b]
Family history of respiratory disease			
Participants whose families have had at least one of the respiratory diseases, n (%)	32 (13.9)	18 (7.9)	0.040[b]
Smoking habits			
Current smoker; n (%)	1(0.4)	7 (3.1)	0.036[c]
Ever smoker; n (%)	14 (6.1)	16 (7.0)	0.678[b]
Previous dust exposure			
Participants who have had previous dust exposure in other factories; n (%)	55(23.9)	21(9.3)	0.0001[b]
Safety training			
Participants who had taken health and safety training; n (%)	30(13.0)	177(78.0)	0.0001[b]
Work place supervision			
Participants who had supervised at work; n (%)	34(14.8)	162(71.4)	0.0001[b]
Energy used at home			
Use biomass fuel for cooking; n (%)	142(61.7)	125(55.1)	0.148[b]

AM: Arithmetic Mean; SD: Standard Deviation; [a] Independent t-test; [b] Pearson chi square; [c] Fisher's exact test. BMI—body mass index; "n": Number of study participants

5. 2 Use of Respiratory Protective Device (RPD)

About 30(13.0%) of wood workers and 138(60.8) of controls were used RPD while on duty. The majority of the 200 (87.0%) of wood workers did not use any type of respiratory protective devices (RPD). Among the non-users of RPD, 167(83.5%) of the wood workers maintioned that the reason for not using RPD was because it was not available or not provided by the institution. Others indicated that the reasons for not using RPD were because it was not comfortable 24 (12%) and 9 (4.5%) of the wood workers reported that the dust was not harmful for health.

5.3 Work place observation

An observational checklist was used to cheek working environment (ventilation), uses of respiratory protective device (RPD) by workers, availability of RPD and safety instructions at the work place. Accordingly, Wood dust particles were accumulated on floors, walls and ceilings in different working departements. The wood dust is highly accumulated in sanding and machine opreationg departments due to the fact that these departments produces excess wood dust.

In addition, it was observed that worker's eyebrows, hair, nostrils and cloths were covered with wood dust particle at the time of data collection. In all wood factories the natural ventilation system was poor and there wass no local exhaust ventilation system. It was found that all of the wood factory workers did not use RPD on duty to reduce wood dust exposure level (Figure 3) and none of the wood factories had RPD available in the store during data collection. In addition, it was observed that all the working departments had no warning signs posted and safety instruction procedures.

Figure 3:Machine department workers (Photograph by Belayneh J.)

5.4 Prevalence of chronic respiratory symptoms

The overall prevalence of chronic respiratory symptoms among wood workers was 151(65.7%) when compared to 53 (23.3%) controls (Table 2).The prevalence ratio of all of the chronic respiratory symptoms was significantly higher for the wood workers compared to controls after adjusting for education, previous and family history of disease, RPD use, year worked in other dusty factories, safety training and work place supervision (Table 2). As the number of current smokers were few, the analysis was performed after excluding the smoking. The analysis was also performed after adjusting for smoking. the result did not change (the data was not showen).

Table 2: Prevalence of chronic respiratory symptoms among wood workers and controls in Addis Ababa, Ethiopia, May, 2019.

Variables	Wood workers (n=230)	Controls (n=227)	Prevalance ratio, 95% CI	P-value
Cough(n%)	81(35.2)	23(10.1)	2.18 (1.16-4.08)	0.015
Phlegm (n%)	102(44.3)	26(11.5)	2.48(1.42-4.34)	0.001
Wheezing(n%)	68 (29.6)	27(11.9)	2.05(1.09-3.86)	0.027
Breathlessness(n%)	92(40.0)	25(11.0)	2.64 (1.47-4.78)	0.001
Chest pain(n%)	86(37.4)	18(7.9)	3.89 (2.05-7.38)	0.0001
At least one chronic respiratory symptom (n%)	151(65.7)	53(23.3)	2.17 (1.51-3.12)	0.0001

Note : CI, confidence interval after adjusting for education, previous and family history of disease, RPD use, year worked in other dusty factories, safety training and work place supervision, p-value when comparing wood workers vs controls; "n": Number of study participants**.**

5.5 Factors associated with chronic respiratory symptoms

5.5.1 Socio demographic factors

Socio demographic factors were assesed using binary logistic regression. Accordingly, sex, age, religion, education and income were asociated with respiratory symptoms at bivarate level (Table 3). Chronic respiratory symptom was significantly associated with sex. Male respondents were 1.61 times (COR=1.61, 95% CI: 1.02-2.55) higher odds of developing chronic respiratory symptoms compared to female respondents. In addtion, workers who had primary and below levels of education had 2.22 times (COR=2.22, 95% CI: 1.43-3.44) higher odds of developing chronic respiratory symptoms compared to those who had secondary and above levels of education. But chronic respiratory symptom was not associated with marital status (Table 3).

Table 3: Crude odds ratio of socio demographic factors associated with chronic respiratory symptoms among wood workers and controls in Addis Ababa, Ethiopia, May,2019.

Variables	Respiratory symptoms		COR(95%CI)	p-value
	Yes	No		
Sex				
Male	168(82.4)	188(74.3)	**1.61(1.02-2.55)**	0.040
Female	36(17.6)	65(25.7)	1.00	
Age (in year)				
≤ 29	96(47.1)	133(52.6)	1.00	
30-39	51(25.0)	74(29.2)	0.96(0.61-1.48)	0.838
≥ 40	57(27.9)	46(18.2)	**1.72(1.07-2.74)**	0.024
Religion				
Orthodox	174(85.3)	191(75.5)	**1.88(1.16-3.05)**	0.010
Muslim and others	30 (14.7)	62(24.5)	1.00	
Marital status				
Married	118(57.8)	134(53.0)	1.22(0.840-1.77)	0.297
Single and others	86(42.2)	119(47.0)	1.00	
Educational leve				
Primary school and below	65(31.9)	44(17.4)	**2.22(1.43-3.44)**	0.0001
Secondary school and above	139(68.1)	209(82.6)	1.00)	
Monthly income				
≤ 2500	64(31.4)	41(16.2)	**2.40(1.53-3.87)**	0.0001
2501-3500	36(17.2)	42(16.6)	1.17(0.89-2.34)	0.649
≥ 3501	105(51.5)	170(67.2)	1.00	

Note: 1.00 reference value

5.5.2 Previous and Family history of respiratory disease and behavioral factors

In this study, previous respiratory disease was found to be significantly associated with development of chronic respiratory symptoms. Workers who had previous respiratory disease were 3.68 times (COR=3.68, 95% CI: 2.15-6.31) higher to have chronic resparatory symptoms as compared to those who were free of previous respiratory disease. Moreover, from behavioral factors only not uses of RPD was significantly associated with development of chronic respiratory symptoms at bivarate level (Table 4). Workers who did not use RPD on duty were 3.65 times higher odds of developing chronic respiratory symptoms compared with those who use RPD (COR=3,65, 95% CI: 2.41-5.54). However, family history of respiratory disease, current and ever smoker were not associated with chronic respiratory symptoms in this study (Table 4).

Table 4:Crude odds ratio of Previous and family history of respiratory disease and behavioral factors associated with chronic respiratory symptoms among wood workers and controls in Addis Ababa, Ethiopia, May, 2019.

Variables	Respiratory symptoms			
	Yes	No	COR(95%CI)	P-value
Previous respirtory disease				
Yes	53 (26.0)	22 (8.7)	**3.68 (2.15-6.31)**	0.0001
No	151 (74.0)	231(91.3)	1.00	
Family histroy of respiratory disease	25 (12.3)	25(9.9)	1.27(0.71-2.29)	0.420
Yes	179 (87.7)	228 (90.1)	1.00	
No				
Current smoker				
Yes	3(1.5)	5(2.0)	0.74(0.18-3.14)	0.683
No	201(98.5)	248(98.0)	1.00	
Ever-smoker				
Yes	15(7.4)	15(5.9)	1.26(0.60-2.64)	0.542
No	189 (92.6)	238(94.1)	1.00	
Uses of RPD				
Yes	43(21.1)	125(49.4)	1.00	0.0001
No	161(78.9)	128(50.6)	**3.65(2.41-5.54)**	

Note: 1.00 reference value

5.5.3 Work related factors

The present study found that development of chronic respiratory symptoms was significantly associated with working department, previous dust exposure, safety training and work place supervision at bivarate analysis ($p<0.05$). Workers who engaged in machine and painting department were 6.42 times (COR=6.42 ,95% CI: 4.00-10.30) higher to develop chronic respiratory symptoms compared with workers who engaged in soft drink production (Table 5). Previous dust exposure was also another variable that showed significant association with development of chronic respiratory symptoms at bivarate level (Table 5). But, service year worked, working hour per week and energy used at home were not associated with chronic respiartory symptoms (Table 5).

Table 5: Crude odds ratio of work related factors associated with chronic respiratory symptoms among wood workers and controls in Addis Ababa, Ethiopia, May. 2019.

Variables	Respiratory symptoms		COR(95%CI)	p-value
	Yes	No		
Service year				
≤ 4	71(34.8)	92(36.4)	1.00	
5-9	53(26.0)	89(35.2)	0.77(0.49-1.22)	0.269
≥ 10	80(39.2)	72(28.5)	1.44(0.92-2.25)	0.108
Working hours per week				
≤ 48	149(73.0)	192(75.9)	1.00	
>48	55(27.0)	61(24.1)	1.21(0.79-1.86)	0.36
Working department				
Carpenter and sanding	63(30.9)	34(13.4)	**6.08(3.62-10.21)**	0.0001
Machine and painting	88(43.1)	45(17.8)	**6.42 (4.00-10.30)**	0.0001
Soft dring production	53(26.0)	174(68.8)	1.00	
Previous dust exposure				
Yes	47 (61.8)	29(38.2)	**2.31(1.39-3.83)**	0.001
No	157(41.2)	224(58.8)	1.00	
Safety training				
Yes	59(28.9)	148(58.5)	1.00	
No	145(71.1)	105(41.5)	**3.46(2.34-5.13)**	0.0001
Work place Supervision				
Yes	62(30.4)	134(47.0)	1.00	
No	142(69.6)	119(53.0)	**2.58(1.75-3.79)**	0.0001
Energy used at home				
Use biomass fuel for cooking	126(61.8)	141(55.7)	1.24(0.85-1.89)	0.267
Use Electricity for cooking	78 (38.2)	112(44.3)	1.00	

Note: 1.00 reference value.

5.6 Multivariable Analysis

In order to identify independent pridictor variables for development of chronic respiratory symptoms, variables that showed significant association at bivarate level, p-value <0.05 were added at multivariable logistic regeression model. Accordingly, from socio-demographic factors only sex was found be independent predictors for development of chronic respiratory symptoms. In this study male respondents had 1.90 times (AOR=1.90, 95% CI: 1.09-3.30) higher odds of developing chronic respiratory symptoms than female respondents. Previous respiratory disease was another variables that showed significantly associated with development of chronic respirtory symptoms, Workers who had previous respiratory disease were 3.87 times (AOR=3.87**,** 95% CI: 2.08-7.19) higher to develop chronic respiratory symptoms compared to those who did not have (Table 6).

Moreover, not use of RPD was found to be an indipendent pridictor variables for the development of chronic respiratory symptoms. Workers who did not use RPD on duty were 1.79 times (AOR=1.79, 95% CI:1.06-3.03) higher odds of developing chronic respiratory symptoms compared to those who use RPD. Working department was also another variables that showed significant association with development of chronic respiratory symptoms**.** Workers who engaged in machine and painting department were 3.72 times (AOR=3.72 ,95% CI: 1.89-7.34) higher odds of developing chronic respiratory symptoms compared with workers who engaged in soft drink production. Furthermore, workers who engaged in carpenting and sanding department were 3.31 times (AOR=3.66 ,95% CI: 1.57-6.97) higher odds of developing chronic respiratory symptoms compared with workers who engaged in soft drink production (Table 6).

However, in this study chronic respiratory symptoms was not association with age, education, income, Previous dusy working factories, safety training and work place supervision at multivariable logistic regression modle (Table 6).

Table 6: Multivariable models of factors associated with chronic respiratory symptoms among wood workers and controls in Addis Ababa, Ethiopia, May, 2019.

Variables	Respiratory symptoms		COR(95% CI)	AOR(95% CI)
	Yes	No		
Sex				
Male	168(82.4)	188(74.3)	**1.61(1.02-2.55)**	**1.90(1.09-3.30)***
Female	36(17.6)	65(25.7)	1.00	1.00
Age (in year)				
≤ 29	96(47.1)	133(52.6)	1.00	1.00
30-39	51(25.0)	74(29.2)	0.96(0.61-1.48)	0.83(0.48-1.43)
≥ 40	57(27.9)	46(18.2)	**1.72(1.07-2.74)**	1.15(0.63-2.12))
Religion				
Orthodox	174(85.3.)	191(75.5)	**1.88(1.16-3.05)**	1.97(0.93-3.47)
Muslim and others	30 (14.7)	62(24.5)	1.00	1.00
Educational leve				
Primary school and below	65(31.9)	44(17.4)	**2.22(1.43-3.44)**	1.35(0.78-2.32)
Secondary school and above	139(68.1)	209(82.6)	1.00)	1.00
Monthly income				
≤ 2500	64(31.4)	41(16.2)	**2.50(1.59-4.00)**	1.64(0.90-2.97)
2501-3500	36(17.2)	42(16.6)	1.35(0.81-2.25)	0.99(0.43-2.29)
≥ 3501	105(51.5)	170(67.2)	1.00	1.00
Previous respiratory disease				
Yes	53 (26.0)	22 (8.7)	**3.68 (2.15-6.31)**	**3.87(2.08-7.19)****
No	151 (74.0)	231(91.3)	1.00	1.00
Uses of RPD				
Yes	43(21.1)	125(49.4)	1.00	1.00
No	161(78.9)	128(50.6)	**3.65(2.41-5.54)**	**1.79(1.06-3.03)***
Working department				
Carpenter and sanding	63(30.9)	34(13.4)	**6.08(3.62-10.21)**	**3.31(1.57-6.97)***
Machine and painting	88(43.1)	45(17.8)	**6.42 (4.00-10.30)**	**3.72(1.89-7.34)****
Soft dring production	53(26.0)	174(68.8)	1.00	1.00
Previous dust exposure				
Yes	47 (61.8)	29(38.2)	**2.31(1.39-3.83)**	1.67(0.98-3.19)
No	157(41.2)	224(58.8)	1.00	1.00
Safety training				
Yes	59(28.9)	148(58.5)	1.00	1.00
No	145(71.1)	105(41.5)	**3.46(2.34-5.13)**	1.24(0.68-2.26)
Work place Supervision				
Yes	62(30.4)	134(47.0)	1.00	1.00
No	142(69.6)	119(53.0)	**2.58(1.75-3.79)**	0.83 (0.46-1.48))

Note: * P-value <0.05 ,**P-value <0.001, 1.00 reference value.

5.7 Lung function test

Table 7 shows the result of lung function among the wood workers and controls. The wood workers had significantly lower FVC and FEV_1 compared with controls after adjusting for age, weigh, height, education and smoking. But FEV1/FVC ratio was not significantly lower among wood workers compared with controls and all participants had FEV_1/FVC values > 70%, indicating that none of the workers had airflow limitation (Table 7).

Table 7: Lung function test among wood workers and controls in Addis Ababa, Ethiopia, May 2019.

Lung function Parametres	Wood worker(n=50)	Controls(n=50)	p-value
FVE (L) – AM (SD)	3.82 (0.64)	4.34 (0.68)	0.010
FEV_1 (L/s) – AM (SD	3.19 (0.57)	3.65 (0.59)	0.006
FEV_1/FVC×100 – AM (SD	83.44 (0.06)	84.37 (0.05)	0.502

Note: Multiple linear regression between wood workers and controls while adjusting for age, weigh, height, education and smoking; p-value: significance level; "n": Number of study participants:AM: Arithmetic Mean; SD: Standard Deviation

5.8 Lung function parameters with duration of exposure time

One way ANOVA result showed that there was significant difference ($p<0.05$) in FEV_1/FVC ratio among the wood workers between duration of exposure time. Wood workers exposed for ≥ 10 years, showed significant reduction in FEV_1/FVC ratio (80.49±0.07) compared with those less duration of exposure time (Table 8). However, significant reduction in FVC and FEV_1 was not observed among the wood workers between duration of exposure time (Table 8).

Table 8: One Way ANOVA of lung function parameters among wood workers at different duration of exposure time to wood dust in Addis Ababa, Ethiopia, May, 2019.

Lung function Parameters	Duration of exposure time			p-value
	< 4 years	5-9 years	≥ 10 years	
	n =24	n =9	n =17	
FVC(L) – AM (SD	3.77(0.68)	4.02(0.54)	3.79(0.66)	0.161
FEV_1(L/s) – AM (SD	3.16(0.54)	3.6(0.46)	3.06(0.65)	0.610
$FEV_1/FVC \times 100$ –AM (SD	84.09(0.06)	87.29(0.04)	80.49(0.07)	0.020

Note: AM: Arithmetic Mean; SD: Standard Deviation p-value; "n": Number of study participants.

6. DISCUSSION

The present study revealed that the prevalence of chronic respiratory symptoms of cough (35.2% vs 10.1%), phlegm (44.3% vs 11.5%), wheezing (29.6% vs 11.9 %), breathlessness (40.0% vs 11.0%), chest pain (37.4% vs 7.9%) and at least one chronic respiratory symptoms (65.7% vs 23.3%) in wood workers and controls respectively. In addition, sex, previous respiratory disease, not use respiratory protective device and working department were found to be independent predictors for chronic respiratory symptoms. The wood workers had significantly lower Forced Vital Capacity (FVC) and Forced Expiratory Volume in the first second ($FEV_{1)}$ compared with controls. But not for FEV_1/FVC ratio.

This study found significantly higher prevalance of all chronic respiratory symptoms among wood workers compared with controls.. This result is consistent with other comparative studies conducted among wood workers and contros in Iran (35), South of Thailand (21), India (45), Benin city, Nigeria (29) and South Nigeria (31). All of these studies reported that wood workers had high prevalence of chronic respiratory symptoms compared with controls. But the present study showed a higher prevalence in all chronic respiratory symptoms compared with the study done among wood workers in Republic of Macedonia (34). The possible reasons for high prevalence of chronic respiratory symptoms in the present study could be due to difference in ventilation type and uses of RPD.

Likewise, the prevalance of chronic cough and chronic phlegm in this study was higher than the study conducted in Iran (35). But the result of this study is lower than the study in south Nigeria (28). This difference might be due to the difference in the ventilation system.

The overall prevalance chronic respiratory symptoms in this study was significantly higher among wood workers (65.7%) compared to controls (23.3%). This result is partly consistent with the study conducted in south Nigeria, where the overall prevalence of chronic respiratory symptoms was 68% among wood workers compared with 10.1% in water bottling companies (28). However, the overall prevalence of chronic respiratory symptoms in this study was found to be higher than the study done in Republic of Macedonia, where the overall prevalance of chronic respiratory symptoms was found to be 43.2% in wood workers compared with 24.3% in office workers (34).

But in the present study the overall prevalence of chronic respiratory symptoms was lower compared to study in Benin city, Nigeria, were the prevalence was 87.3% in wood workers than 18.7% in comparision groups (29). This may be due to awareness levels of wood workers and controls to take preventive measures.

Regarding associated factors for development of chronic respiratory symptoms only sex was independently associated with development of chronic respiratory symptoms from socio demographic factors when added in multivariable analysis model. Male respondents had 1.90 times (AOR=1.90, 95% CI**:** 1.09-3.30) higher odds of having chronic respiratory symptoms than female respondents..This result is inconsistent with the study done in Thailand, where being female workers was associated with development of chronic respiratory symptoms (23). But the result is consistent with the study conducted in Dejen town among cement factory workers (51). On the other hand previouse respiratory disease showed statisticaly significant association with development of chronic respiratory symptome when taken in to multivariable analysis model. Workers who had previous respiratory disease were 3.87 times (AOR=3.87, 95% CI: 2.08-7.19) higher odds of developing chronic respiratory symptoms compared with those who were free of previous respiratory disease. This result is consistent with the studies conducted in Ethiopa (51, 55, 56). All of these studies reported that previous respiratory disease was an independent predictors for the development of chronic respiratory symptoms. This implies that working in dusty working enviroment aggravate the existing respiratory disease.

Furtheremore,The odds of developing respiratory symptom among workers who did not use RPD on duty were 1.79 times (AOR=1.79, 95% CI: 1.06-3.03) higher compared to those who use RPD. This result is in line with the study conducted in Northeast Thailand and Ethiopia (46, 56). This showed that Respiratory protective device is mandatory to prevent dust exposure. However, this result is inconsistent with the study conducted in Dejen town (51).This difference might be due to the difference in the amount of dust generated in the two factories. Moreover, working department was another variable that showed significant association with developmant of respiratory symptoms. Workers who were engaged in carpenter and sanding department were 3.31 times (AOR=3.31, 95% CI: 1.57-6.97) higher odds of developing chronic resparatory symptoms compared to soft drink production workers.

In addition, Workers who were engaged in machine oprating and painting were 3.72 times(AOR=3.72, 95% CI: 1.89-7.34) higher to develop chronic respiratory symptoms compared with those soft drink prodution. This result is in agreement with studies conducted in Ethiopia (55, 57). However, this study did not found significant associated between education and chronic respiratory symptom. This is inconsistent with study conducted in Dejen town (51). This might be education alone is not enough in areas were uses of RPD, safety training and work place supervision is limited.

In the current study the wood workers had significantly lower forced vital capacity(FVC) and forced expiratory volume in the first second(FEV_1) compared with controls after adjusting for age, weight, height, education and smoking. This result showed that occupational exposure to wood dust may cause dicline in FVC and FEV_1 as found in previous studies conducted in Sulaimani city, Iraq, Norway and Turkey (41, 44, 48). Despite the fact that wood workers exposed to high amount of wood dust, which was observed during work place survey this study did not found significant difference in FEV_1/FVC ratio reduction between wood workers and controls. This result is inconsistent with other previousely done comparative studies in Golestan province, Iran (68), South Thailand (21), India (24, 45) and Nigeria (28, 31)**.** All of these studies reporetd significant difference in FEV_I/FVC ratio reduction among wood workers compared to controls. The possible reason for the diffrence might be due to the amount of wood dust each workers exposured and duration of exposure time. Furthermore, In this study, both wood and Moha soft drink industry (controls) workers had a FEV1/FVC > 70%. This is similar with studies conducted in Ethiopia, Macedonia, Iran and Poland which showed that the mean FEV1/FVC ratio was higher than 70% among the study participants (33-35, 38). However, the result of this study is in contrast with studies done among Danish furniture workers which shows a reduced lung function (37). According to the recommendation of Global Initiative for Chronic Obstructive Lung Disease (GOLD) the ratio of FEV1/FVC < 70% confirms the presence of persistent airflow limitation (64).

This study also found that significant relation between reduction of lung function parameters in FEV_1/FVC ratio and duration of exposure time to wood dust. The implication of this result is that the reduction in FEV_1/FVC ratio is deteriorate when the duration of exposure increase.

The result of study is inconsistent with other studies in Sweden (36) and Sulaimani city, Iraq (44) which showed that there was no significant relation between reduction of lung function and duration of exposure time in wood dust. The possible reason for this difference could be due poorlly ventlated and absence of local exhaust ventilation in the current study areas. It coud also be due to duration of exposure time to wood dust.

7. STRENGTH AND LIMITATION OF THE STUDY

7.1 Strength of the study

To the best of my knowledge, it is the first study in Ethiopia to assess both prevalence of chronic respiratory symptoms and lung function parameters among large scale wood factory workers.

The control group in the present study was from another production factory, with very low dust levels. not from the general population to reduce bias that can be attributed due to baseline characteristics such as socio-demographic and economic differences between the factory workers and the population.

7.2 Limitation of the study

The study did not measure the amount of wood dust each worker is exposed to during their work time.

The workers may have caused a recall bias in the respiratory symptom assessment, as symptoms might not be easy to remember.

The data collector may have caused an observer bias in measuring antropometric parameters. But through strict supervision and control for possible confounders during analysis we tried to minimize the effect.

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8. CONCLUSSION

The wood workers exposed to wood dust had significantly higher prevalence of chronic respiratory symptoms campared with controls, i.e Moha soft drink industry workers. Moreover, Sex, previous respiratory disease, not use of respiratory protective device (RPD) and working department were found to be an independent pridictors for development of chronic respiratory symptoms.The wood workers had significantly lower forced vital capacity (FVC) and forced expiratory volume in the first second(FEV_1) compared with controls. This showed that wood workers are an increasing risk of developing respiratory disorder compared to controls and this risk is more pronounced in a areas were ventilation system and use of RPD is limited. The study also found that significant relation between reduction of lung function parameters in FEV_1/FVC ratio and duration of exposure time to wood dust.

9. RECOMMENDATION

Based on the results of the study the followeng were recommended

For Ministry of Labour and Social Affairs (MOLSA)

The Ministry of labour and social affair jointly with Ministry of health and Minstry of industry should have regular work place supervision to ensure the health of workers in large scale wood factories.

For factory oweners and managers

The wood factory oweners and managers should provide all the necessary respiratory protective device for the wood workers.

The wood factory owners and managers should implement engineering dust control measures in the long run.

They should also give health and safety training on the efective uses of provided RPD and work place supervision to workers on regular basis.

For the workers

The wood workers should use respiratory protective device provided by the factory owners and managers while on duty to minimize the adverse health effects of wood dust.

For researchers

It is better to conduct a prospective cohort study which is undertaken in order to characterize the association between dust exposure and lung function reduction among large scale wood factory workers.

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ANNEXES

Annex I Participant Information sheet

How are you? My name is ________________ I am working as a data collector for the study conducted in this factory by Belayneh Jabur who is studying for his Master's degree at Addis Ababa University, College of Health Science, 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: Assessments of respiratory symptoms and lung function parameters among workers of large scale wood factory in Addis Ababa, Ethiopia, 2018/19.

Purpose of the study: The aim of this study is to assess respiratory symptoms, lung function parameters and associated factors among workers of wood factory and 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 results will be used as evidence and input to reduce the potential health risk of exposure to wood dust.

Procedure and duration: I will be assessing chronic respiratory symptoms by using Questionnaires, Lung function parameters by using Spiro meter that needs your full cooperation and this may take about 30 to 45 minutes and the procedures will take place in your working environment.

Benefit: The study do not have a short term financial and health care benefit for being study participant as an individual and group. But indirectly the results from this study will help the policy maker, practitioner and concerned organization to formulate strategy for improving occupational health safety practice. In addition, the result of the study will serve as base line data in the field.

Risk: The study does not have any inhuman treatment and does not cause any physical harm, social discrimination and economic loss. But during performing lung function test the participant may feel dizzy or discomfort.

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

Right of participants: Participating 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 have any question, which is not clear about the study you can contact the PI and primary advisor. PI: Belayneh Jabur **:** Tell phone +251-912 09 70 41**:** Email **:** belayengi@gmail.com and primary advisor**:** Dr Samson Wakuma **:** Tell phone+1251-923-94-09-98**:** Email **:** Samson-wakuma@yahoo.com.

Annex II Informed consent form

Detail information about the study is explained to me. I have understood that the purpose of this study is to assess chronic respiratory symptoms, lung function parameters and associated factors among workers of wood factory and to write a thesis as a partial fulfillment of Master's degree in public health for the principal investigator.

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 study will not have any short term financial and health care benefits being participant and it does not cause any physical harm, social discrimination and economic loss on me. But the I may feel dizzy or discomfort during performing lung function test. I assured that there would be confidentiality of my response and the collected data will be used only for the study. It also explained to me that I have the right to stop participation at any time and ask information that is not clear about the study and contact the principal investigator as well as primary advisor. Moreover, I understood that participating in this study is important for improving occupational safety practice and to serve as base line date in the field.

I have read this consent form or it has been read to me in the language I understood. 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 III English Version Questionnaire

2019 Addis Ababa University, Collage Health Science, School of Public Health.

A modified version American Thoaracic Society (ATS) questionnaire to record chronic respiratory symptoms and associated factors among workers of large scale wood factory and Moha soft drink industry in Addis Ababa, Ethiopia, 2019.

Data collection date ___________

200. Factory code ____________

201. Status of workers: 1.Wood factory 2. Moha soft drink industry

202. ID number of the participant _______________

Part I: Socio demographic characteristics of the respondents

S.No	Questions	Response	Skip
Q101	Sex (by observation)	1. Male 2. Female	
Q102	Age in complete years	__________ years	
Q103	Religion	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. Others /Specify __________	
Q104	Marital status	1. Married 2. Single 3. Divorced 4. Widowed	
Q105	Educational level	1. Illiterate 3. Primary school (1-8) 4. Secondary school (9-12) 5.Certeficate and above	
Q106	Average Monthly salary in birr	_________ (Ethiopian Birr)	

S.No	Questions	Response	Skip
Part II: Respiratory symptoms related questions			
	Q201 Cough related questions		
Q201A	Do you usually have a cough?	1. Yes 2. No	If no, skip to Q 211C
Q201B	Do you usually cough as much as 4 to 6 times or 4 or more days out of the week?	1. Yes 2. No	
Q201C	Do you usually cough at all on getting up, or first thing in the morning?	1. Yes 2. No	
Q201D	Do you usually cough at all during the rest of the day or at night	1. Yes 2. No	
Q201E	If yes for Q201A.201B.201C and 201D.do you usually cough like this on most days for 3 consecutive months or more during the year?	1. Yes 2. No	
Q201F	For how many years have you had this cough?	__________(Years)	
	Q202 Phlegm related questions		
Q202A	Do you usually bring up phlegm from your Chest?	1. Yes 2. No	If no, skip to Q 202C
Q202B	Do you usually bring up phlegm like this as much as twice a day, 4 or more days out of the week?	1. Yes 2. No	
Q202C	Do you usually bring up phlegm at all on get-ting up or first thing in the morning?	1. Yes 2. No	
Q202D	Do you usually bring up phlegm at all during the rest of the day or at night?	1. Yes 2. No	
Q202E	If yes for Q202A.202B.202C and 202D, do you bring up phlegm like this on most days for 3 consecutive months or more during the year?	1. Yes 2. No	
Q202F	For how many years have you had trouble with phlegm?	__________(Years)	
	Q203 Wheezing Related Questions		
Q203A	When you have a cold, do you have wheezing or whistling sound in your chest?	1. Yes 2. No	
Q203B	Do you have wheezing or whistling sound in your chest in most days and night?	1. Yes 2. No	
Q203C	If yes for Q203 or 203B how many years has this wheezy sound present?	__________(Years)	
	Q204: Breathlessness related questions		
Q204A	Are you troubled by shortness of breath when hurrying on the level or walking uphill?	1. Yes 2. No	
Q204B	Do you have to walk slower than people of your age on the level due to breathlessness?	1. Yes 2. No	
Q204C	Do you have to stop for breath when walking at your own pace on the level?	1. Yes 2. No	
Q204D	Do you ever had to stop for breath after walking about a certain distance or a few minutes on the level ground?	1. Yes 2. No	

Q204E	Are you too short of breath to leave the house or short of breath on dressing or undressing?	1. Yes 2. No	
	Q205 Chest pain Related Questions		
Q205A	If you get a cold, does it usually go to your chest? (Usually means more than 1/2 the time)	1. Yes 2. No	
Q205B	In the past three year, have you had any chest illnesses that have kept you off work or in bed?	1. Yes 2. No	If no, skip to Q301
Q205C	Did you produce phlegm with any of these chest pain?	1. Yes 2. No	
	Part III: Previous and family history of respiratory diseases related questions		
Q301	Have you ever had any respiratory disease which is confirmed by physician?	1. Yes 2. No	If no, skip to Q303
Q302	Have you ever had any of the following respiratory disease? (Circle all that apply)	1. Asthma 2. Pneumonia 3 .Chronic bronchitis 4. Other chest illness 5.Other/specify_______	
Q303	Were your parents ever told by a physician that they had chronic respiratory disease?	1. Yes 2. No	If no, skip to Q401
Q304	Did your parents ever had any of the following respiratory disease? (Circle all that apply)	1. Chronic bronchitis 2. Emphysema 3. Asthma 4. Lung cancer 5. Other chest conditions	
	Part Iv: Behavioral related questions		
Q401	Do you now smoke cigarette?	1. Yes 2. No	If no, skip to Q402
Q402	Have ever smoke cigarette?	1. Yes 2. No	If no, skip to Q406
Q403	How many cigarettes do (did) you smoke per day?	_____No cigarettes per day	
Q404	How many cigarettes do (did)you smoke(smoked) per day?	____No cigarettes per week	
Q405	For how long have you been smoked?	_______(In years)	
Q406	Do you always wear personal protective devices while on duty?	1. Yes 2. No	If no, skip to Q408
Q407	If Q406 answer is "Yes“ which type of personal protective equipment do you use? (Circle all that apply)	1. Mask respiratory 2. Full face pieces respiratory 3. Breathing apparatus 4. Pieces of cloths 5. Others/specify________	
Q408	If Q406 answer is "No “Select the most appropriate reasons for not using	1. Not available 2. Not comfortable for work 3. Not provided by institution 4. The dust is not harmful 5. Others specify_____	

Part V: Work related factors questions				
Q501	For how long have you been working in this factory?	_____________Years		
Q502	For how many working hours per day you are working in this factory?	_____________hour/day		
Q503	For how many working days 'per a week you are working in this factory?	____________day/week		
Q504	Which section are you working currently and for how long?	Working department	Service year	
		Carpenter		
		Sanding		
		Machine operating		
		Painting		
		Other/specify__		
Q505	Have you ever worked in other sections in the past in this factory?	1. Yes	2. No	If no, skip to Q507
Q506	If Q 505 answer is "Yes" indicate which section and for how long? (Circle all that apply)	Working department	Servic e year	
		Carpenter		
		Sanding		
		Machine operating		
		Painting		
		Other/specify_		
Q507	Have you ever worked in other dusty types of work?	1. Yes	2.No	If no, skip to Q509
Q508	If Q 507 answer is "Yes", for how long have you worked in any of the following types of work? (in years/months	Worked area	Service year	
		Coffee processing		
		Textile factory		
		Cement factory		
		Floor factory		
		Gas station		
		Metal factory		
		Others_______		
Q509	Which type of energy do you use most in your home for cooking?	1. Charcoal 2. Fire wood 3. Kerosene4. Electrics 5.Other/specify------		
Q510	Do you ever had taken occupational health and safety training?	1. Yes 2. No		
Q511	Do you ever been supervised at work place ?	1. Yes 2. No		

Name and signature of data collector______________________ date __________

Annex IV Observational checklist

s.no	**Workplace environment and ventilation**	Response		Comment
1	Is the wood dust particles accumulated on working place?	Yes	No	
2	Is the work place well ventilated /free fresh air movements?			
3	Is there mechanical ventilation system in the work place ?			
4	Is local exhaust ventilation system is in placed?			
	Uses, availability of PPE and safety instruction			
5	Is the required personal protective equipment provided and used by all workers while on duty?			
6	Is Personal protective equipment is available in the store ?			
7	Are the areas requiring PPE usage properly identified by warning signs?			
8	Is there safety instructions and procedures in the work place ?			

Annex V Information Sheet (Amharic Version)

<u>በጥናቱ ላይ ለሚሳተፉ የሚሰጥ መረጃ</u>

ጤና ይስጥልኝ! እኔ ስሜ ________________________ እባላለሁ፡፡ እዚህ የተገኘሁት የአዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የህበረተሰብ ጤና ሳይንስ ትምህርት ቤት የድህረ ምረቃ ተማሪ የሆኑትን በላይነህ ጃቡርን ወክዬ ነው፡፡

የጥናቱ ርዕስ፡ በአዲስ አበባ በሚገኙ እንጨት ፋብሪካ ስራተኞች ላይ የመተንፈሻ አካላት ህመም ምልክቶች እና መንሴዎቻቸው ነው፡፡
የጥናቱ ዋና አላማ፡ እንጨት ፋብሪካ ስራተኞች ላይ የመተንፈሻ አካላት ህመም ምልክቶች እና መንሴዎቻቸውን ለይቶ ማወቅ ሲሆን ለጥናት አድራጊው ለድህረ ምረቃ ትምህርት ማሙያነት የሚካሄድ እና ጥናቱ ሲያልቅ በእንጨት ስራ ላይ ለሚደረሱ የጤና ችግሮች ግብዓት ሆኖ ያገለግላል፡፡

መመሪያ እና የሚወሰደው ጊዜ፡ ለጥናቱ የተዘጋጁ መጠይቆችን እጠይቃለሁ፡፡ ቀላል ዘዴ በመጠቀም አተነፍፈስዎን እለካለሁ ይህም የእረሶን ሙሉ ትብብር የሚጠይቅ ይሆናል፡፡ ስለሂደቱ አጥር ያለ ገለጻ ይሰጣል፡፡ልኬቱ የሚካሄደው ስራ ቦታ ሲሆን የሚወስደው 30-45 ደቂቃ ነው፡፡

ጥቅም፡ ይህ ጥናት የአጭር ጊዜ የገንዘብ እና የጤና እንክብካቤ ጥቅማ ጥቅሞች ለተሳታፊው/ዎች/የሉትም፡፡ ነገር ግን በሂደት የጥናቱ ውጤት ለህግ አውጭዎች፤ ለባለሙያዎች እና ለሚመለከተው አካል ለሰራ ደህንነት ማሻሻያ ስትራቴጂክ ቀረፃ ይረዳል፡፡ በተጨማሪም ጥናቱ በመስኩ እንደ መነሻ መረጃ ሆኖ ያገለግላል፡፡

ጉዳት፡ ይህ ጥናት በተሳታፊዎች ላይ ኢሰብአዊ የሆነ አቀራረብ አይኖረውም፡፡ አካላዊ፤ ስነልቦናዊ እና ኢኮኖሚያዊ ጉዳት አያስከትልም፡፡ ነገር ግን አተነፋፈስዎ በሚለካበት ጊዜ ራስዎን ሊያዞርዎት ይችላል፡፡

የጥናቱ ሚስጥራዊነት፡ የሚሰጡት መረጃ ሚስጥራዊነቱ የተጠበቀ እና ስምዎ የማፃፍና የማይጥጠቀስ መሆኑን ልገልጽልዎት እወዳለሁ፡፡

የተሳተፊዎች መብት፡ በጥናቱ ላይ መሳተፍ በፍላጎት ላይ የተመሰረተ ነው፡፡ በጥናቱ ላይ መሳተፍ ወይም አለመሳተፍ ይችላሉ፡፡ ተሳታፊዎች ከጥናቱ በፈለጉት ጊዜ ማቋረጥ ይችላሉ፡፡ ከጥናትጋር ተያያዥ ጥያቄ ካለዎት ወይም ተጨማሪ መረጃ ከፈለጉ ጥናት አድራጊውን ወይም ዋና አማካሪውን በሚከተለው አድራሻ ማግኘት ይችላሉ፡፡

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Annex VI Informed Consent Form (Amharic Version)

<u>የተሳታፊዎች የፍቃደኝነት መጠየቂያ ቅጽ</u>

ስለ ጥናቱ በቂ መረጃ እና ገለፃ ተሰጥቶኛል፡፡ የዚህ ጥናት ዓላማም እንጨት ፋብሪካ ስራተኞች ላይ የመተንፈሻ አካላት ህመም ምልክቶች እና መንስኤዎትን ለይቶ ማወቅ ሲሆን ጥናቱ ለጥናት አድራጊው ለድህረ ምረቃ ትምህርት ማሙያነት የሚካሄድ መሆኑን አውቃለሁ፡፡ በተጨማሪ ጥናቱ የሚወስደውን ጊዜ እና ቦታ በአግባቡ የተረዳሁ ሲሆን የአጭር ጊዜ የገንዘብ እና የጤና እንክብካቤ ጥቅማ ጥቅሞች ለተሳታፊው እንደሌሉት እና አካለዊ፣ ስነልቦናዊ፣ ኢኮኖሚያዊ ጉዳት በተሳታፊዎች ላይ እንደማያስከትል ነገር ግን አተነፋፈሴ በሚለካበት ጊዜ ራሴን ሊያዞረኝ እንደሚችል በሚገባ ተረድቻለሁ፡፡ እንዲሁም ማንኛውም እኔን የሚመለከት መረጃ ሚስጥራዊነቱ የተጠበቀ እና ለጥናቱ ዓላማ ብቻ እንደሚውል አውቃለሁ፡፡ በጥናቱ ላይ ለመሳተፍ ፍቃደኛ ካልሆንኩ እንደማልገደድ እና በማንኛውም ሰዓት ማቋረጥ እንደምችል እንዲሁም ለጥናት አድራጊው እና ለዋና አማካሪው ያልገባኝን ጥያቄ መጠየቅ እንደምችል የተገለጠልኝ ሲሆን በዚህ ጥናት መሳተፍ ለሰራ ደህንነት ማሻሻያ እና ጥናቱ በመስኩ እንደ መነሻ መረጃ ሆኖ እንደሚያገለግል ተረድቻለሁ፡፡

ይህ የፍቃደኝነት መጠየቂያ ቅጽ ከላይ በውስቱ ስለያዛቸው ጉዳዮች በማውቀው ወይም በምረዳው ቋንቋ አንብቤ/ተነቦልኝ ተረድቻለሁ፡፡ በመሆኑም በጥናቱ ላይ ለመሳተፍ የተሰማማሁ መሆኔን በፊርማዬ አረጋጣለሁ፡፡

የተሳታፊው ፊረማ ---------------------------------ቀን----------------------

የመረጃ ሰብሳቢው ስምና ፊርማ ------------------------------ቀን---------------------

Annex VII Amharic Version Questionnaire

በ2011 ዓ.ም በአዲስ አበባ ውስጥ በሚገኙ ትልልቅ እንጨት ፋብሪካ ሰራተኞች ላይ የመተንፈሻ አካላት ህመም ምልክቶች እና መንሴዎቻቸው ለይቶ ለማወቅ የተዘጋጀ መጠይቅ.

ቃለ-መጠይቅ የተደረገበት ቀን_______________

1. የፋብሪካ ኮድ_____________________

2. የተሳታፊ ሁኔታ፡ 1. እንጨት ፋብሪካ ዉስጥ የሚሰሩ

2. በሙዓለስላሳ በመጠች ፋብሪካ የሚሰሩ

3. የተሳታፊው መለያ ቁጥር ___________________

ክፍል አንድ፡ ማህበራዊ ሁኔታ በተመለከተ			
ተ.ቁ	ጥያቄ	ምላሽ	ይለፉ
ጥ101	ፆታ (በመመልከት)	1. ወንድ 2. ሴት	
ጥ102	እድሜ(በሙሉ ዓመት)	__________ዓመት	
ጥ103	ሀይማኖት	1.ኦርቶዶክስ 2.ሙስሊም 3.ፕሮቴስታንት 4. ሌላ ካለ ይጠቀስ ________________	
ጥ104	የጋብቻ ሁኔታ	1.ያገባ(ች) 2.ያላገባ(ች) 3.የፈታ(ታች) 4.የሞተበት(ባት)	
ጥ105	የትምህርት ደረጃ	1. ያልተማረ/ች) 2. የመጀመሪያደረጃት/ት (1-8) ያጠናቀቀ(ች) 3. ሁለተኛ ደረጃት/ት (9-12) ያጠናቀቀ(ች) 4. ሰርተፊኬት ከዛ በላይ	
ጥ106	አማካይ ወርሃዊ ደመወዝ በብር	__________ (በኢትዮጲያን ብር)	

ክፍል ሁለት: የአተነፋፈስ ስርዓት ምልክቶችን የተመለከቱ ጥያቄዎች			
ተ.ቁ	ጥያቄ	ምላሽ	ይለፉ
ጥ201 ሳልን በተመለከተ			
ጥ201ሀ	አብዛኛውን ጊዜ ሳል ያስልዎታል?	1. አዎ 2.አያስለኝም	አያስለኝም ከሆነ ወደ ጥ201ሐ ይለፉ
ጥ201ለ	አብዛኛውን ጊዜ በቀን 4-6 ጊዜ፣ በሳምንት 4 ጊዜ ወይም ከዛ በላይ ሳል ያስለዎታል?	1. አዎ 2.አያስለኝም	
ጥ201ሐ	አብዛኛዉን ጊዜ ጠዋት ወይም ከእንቅልፍዎ ሲነሱ ሳል ያስልዎታል?	1. አዎ 2. አያስለኝም	
ጥ201መ	አብዛኛዉን ጊዜ ቀን ወይም ማታ ጊዜ ሳል ያስልዎታል?	1. አዎ 2. አያስለኝም	
ጥ201ሠ	ለጥያቄ 201ሀ፣ለ፣ሐ ወይም መ መልስ አዎ ከሆነ አብዛኛውን ጊዜ ለተከታታይ ሶስት ወራት ወይም ከዚያ በላይ በአብዛኞቹ ቀናት ሳል ያስልዎታል?	1.አዎ 2.አያስለኝም	
ጥ201ረ	ይህ ሳል ለምን ያህል ዓመት ነበረብዎት?	____________ዓመት	
ጥ202 አክታን በተመለከተ			
ጥ202u	አብዛኛውን ጊዜ አክታ ከደረትዎ ይዎጣል?	1. አዎ 2. አይወጣም	አይወጣም ከሆነ ወደ ጥ202ሐ ይለፉ
ጥ202ለ	አብዛኛዉን ጊዜ አክታ በቀን 2 ጊዜ፣ በሳምንት 4 ጊዜ ወይም ከዛ በላይ ይወጣል?	1. አዎ 2. አይወጣም	
ጥ202ሐ	አብዛኛዉን ጊዜ ጠዋት ወይም ከእንቅልፍዎ ሲነሱ አክታ ነበርዎት?	1. አዎ 2. አይወጣም	
ጥ202መ	አብዛኛዉን ጊዜ በቀን ወይም በማታ አክታ ነበርዎት?	1. አዎ 2. የለብኝም	
ጥ202ሠ	ለጥያቄ 202ሀ፣ለ፣ሐ ወይም መ መልስ አዎ ከሆነ አብዛኛውን ጊዜ ለሶስት ተከታታይ ወራት ወይም ከዚያ በላይ በአብዛኞቹ ቀናት አክታ ነበርዎት?	1. አዎ 2. የለብኝም	
ጥ202ረ	ይህ አክታ ለምን ያህል ዓመት ነበርዎት?	__________ዓመት	
ጥ203 የማንኮራፋት ድምፅ በተመለከተ			
ጥ203ሀ	ለቅዝቃዜ በሚጋለጡበት ጊዜ ከደረትዎ የማንኮራፋት ወይም የማፏጨት ድምፅ ያሰማሉ?	1. አዎ 2.አላሰማም	
ጥ203ለ	ከደረትዎ የማንኮራፋት ወይም የማፏጨት ድምፅ በቀን ወይም በማታ ያስማሉ?	1. አዎ 2.አላሰማም	
ጥ203ሐ	ለጥያቄ 203ሀ ወይም ለ መልሶ አዎ ከሆነ ማንኮራፋት ወይም ማፏጨት ማሰማት ከጀመሩ ምን ያህል ዓመት ሆነዎት?	____________ዓመት	
ጥ204 የትንፋሽ ማጠርን በተመለከተ			
ጥ204ሀ	በፍጥነት ሲራመዱ ወይም ደረጃ ወደ ላይ (ተራራ) ሲወጡ የትንፋሽ ማጠር ችግር ነበርዎት?	1.አዎ 2.አልነበረብኝም	አያጥረኝም ከሆነ ወደ ጥ205 ይለፉ
ጥ204ለ	በትንፋሽ ማጠር ምክንያት ከዕድሜ አቻ ከሆኑ ጓደኞዎት ባነሰ ፍጥነት የመራመድ አጋጣሚ ነበረብዎት?	1.አዎ 2.አልነበረብኝም	
ጥ204ሐ	በራስዎ ፍጥነት ሜዳ ላይ ሲራመዱ የትንፋሽ መቋረጥ አጋጥሞት ያዉቃል?	1.አዎ 2.አላጋጠመኝም	
ጥ204መ	በሜዳ ላይ ወደ 100 ያርድ(96 ሜ) ከተራመዱ በኋላ የትንፋሽ መቋረጥ አጋጥሞት ያዉቃል?	1.አዎ 2.አላጋጠመኝም	

ጥ204ሠ	ከቤት ሲወጡ፤ ልብስ ሲለብሱ ወይም ሲያወልቁ ከፍተኛ የትንፋሽ መቋረጥ አጋጥሞት ያዉቃል?	1.አዎ 2.አላጋጠመኝም	
ጥ205 የደረት ህመምን በተመለከተ			
ጥ205ሀ	በአብዛኛዉ ለቅዝቀዜ በሚጋለጡበት ጊዜ የደረት ህመም ይሰማዎታል?	1. አዎ 2.አይሰማኝም	
ጥ205ለ	ባለፈው ሶስት አመት በደረት ህመም ምክንያት ከስራ ቀርተዉ ወይም ተኝተዉ ያዉቃሉ?	1. አዎ 2.አላውቅም	አላወቅም ከሆነ ወደ ጥ301 ይለፉ
ጥ205ሐ	የደረት ህመሙ አክታ ኑሮት ያዉቃል?	1. አዎ 2. የለም	
ክፍል ሶስት፡- ከዚህ በፊት የነበሩ እና ከቤተሰብ ጋር ለረጅም ጊዜ የሚቆዩ የመተንፈሻ በሽታዎች የተመለከቱ			
ጥ301	በሀኪም የተረጋገጠ የመተንፈሻ ህመም ነበረብዎት?	1. አዎ 2. የለብኝም	የለብኝም ከሆነ ወደ ጥ303 ይለፉ
ጥ302	ከተዘረዘሩት ህመሞች ዉስጥ የትኞቹን ታመዉ ነበር?(ከአንድ በላይ መልስ ይችላል)	1. አስም 2. የሳምባ ምች 3. የቆየ ብሮንካይተስ 4. የደረት አካባቢ ችግር 5. ሌላ ካለ-------------	
ጥ303	በወላጅ እናትዎ ወይም አባትዎ በሀኪም የተረጋገጡ ለረጅም ጊዜ የሚቆዩ የመተንፈሻ ህመምች ነበረባቸዉ?	1. አዎ 2. አልነበረም	አልነበረም ከሆነ ወደ ጥ401 ይለፉ
ጥ304	ቤተሰቦችህ(ችሽ) ከተዘረዘሩት የመተንፈሻ ህመሞች ዉስጥ የትኞቹን ታመዉ ነበር?(ከአንድ በላይ መልስ ይችላል)	1. የቆየ ብሮንካይተስ 2.ለመተንፈስ የሚያውክ የሳንባ በሽታ 3. አስም 4. የሳምባ ካንሰር 5. የደረት አካባቢ ችግር	
ክፍል አራት፡- የአኗኗር ዘይቤን የተመለከቱ ጥያቄዎች			
ጥ401	በአሁኑ ጊዜ ሲጋራ ያጨሳሉ?	1. አዎ 2.አላጨስም	አላጨስም ከሆነ ወደ ጥ402 ይለፉ
ጥ402	በህይወተዎ ሲጋራ አጭሰዉ ያቃሉ?	1. አዎ 2.አላዉቅም	አላውቅም ከሆነ ወደ ጥ406 ይለፉ
ጥ403	በቀን ስንት ስጋራ ያጨሳሉ (ነበር)	________(ቁጥር)	
ጥ404	በሳምንት ስንት ሲጋራ ያጨሳሉ (ነበር) ?	___________(ቁጥር)	
ጥ405	ለምን ያህል ዓመት አጨሱ (ነበር)?	_____________ዓመት	
ጥ406	በስራ ላይ የብናኝ መከላከያ ልብስ ይለብሳሉ?	1.አዎ 2. አለብስም	አለብስም ከሆነ ወደ ጥ408 ይለፉ
ጥ407	ለጥያቄ 406 መልስዎ አዎ ከሆነ ከሚከተሉትዉስጥየትኛዉንመከላከያ ይጠቀማሉ?(ከአንድ በላይ መልስ ይችላል)	1. የአፍ/አፍንጫ መሸፈኛ 2.ጭምብል(የፊት መሸፈኛ) 3. የአየር ማጣሪያ መሳሪያ 4.የልብስ ቁራጭ 5.ሌላካለይጥቀሱ_________	
ጥ408	ለጥያቄ 406 መልሰዎ አለብስም ከሆነ የብናኝ መከላከያ ልብስ የማይለብሱበትምክንያት ምንድን ነዉ?	1. ጭራሽ ስለ ሌለ 2. ለመልበስ ስለማይመች 3.በማስሪያቤትስለማይቀብ 4. ጎጅብናኝ ስለ ሌለ 5. ሌላ ካለ ይጥቀሱ_____	

ክፍል አምስት :- የስራ ቦታን የተመለከቱ			
ጥ501	አሁን በሚሰሩበት ፋብሪካ ስንት ዓመት ሰርተዋል?	____________(በዓመት/ወር	
ጥ502	አሁን በሚሰሩበት ፋብሪካ በቀን ምን ያክል ሰዓት ይሰራሉ?	_____________(በሰዓት)	
ጥ503	አሁን በሚሰሩበት ፋብሪካ በሳምንት ስንት ቀን ይሳራሉ?	____________(በቀን)	
ጥ504	አሁን የሚሰሩበት በየተኛዉ የሥራ ክፍል እና ለምን ያክል ጊዜ ሰሩ?	የሚሰሩበት ክፍል | የአገልገሎት ዘመን አናጢ | ማለስለስ | ማሽን | ቀለም | ልላ ካል |	
ጥ505	ከአሁን በፊት በዚሁ ፋብሪካ ሌላ ስራ ክፍል ለዓመት ወይም ከዓመት በላይ ሰርተው ያውቃሉ?	1.አዎ 2 አላወቅም	አላውቅም ከሆነ ወደ ጥ507 ይለፉ
ጥ506	ለጥያቄ 505 መልስዎ አዎን ከሆነ በየተኛዉ የሥራ ክፍል ለምን ያህል ጊዜ ሰርተዉ ነበር? (ከአንድ በላይ መልስ መስጣት ይቻላል	የሚሰሩበት ክፍል | የአገልገሎት ዘመን አናጢ | ማለስለስ | ማሽን | ቀለም | ልላ ካል |	
ጥ507	ከዚህ በፊት ለብናኝ ሊያጋልጥ የሚችል ሌላ ሥራ ሰረተዉ ያዉቃሉ?	1.አዎ 2. አላወቅም	አላውቅም ከሆነ ወደ ጥ509 ይለፉ
ጥ508	ለጥያቄ 507 መልስዎ አዎን ከሆነ የስራ ቦታና ለምን ያክል ጊዜ ሰርተዉ ነበር? (ከአንድ በላይ መልስ መስጣት ይቻላል)	የስራ ቦታ | አገልገሎት ዘመን ቡና መፈልፍየ | በጨርቃጨርቅ ፋብሪካ | በሲሚንቶ ፋብሪካ | በዱቄት ፋበሪካ | ብረትማቅለጫ ፋብሪካ | በነዳጅ ማደያ | ልላ ካለ |	
ጥ509	በአብዛኛዉ ጊዜ በቤትዎ ለምግብ ማብሰያነት የምትጠቀሙት የነዳጅ ኀይል ምንድ ነዉ?	1.ከሰል 2.እንጨት 3.ነጭጋዝ 4.ኤልክትሪክ 5.ሌላ ለ------	
ጥ510	የሥራ ደህንነት ስልጠና ወስደዋል?	1. አዎ 2. አልወሰድኩም	
ጥ511	በስራ ደህንነት ጤና ጉዳዮች ላይ ክትትልናድጋፍ ተደርጎሎት ያውቃል?	1. አዎ 2. አላውቅም	