



**ADDIS ABABA UNIVERSITY,
COLLEGE OF HEALTH SCIENCES,
SCHOOL OF PUBLIC HEALTH**

**CHRONIC RESPIRATORY SYMPTOMS AND ASSOCIATED FACTORS
AMONG FRUIT AND VEGETABLE WORKERS IN, ADDIS ABABA,
ETHIOPIA. COMPARATIVE CROSS SECTIONAL STUDY**

BY YIDNEKACHEW ALEMU (BSC)

**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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ETHIOPIA**

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TABLE OF CONTENTS

Contents

pages

ACKNOWLEDGEMENT	I
TABLE OF CONTENT.....	II
LIST OF TABLES	V
LIST OF FIGURES	VI
ACRONYMS AND ABBREVIATIONS.....	VII
ABSTRACT	VIII
1. INTRODUCTION	1
1.1 Background of the study	1
1.2 Statement of the problem	2
1.3 Rationally of the study.....	3
1.4 Significant of the study.....	4
2. LITERATURE REVIEWS.....	5
2.1 Overview of green grocer market workers.....	5
2.2. Prevalence of chronic respiratory symptoms among vegetable market workers.....	5
2.3. Factors affecting chronic respiratory symptoms.....	6
2.3.1 Socio-demographic factors and chronic respiratory symptoms.....	7
2.3.2. Personal factors and respiratory symptoms.....	8
2.3.3 Outdoor and indoor air pollution and chronic respiratory symptoms	8
2.3.4. Work-related factors and chronic respiratory symptoms	8
2.3.4.1 Duration of employment and chronic respiratory symptoms.....	9
2.4. Vegetable market places microbial concentrations and respiratory symptoms.....	10
3. OBJECTIVES.....	12
3.1 General objective.....	12
3.2 Specific objectives.....	12
4. METHODS.....	13
4.1 Study area.....	13
4.2 study period	13
4.3 Study design	13
4.4 Source population.....	13
4.5 Study population.....	13



4.6 Inclusion criteria.....	13
4.7 Exclusion criteria.....	13
4.8 Sample size determination.....	13
4.9 Sampling technique procedure.....	15
4.10 Data collection tool and procedure.....	16
4.11 Data management	17
4.12 Data quality assurance.....	17
4.13 Data processing	18
4.14 Data Analysis.....	18
4.15 Ethical consideration.....	18
4.16 Dissemination of the result.....	19
4.17 Operational definition.....	19
4.18 Variables.....	20
5. RESULTS.....	21
5.1. Socio-demographic characteristics of respondents.....	21
5.2. Work related factors among flour mill and Pepsi factory workers.....	23
5.3. Prevalence of chronic respiratory symptoms.....	24
5.4. Respiratory protective devices.....	26
5.5. Work place observation.....	27
5.6. Factors associated with chronic respiratory symptoms.....	28
5.6.1 Socio demographic factors.....	28
5.5.2. Work related factors.....	29
5.7. Multivariable Analysis.....	31
5.8 Microbial load.....	34
6. DISCUSSION.....	35
7. STRENGTH AND LIMITATION OF THE STUDY	38
8. CONLCUTION	39
9. RECOMMENDATION	40
10. REFERENCES	45
ANNEX	46
Annex I Information sheet in (English).....	46



Annex II. Informed consent in (English).....	47
Annex III questioners in English.....	48
Annex IV. Observational checklist for PPE usage	54
Annex V. Information sheet (Amharic version).....	55
Annex VI. Informed consent (Amharic version).....	56
Annex VII questioners in Amharic.....	57

LIST OF TABLES

PAGE

Table 1: Socio-demographic and behavioral characteristics of fruit and vegetable market workers and office workers, Addis Ababa city, Ethiopia, 2021.	34
Table 2: Work related factors and past respiratory illnesses of workers, Addis Ababa city, Ethiopia 2021.....	36
Table 3: Prevalence of respiratory symptoms in flour mill and Pepsi factory workers, Addis Ababa city, 2021.....	37
Table 4: Crude odds ratio of socio demographic factors associated with chronic respiratory symptoms among market workers and controls in Addis Ababa, Ethiopia, 2021.....	40
Table 5: Crude odds ratio of work related factors associated with chronic respiratory symptoms among fruit and vegetable market workers and controls in Addis Ababa, Ethiopia, Dec. 2020...	41
Table 6: Multivariable models of factors associated with chronic respiratory symptoms among fruit and vegetable market workers and controls in Addis Ababa, Ethiopia, May, 2021	42
Table 7: Results of air culture in terms of growth of Bacteria and fungi.....	43



LIST OF FIGURES

PAGE

Figure 1. Conceptual framework.....	11
Figure 2 Schematic presentation and sampling procedures of fruit and vegetable workers.....	16
Figure. 3. Schematic presentation of Sampling Technique and Procedure of office workers.....	17
Figure 4 cold box, autoclave, Incubator.....	27
Figure 5 Personal protective devices availability and the reason not used by factory workers.....	37
Figure 6. Picture of waste disposal problems and Loading and unloading department workers in fruit and vegetable workers Pictured by (YIDNEKACHEW ALEMU.)	38

ABBREVIATIONS AND ACRONYMS

AAU	Addis Ababa University
AOR	Adjusted Odds Ratio
BMRC -	British Medical Research Council's
COPD-	Chronic Obstructive Pulmonary Disease
COR -	Crude Odds Ratio
CFU -	Colony Forming Unit
DALYs-	Disability Adjusted Life Years
DW	Distilled Water
PEFR-	Peak Expiratory Flow Rate
PR-	Prevalence ratio
FVC -	Forced Vital Capacity
FEV1 -	Forced Expiratory Volume in one second forced vital capacity
URTI-	Upper Respiratory Tract Infection
PPE-	Personal Protective Equipment
RPE-	respiratory protective equipment
TC -	Traffic Circle
TNTC	Too Numerous To Count
PG -	Public Garden

ABSTRACT

Background: Fruit And Vegetable Market is an abundant source of bio- aerosols as fruits and vegetables are in and out in the daily basis. Thus, regular workers are exposed to these bio-aerosols for a significant period of time depending on their work timetable. Exposure to organic and inorganic waste and long term inhalation of bio-aerosols during working hours may be associated with increases in chronic respiratory health symptoms among green grocers.

Objective: The objective of this research was to determine the prevalence of chronic respiratory symptoms and related factors of fruit and vegetable workers compared with the control, in Addis Ababa, Ethiopia.

Methods and materials: Comparative cross sectional study was carried out from Sep 2020–July 2021. A total of 314 (156 fruit and vegetable workers and 158 office workers) were participated in the study. Chronic respiratory symptoms were assessed by interview method using questionnaire adapted from the British Medical Research Council's. Then data was first entered using Epi info version 7.1. Then data were smoothed, edited using SPSS version 24 software. Multiple linear regressions, bivariate logistic regressions and Multivariable logistic regression were computed to depict the data and related factors. Also culture method was done to count and compare bacterial and fungal concentrations between fruit and vegetable workers and office workers.

Results: In this study the prevalence ratio of overall chronic respiratory symptoms (PR = 2.87, 95% CI: 1.772-4.66) was significantly higher fruit and vegetable workers (46.7%) compared to controls (23.4%). And also the bivariate and multivariable logistic regression score showed that sex, (AOR = 2.11, 95% CI = 1.12-3.98) educational status, (AOR = 1.34, 95% CI = 0.78-2.32), Working hours per day (AOR = 3.91, 95% CI = 1.586-9.65), working department (AOR = 3.20, 95% CI = 0.90-11.40) were associated with chronic respiratory symptoms. And an average Bacterial and Fungal concentration was also found to be significantly higher in the air of vegetable market (276 Colony Forming Unit) as compared to air in the workplace of controls (7 Colony Forming Unit). Similarly vegetable markets have higher number of fungal concentration than that of the controls. I.e. (too numerous to Count) versus nil respectively.



Conclusion: The fruit and vegetable market workers (green grocers) had a higher prevalence of chronic respiratory symptoms relative to office workers. So that, respiratory protective devices should be given to deliver preventive measures.

Keywords: fruit and vegetable market workers (green grocers), organic dust, chronic respiratory symptoms.



1. INTRODUCTION

1.1 Background

Workers such as fruit and vegetable workers are actively engaged in handling of different vegetables and fruits originated from different localities, exposed to large quantities of bio-aerosols, which constitutes not only the vegetable debris, but also a variety of aerosolized microorganism(1).

Bio-aerosols are ubiquitous, highly variable, complex, and natural or man-made in origin, and contain various bacteria, fungi, spores, organic fiber, endotoxin, and peptidoglycan and many of them may act as allergen, inflammatory mediator, or in some other ways to act on the respiratory system. The symptom may appear in the form of various allergic, obstructive, or restrictive lung disorders(2).

Fruit and Vegetable market is a rich source of bio aerosols as loads of fruits and vegetables are loaded and unloaded daily. It is generally known that bio aerosols present in the air can affect human health, causing mainly respiratory diseases transmitted(3).

Fruit and Vegetable market workers face many problems at their work place. For example, majority of employers do not provide personal protective equipment such as face mask, shoe covers and rubber boot. In addition, they are not allowed to assure their safety issues(3).

Fruit and vegetable market workers may face different respiratory symptoms due to their work place improper sanitary conditions and due to decay of fruit and vegetables and in Ethiopia the issue is not well studied. So this study assessed the prevalence of chronic respiratory symptoms and associated factors of green grocers in Addis Ababa. The study will contribute as base line for further studies.

1.2 Statement of the problem

Respiratory disorders from occupational sources are the major public health problems, accounting for 30% of all reported work-related diseases and 10–20% of deaths worldwide(4).

The publication which was released from U.S.A stated that globally, owing to exposure to occupational airborne particulate matters, an estimated 386,000 deaths and nearly 6.6 million disability adjusted life years (DALYs) occurred among workers (5).

One report from England showed that from all occupational diseases chronic respiratory symptoms accounted 10% and around 12,000 death annually due to occupational respiratory disease of which about two-third of the death were due to dust related disease(6).

But it is much greater in developing countries, where effective air contamination reduction and technological risk strategies are no or less available, workers are regularly exposed to dust particles which have both short and long term health problems, like Nigeria which was reported with 91% of occupational asthma cases out of 855 occupational diseases in the year 1991(6).

Bio-aerosols with high bacterial content are responsible for high endotoxin levels in the working environment, which is a major risk factor for respiratory problem among workers in vegetable market(7).

In addition, vegetable market workers can be exposed to non-specific irritant, various dust, fumes, and vegetable matters that can increase bronchial reactivity which in turn can cause bronchospasm (8).

A comparative study conducted in India among vegetable markets workers indicated a higher prevalence of acute and chronic respiratory symptoms compared to controls and also the same research showed that lung function reductions, such as Forced Vital Capacity and Forced Expiratory Volume in one second forced vital capacity relative to controls(9).

No study has been conducted to assess the respiratory problem among vegetable market workers in Ethiopia. Therefore, the purpose of this study was to describe the prevalence of chronic respiratory

symptoms and related factors among fruit and vegetable (greengrocer) market workers in Addis Ababa.

1.3. RATIONALE OF THIS STUDY

Previous studies done about the prevalence of chronic respiratory symptoms and associated factors among vegetable market workers vary greatly. For instance, there is a discrepancy of results on the prevalence of overall chronic respiratory symptoms reported in a study of vegetable market workers in Indian city of Nagpur and Rishikesh. Even if there is not clear results in Rishikesh, in the city of Nagpur the study reveals the prevalence of cough (46.6%), phlegm (26.6), wheezing (16.6) and breathlessness (23.3%) (7), (9).

The studies showed different results of microbial count of bacteria and fungi among vegetable markets and the discrepancy also showed in the results of measurement of Reduction of lung function parameters among vegetable market workers in studies done in the two Indian cities. (7), (9), while another research which was released from Poland did not express any relation on lung function reduction. Thus, there is a controversial result among published literatures concerning the respiratory health for vegetable market workers, and a study among large scale vegetable workers in Ethiopia is needed.

Secondly as much as my knowledge concern there is no study about respiratory problems among vegetable market workers in Ethiopia; therefore this study was helped to gain deeper knowledge of respiratory symptoms for the vegetable market employees in Addis Ababa, Ethiopia.

1.4 SIGNIFICANCE OF THE STUDY

With the above notifications at the background, it is relevant to determine chronic respiratory symptoms, and associated factors among vegetable market workers. The main result of these research and recommendations will assist for vegetable market employees and owners to oversee and act in accordance these results.

In addition, it is crucial for Ministry of Labor and Social Affairs office (MOLSA), trade and industrial development bureau in Ethiopia as well as Federal ministry of health, Regional health bureau and Non-Governmental Organizations (NGOs) to formulate a plan to enhance the occupational safety and health practice of vegetable markets for a wellbeing of workers.

Also, used as reference data for additional investigations in this domain of knowledge.

2. LITERATURE REVIEW

2.1, Overview of fruit and vegetable Market Workers

Vegetable markets in developing countries are a major organic dust producing Occupational urban settings (7). In the vegetable market of the present study roads are invariably filled with mud and, most of the time, are water logged. Stray cattle are always seen in these markets. Cow dung is spread on narrow lanes in the market. Heaps of decaying waste vegetables, particularly leafy vegetables are present everywhere. There is a very poor sanitation and a very bad system of waste disposal.

Vegetable markets are also characterized as a human activity enriched site and also a highly trafficked site. People in these areas are actively engaged in various activities, responsible for generation of higher quantity of bio aerosols(9).

Fruit and vegetable markets also called produce market are defined as shops which are common in cities that manage business of buying and selling of fruits and vegetables (10)

2.2. Prevalence of chronic respiratory symptoms among vegetable market workers

Organic dust refers to a complex mixture of organic materials that may include several Substances, such as materials from vegetables, pollen, wools, animal manure, insect faeces, micro-organisms, bacterial and fungal toxins, cell walls, and some antibiotics. Exposure to organic dust can cause inflammatory responses in the mucous membranes of the respiratory system of exposed workers, which may then lead to adverse respiratory outcomes(1).

It has been shown in some studies that aerosolized microorganisms, spore-forming gram-positive bacteria survive in the air for a considerable time and even non-spore forming gram-negative bacteria lasts for few hours are associated with decay of agricultural commodities (7).

Organic dusts may be inhaled during the processing, packing and distribution of agricultural products. Cleaning, cutting, peeling and carrying of fruits and vegetables can produce such bio

aerosols into the breathing zone in the market. Thus, people who work in the market area are likely to be exposed to inhaled pollutants that are harmful to their respiratory health (10).

And also in another comparative prevalence study which was done in a Republic of Iran among vegetable market workers and office workers showed that Occupational facing to bio aerosols can cause workers to high prevalence of chronic respiratory symptoms, which was expressed as cough (24.3% vs. 10.4%), Phlegm (40% vs. 20.8), cough with sputum (22.9% vs. 11.7) Shortness of breath (17.1% vs. 11.7), wheezing (22.9 vs. 3.9) among vegetable market workers compared to office workers respectively(10).

Environmental organisms are usually nonpathogenic. However, daily exposure to organism in high microbial concentration found in samples of market area can be associated with a decline in pulmonary function found in workers of vegetable market (11)

On the other hand High bacterial levels in green grocer markets are responsible for high endotoxin levels which indicate a potential risk of Respiratory disorders among workers. for example a research which was done in India stated that out of 30 fruit and vegetable workers 24(80%) of them showed respiratory symptoms comparing the controls which are only 6(20%) which was statistically significant ($p < (0.05)$) (12).

2.3. Factors affecting chronic respiratory symptoms

2.3.1 Socio-demographic factors and chronic respiratory symptoms

Researches indicate that occupational respiratory symptoms at the work places often associated with socio-demographic factors. For example, a study in Tanzania indicated that street sweepers who had not attended school were more likely to report cough 34 (64.4%) and phlegm 25(51.0%) symptoms, compared to those who attended school. Also, respiratory symptoms including wheezing 20(40.8%), nose irritation 20(40.8%), sneezing 36(73.5%) and breathlessness 19(38.8%) were reported high among workers who did not attend school compared with those who had attended school (13).

The same Study reported that age is also associated with occupational respiratory symptoms example more phlegm 7(63.6%) at age of above 61 years and wheezing 10(50.0%) at the age group of 18 – 35 years. But, more respiratory symptoms including cough 23(65.7%) at the age

group of 51 – 60 years, sneezing 15(35.0%) at 18 – 35 years, nose irritating 17(47.2%) at 36 – 50 years, and breathlessness 4(36.4%) at 61 years and above were reported, but not statistically significant, $p > 0.05$ (13).

Many Studies showed sex is associated with some health problems such as a study from modjo town, Ethiopian indicated that compared to Males, female workers had 1.80 higher odds of developing respiratory symptoms [AOR: 1.80; 95% CI (1.24, 3.34)] (14).

And also in another study conducted in Addis Ababa, Ethiopia showed that female participants had more chance of contracting respiratory symptoms (AOR=2.188 95% CI: 1.143, 4.189) than the males counter parts(15).

A study from Ethiopia showed that there was an increase of occurrence of chronic respiratory symptoms as the age of the workers increasing among flour factory workers (16).

A study conducted also in Ethiopia, East Gojam, indicated that workers education level of grade 8 primary education and below had a possibility to acquire chronic respiratory symptoms than those whose education level was diploma and above (AOR = 4.07, 95 % CI = 1.86-8.92) (17).

2.3.2. Personal factors and respiratory symptoms

Personal protective devices are very important for workers safety not only for green grocers but also other working environment but there is a gap in this issue. For instance a study done at flour factory in Addis Ababa, Ethiopia showed that only 43.6 % were using PPE while they were on duty and 22.5 % of them reported that they were not using it all the time they are on duty(18).

Wearing Personal protective equipment at workplace is weighty to keep safe workers against one or more negative outcome to their health or safety(19). Study in Ethiopia tannery factory workers showed that workers who did not use protective equipment was 2.3 times more likely to develop respiratory conditions than PPE users. This finding is similar to that of a study done in Pakistan(20).

A study which was focused on waste collectors indicated that provision of personal protective measures during collection hours together with modernization of waste collection reuse will eased

the job for the workers and reduced the exposure to dust and the incidence of respiratory complaints ((14), (19)).

An interesting thing was also reported from Germany that agricultural workers and farmers were having a lower prevalence of smoking. This suggests some role of repeated exposure of organic dust or bio aerosol to which these workers were exposed in causing respiratory problems in them(15).

A research release on occurrence of occupational respiratory Symptoms, bronchial asthma and Obstructive lung disease of tannery factory employee during 2010-2011 in Karachi, Pakistan, indicated that some of respondents are addicted to Alcohol (23.7%). It irritates bronchi, resulted to bronchial hyper-responsiveness and sensitizes airways to occupational allergens. It is a main predictor of wheezing and sounding reason to elevate prevalence rate of bronchial asthma.(20)

2.3.3 Outdoor and indoor air pollution and chronic respiratory symptoms

Most of the airborne microbes in outdoor environment originate from natural sources such as soil water, animal and humans, but activities like traffic, people gathering, industrial operations and agricultural process also contribute for the load of microbes. In market areas, poor sanitary measures also contribute to building up and spreading of various microorganisms (3).

A study in Rajasthan India showed that High population density, heavy traffic and unhygienic conditions at the site may be the predominant source of microorganisms(6). The study added that both nonpathogenic and pathogenic form was prevalent in the market area. The study also showed significant correlation between population density and concentration of microorganisms in outdoors and has found significantly higher count of both bacteria and fungi at Traffic Circle (TC) than Public Garden (PG) during weekdays (6).

Although, most of the microorganisms present were mainly noninfectious, inhalation of non-infectious microorganisms and their constituents repeatedly can also cause inflammation of the respiratory system while antigens and allergens may activate the immune system and cause allergic

and immune toxic effects, which are responsible for mucous membrane irritation, extrinsic allergic alveoli with organic dust toxic syndrome, bronchitis, asthma and infection(10).

Researchers in Bangladesh conducted a case-control study with children less than 5 years of age. They evaluated the presence of respiratory symptoms and signs as well as respiratory disease (bronchiolitis, asthma, pneumonia) depending on the use of solid biomass fuels. In homes in which biomass was used as fuel, clear associations were found with shortness of breath (OR: 6.30; IC 95% 1.60–29.1), intercostal muscle retraction (OR: 5.50; CI 95%1.30–29.40), and wheezing (OR: 4 IC 95% 1.10– 16.20) (21).

2.3.4. Work-related factors and chronic respiratory symptoms

2.3.4.1 Duration of employment and chronic respiratory symptoms

A particular time interval of an employment is one of the crucial factors for the occurrence of respiratory symptoms in workers. A research done in Iraq expressed that workers employed in industries more than 20 years reported higher respiratory symptoms than workers employed in industries from 10 to 19 years and less than 10 years and also allergic symptoms increase on starting and during work and better result after refrain from the same work stead, during weekends and on holidays(22).

Employment status was also found to be a significant factor of respiratory symptoms (19). Hence, temporary workers had higher odds of developing respiratory symptoms compared to permanent employees. The possible reason might be differences in benefit packages the industry Provides to permanent and temporary workers (19). Thus, temporary workers have limited access to basic safety training and the use of personal protective devices. Furthermore, such groups of workers are usually forced to do more tasks for fear of losing their jobs or to stay on their jobs for more time(19).

A study on chronic respiratory symptoms in Addis Ababa on street sweepers who had greater than five (> 5) working hours per a day in street sweeping had 1.91 times the risk of developing chronic

respiratory health symptoms than those who worked for less than or equal to (≤ 5) hours per a day (AOR = 1.91, 95 % CI; 1.21 - 3.02), $p = 0.005$ (23).

Another occupational based cross sectional study in Ethiopia showed that employment status was also found to be significantly associated with the respiratory symptoms. The likelihood of having respiratory symptoms were 3.43 times higher among temporarily employees than their counterpart permanent employees [AOR: 3.43; 95% CI (2.63, 7.95)](14).

2.4. Vegetable market places microbial concentrations and respiratory symptoms.

Bio aerosols are airborne particles that are living (bacteria, viruses and fungi) or originated from living organisms. Spore-forming bacteria and fungi are able to survive in bio aerosols and stay viable for a long time in the air but the situation becomes worse when they are able to multiply in these aerosols. It is generally known that bio aerosols present in the air can affect human health, causing mainly respiratory and related diseases transmitted via respiratory route, allergic and toxic reactions (10)

In study in Nagpur India statistically significant lower values of Pulmonary function parameters were observed in cases as compared to controls. Fungal and bacterial concentrations in market air (0.36×10^5 to 2.45×10^5 CFU/m³ and 1.13×10^5 to 1.042×10^6 CFU/m³ resp.) were much more ($p < 0.001$) than control residential air (0.28×10^3 to 0.40×10^3 CFU/m³ and 0.38×10^3 to 1.36×10^3 CFU/m³ resp.)(7).

Compromised respiratory status related with exposure of bio-aerosols in vegetable market has also been documented in a study done in India. A study conducted in India indicated that bacterial and fungal concentration was found to be significantly higher in the air of vegetable market as compared to air in the workplace of controls (such as coagulase-negative staphylococci > 25 colony forming unit (CFU) at incubation temperature vs. 10–12 CFU at incubation temperature, significant growth of *Mucor Aspergillus niger*, and *Candida non albicans* in vegetable market as compared to workplace of controls(9).

Conceptual Framework

As we have expressed in the above reviews, chronic respiratory health symptoms among vegetable market workers including bacterial and fungi exposure were summarized on the conceptual framework showed below (figure 1).

This conceptual framework was progressed through a sequence of stages by considering chronic respiratory health symptoms and bio aerosol of vegetable market will be related to those factors as reviewed from the literature. As we discovered in the conceptual framework chronic respiratory health symptoms can be associated with socio demographic, behavioral, and work environment factors including microbial (bio-aerosol) concentrations of the fruit and vegetable market places.

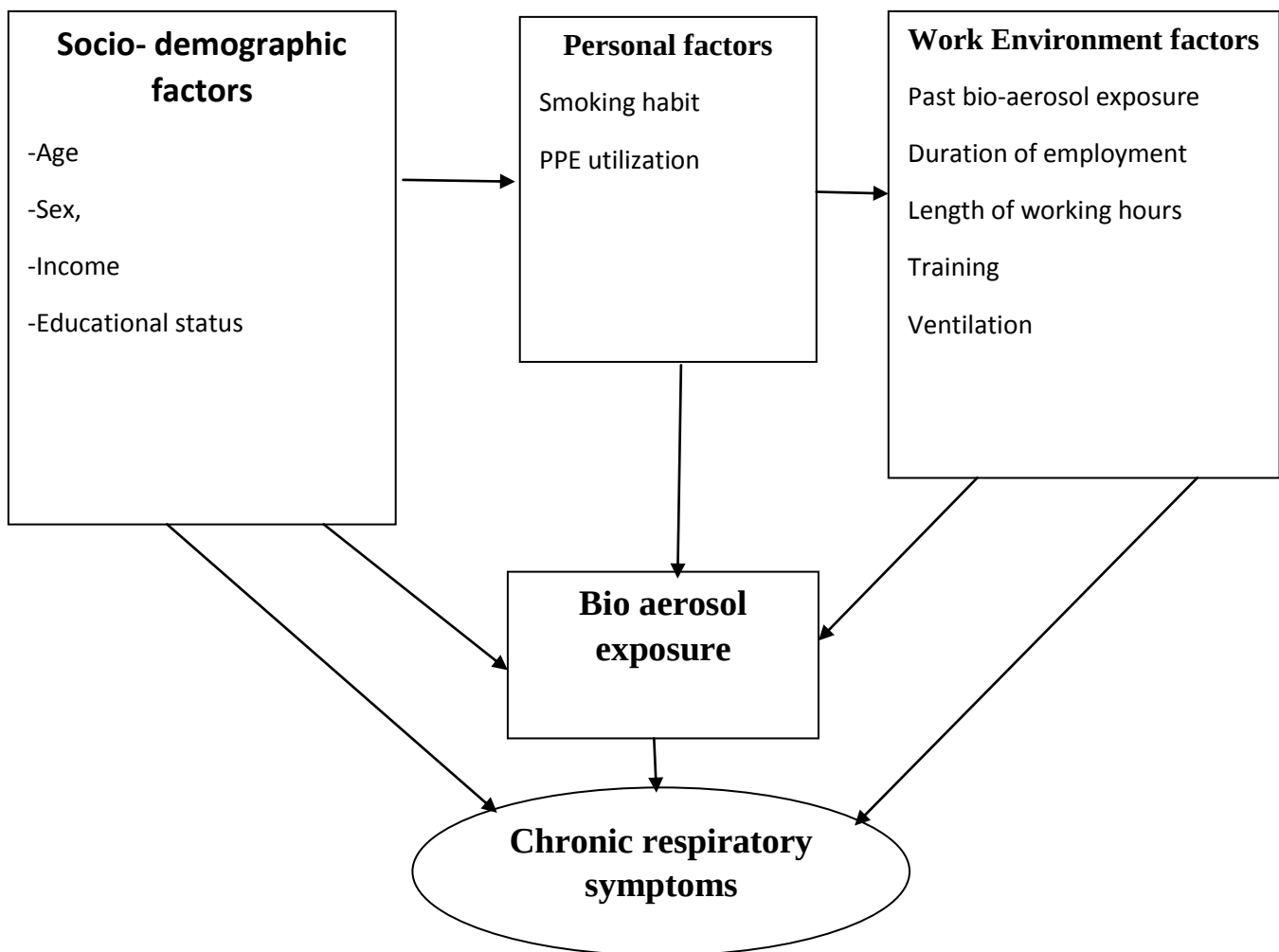


Figure 1. Conceptual frame work of relationship between respiratory health symptoms and associated factors among vegetable market workers

Research questions

- What is prevalence of chronic respiratory symptoms among large scale fruit and vegetable workers compared to controls?
- What are the associated factors for the development of chronic respiratory symptoms?
- What is the microbial count status of large scale fruit and vegetable markets compared with controls?

3. OBJECTIVE

3.1, General Objective:

To determine the prevalence of chronic respiratory symptoms and associated risk factors among workers in fruit and vegetable markets in Addis Ababa, Ethiopia, 2021.

3.2, Specific objectives:

1. To find the magnitude of chronic respiratory problems among vegetable market workers.
2. To list down factors associated with chronic respiratory symptoms among vegetable market workers.
3. To assess microbial culture of air in the vegetable market and in the working place of controls.

4. METHODS

4.1 Study area

The research was conducted in fruit and vegetable markets and governmental offices found in the city of Addis Ababa, Ethiopia. The city has 10 large scale vegetable markets and 119 woredas which are located in all of the 10 sub cities.

4.2 study period

The study was conducted from Sep 2020–Jun 2021.

4.3. Study design

A comparative cross-sectional study was conducted to determine occupational chronic respiratory symptoms and related factors among fruit and vegetable market workers and office workers in Addis Ababa, Ethiopia.

4.4, source population

The source populations was all workers from fruit and vegetable markets and also all workers from offices in Addis Ababa, Ethiopia.

4.5 study population

The selected respondent workers from three fruit and vegetable markets in Addis Ababa, Ethiopia.

4.6. Inclusion criteria

All workers who were direct involvement on the work of the markets, who have a minimum of one year work experience and having >18 years were involved in the study.

4.7. Exclusion criteria

All workers who were not directly involve on the work of the markets, who have less than one year work experience and age <18 age were excluded from the study.

4.8. Sample size determination

Workers who had direct involvement in the vegetable market counted as an exposed group, whereas workers from woreda office was considered as non- exposed groups.

And the sample size was computed for both of objective by using double proportion formula.

1 Sample size for magnitudes of chronic respiratory symptoms)

The sample size for this research was computed using double population proportion formula considering the occurrence of wheezing among the primary vegetable market workers in India which is 16.6% and 3.3% among the controls(7).

A 95% power was used at significance level of 0.05. Non-response will be considered as 10%. The sample size determination will be calculated as follows.

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 * (P1(1-P1) + P2(1-p2))}{(P1-p2)^2}$$

Where as

P1= 16.6% (proportion of respiratory symptoms (Wheezing) among vegetable market workers)

P2= 3.3% (proportion of respiratory symptoms (Wheezing) among non-vegetable workers)

Z α /2= Level of statistical significance 1.96 at confidence level of 95% and

Z β = Desired power of 95% = 1.64

N= 144

N= 158 for each group

Totally 316

2. Sample size for second objective (associated factors)

Comparative cross sectional Study conducted in Ethiopia showed that the prevalence of work-related respiratory disorders among workers who are permanent and temporary workers were 14% and 13% respectively(14).

Based on a study finding sample size calculated using the following double proportion formula.

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 * (P1(1-P1) + P2(1-p2))}{(P1-p2)^2}$$

Where,

n= sample size to be determined

P1= 14 %(proportion of respiratory disorders among workers who are use PPE)

P2= 13 %(proportion of respiratory disorders among no PPE users workers)

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

Z_{β} = Desired power for 95% power = 1.64

P1-P2 = population risk difference proportions

$$n = \frac{(1.96 + 1.64)^2 * (0.14(1-0.14) + 0.13(1-0.13))}{(0.14-0.13)^2} = 105$$

Adding 10% for non-response it become **115** for each subjects

Total sample size of 230

Among the two objectives the first gives maximum sample size that is 316. Therefore; we taken sample size for chronic respiratory symptoms and associated factors was 316. 158 workers was from office workers (non-exposed) and the rest 158 were selected from the vegetable market while Microbial culture of air in the two vegetable markets and the control was also done.

4.9 Sampling Technique and Procedure

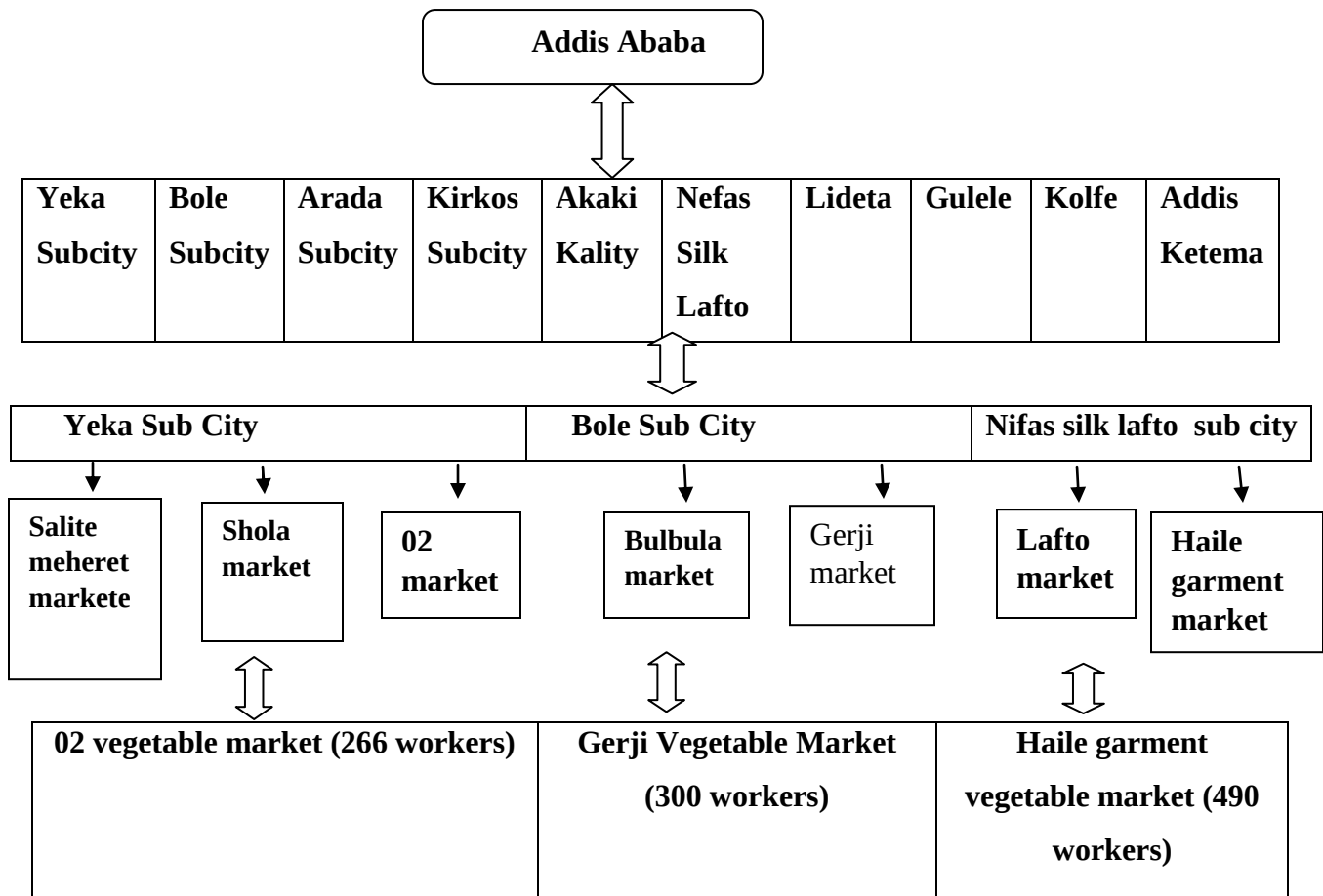


Figure. 2. Schematic presentation of Sampling Technique and Procedure of fruit and vegetable workers.

Simple random sampling technique was applied for each group during data collection.

Also for the non-exposed group out of 10 sub cities in Addis Ababa city administration randomly selected yeka sub city was used and out of 13 woredas in the yeka sub city the selected three (3, 9, 12) woredas was involved using simple random sampling technique and 158 samples was divided for each woredas using proportional allocation system according to the numbers of workers in each of woredas.

And finally out of the selected three vegetable markets and three offices all of the places were used to count the bacterial and fungal concentrations. (Figure 3)

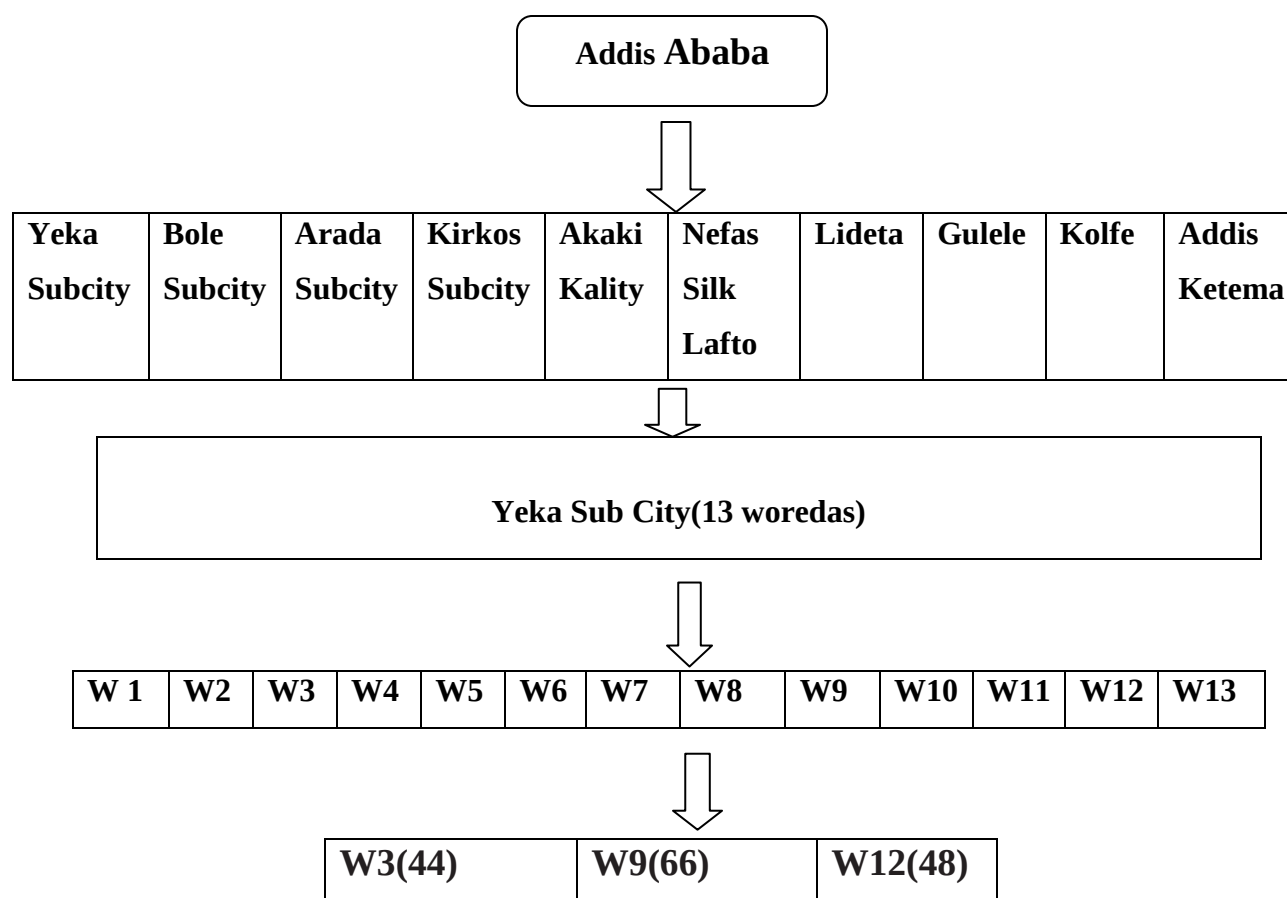


Figure. 3. Schematic presentation of Sampling Technique and Procedure of office workers.

4.10, Data collection tool and procedures

4.10.1 Questionnaire based procedure

The Data was collected using questionnaire adopted from British Medical Research Council (BMRC) (24).

The questionnaire was translated to Amharic, and re translated back to English to keep its coherence with the initial one. And also before the interview: enough awareness was given to the interviewee about the aim of the study.

The content of the questionnaires was:

- ❖ Socio-demographic characteristics (age, sex, educational status and income)

Work history (all activities during and after work shift).

- ❖ Common chronic respiratory symptoms (cough, cough with sputum, shortness of breath, wheeze, and chest pain).
- ❖ Behavioral factors of workers (like smoking habit and usage of PPE)
- ❖ Past medical history (like history of Asthma, Chronic bronchitis, Lung cancer and Tuberculosis).

4.10.2 Observational Checklist

An observational checklist was used to describe the important of personal protective equipment's (PPE) and working environment neatness.

4.10.3 Procedure of microbial load counting (culture)

Culture methods were used to assess the microbial load in the vegetable markets. Two types of culture were used, fungal count and bacterial count.

And the procedure was first we made solutions with 23.5 gm. aerobic plate count agar /1000 ml of DW for bacterial and 40 gm. of yeast and mold agar/1000ml of DW then autoclaved at 120c0 for 15 minutes and also cooled at 55c0 .then we prepared a sterilized petri dishes and pour the medias in to each of sets of petri dishes. And was kept at three different sites of vegetable market about 50–80 m apart at the same level from the ground 5 m away from the shops so as not to be specific to a particular type of vegetable shop. They were exposed to air for 18 min, closed, and incubated at 30°c for 72 hours and started counting the microbes. The same was done in the environment of control group.



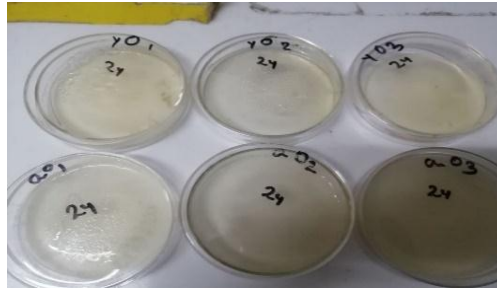


Figure 4. cold box, autoclave. Incubator and petri dishes.

4.11 Data management

After the end data collection, the data was coded, edited and entered in computer using Epi-data software version 7.1 then exported to SPSS version 24. Data was cleaned in SPSS version 24 by analyzing frequencies and percentages to identify missing variable.

In addition, some pre coded variables were recoded and handled by saving in different folders in the computer and flash disk as well email.

4.12 Data quality assurance

To keep data quality, standardized questionnaire and skilled professional (environmental health and microbiologists) were involved in data collection. Laboratory technology equipment's and software, and Prior to the actual data collection the questionnaire was pretested on 5% workers in which was outside the selected fruit and vegetable markets and offices as well. And data collector's and respondent's problem identified and corrected accordingly.

For, microbiology part skilled microbiology professional's was participated from Addis Ababa New Zealand milk products Ethiopia Shear Company laboratory department division and the apparatus calibrated and refrigerates were prepared before starting procedure daily and weekly basis and also cold boxes were used for transporting samples from the laboratory to the places where samples were taken for the sake of safety of the samples.

Once the data collected, then it handled in computer and flash disk and double data entry done to keep the accuracy of the data.

4.13 Data processing

The Collected data was organized and entered in Epi data version 3.1 and cleaning was done to avoid missing values, outliers and other inconsistencies. For data cleaning, frequency, sort and list were used. Cleaned data exported to SPSS version 24 for analysis.

4.14. Data analysis

Descriptive statistics was used to summarize data. Chi-square was applied to detect the difference between fruit and vegetable workers and office workers. Crude odds ratio with 95% CI was computed to understand the relation between exposure variable and chronic respiratory symptoms. Binary logistic regression and independent t-test was used to compare the prevalence of chronic respiratory symptoms of green grocers and office workers.

A bivariate analysis was used to identify whether exposure variables are significantly associated with outcome variables or not. The multivariable analysis was used to identify variables associated with both outcome and exposure and to identify the confounding variables.

Bacterial and fungal concentration in samples of air was also compared in two groups with respect to their types and number of colony forming units.

4.15 .Operational definition

Respiratory symptoms

Referred to as respiratory tract symptoms that participants will respond at least one of respiratory illness symptoms for example cough, cough with sputum, breathlessness and wheezing in the last 12 months prior to study time (25).

Duration of exposure: -explained as the working hours of employees in the institution per day.

Duration of employment: it is the current employee work experience in the institutions. .

Chronic respiratory disease: - a respiratory disease like TB, chronic bronchitis, lung cancer, asthma, and heart disease that could be contracted before and diagnosed by the concerned health professionals in recognized health center.

Chronic respiratory symptoms: - The development of one or more of the chronic symptoms of a cough, cough with sputum, breathlessness, wheezing, chest illness which lasts for at least three months in one year (25).

Chronic Cough:-Experience of a cough for most days of the week (≥ 4 days) for at least three months in one year (25).

Cough with sputum production: - It is defined as productive cough on most days of the week (5 days) for at least three continues months in one year(25).

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.

Chronic wheezing:-a condition of causing a wheezy or whistling sound heard during inhalation or exhalation (at least three months in a year) (25).

Chronic chest pain: -it is referred to as the past one year, chest pain that make the workers absent from their duty.-

Current smokers:-Workers who were smoking at the time of the study or a person who smoke cigarettes every day or some days.

Ever smoker: -a person smoked at least 100 cigarettes in his entire life never smoker: participants who had never smoked(26).

Never smoker: participants who had never smoked.

4.16 Ethical consideration

Ethical permission and approval was gained from Research Ethics Committee at School of Public Health Sciences of Addis Ababa University. Information was communicated with individual study subjects in private and maintained confidentiality and written consent to participate in the study was obtained from all participants. Coding was used to eliminate names and other personal identification of respondents throughout the study process.

4.17 Dissemination of the result

The final result of this thesis will be circulated to all stakeholders and the findings will be released on known scientific journals.

4.18 variables

4.18.1 Dependent variable

- Chronic respiratory symptoms (cough, phlegm, wheezing, breathlessness and chest pain)
- Bio-aerosol concentration.

4.18.2 Independent variables

Duration of exposure

Length of Working hours

Past dust exposure

Age, Sex, income, educational status

Smoking habit

Availability and usage of PPE

Training

Ventilation

5. RESULTS

5.1 Socio-demographic and behavioral characteristics of respondents

Three hundred sixteen workers were chosen from fruit and vegetable market and office to participate in this project, of which 314 workers were participated and 99.4 % of them responded the questions. From 314 study volunteered participants, 221 (70.4%) were males and 93 (29.6%) were females.

The mean age of fruit and vegetable market workers was 36.24 with ± 12.015 standard deviation and for office workers, was 36.36 with ± 9.049 standard deviation and pointing from 18 to 67 years.

Fifty-nine, (37.8%) of respondents from fruit and vegetable market had completed primary level of education and about 132 (83.5%) of office work participants had attained diploma and above level of education. Ninety four, (59.4%) of participants from fruit and vegetable market had monthly income of 2000 to 4000 and 121 (76.6%) of office worker participants were got ≥ 4000 monthly income.

Smoking is not common among vegetable market workers and office workers in these study. About 25(16%) of vegetable market participants, and 27 (17.1%) of office work participants were ever cigarette Smokers and 15 (9.6%) of market worker participants and 14 (7.5%) of office worker participants were currently smoking cigarettes. But there were a significant difference between market workers and office work participants in terms of use of Respiratory protective devices. (Table 1).

I have found a great difference between market workers and office work participants in terms age, educational status and smoking habit (current) and monthly income ($p \leq 0.05$). However, in terms mean age, sex as well as smoking habit (ever) there were no significant differences between fruit and vegetable market workers and office work participants, $p > 0.05$ (Table 1).

Table 1: Socio-demographic and behavioral characteristics of fruit and vegetable market and office workers, Addis Ababa city, Ethiopia, 2020.

Variables	Fruit and vegetable workers (n=156)	Office workers(n=158)	P-value
	N (%)	N (%)	
Sex of respondents			
Male	111(71.2%)	111(69.6%)	0.861^a
Female	45(28.8%)	47(30.4%)	
Age (in years)			
<=29	63(40.5%)	46(29.2%)	0.025^a
30-39	36(23.7%)	57(35.4%)	
>=40	57(35.8%)	55(35.4%)	
Mean ± SD	36.24 ± 12.015	36.36 ± 9.04	0.922^b
Educational status			
primary education 1-8	60(38.5%)	14(8.9%)	0.000^a
Illiterate	17(10.9%)	0(0.0%)	
secondary education 9-12	42(26.9%)	12(7.6%)	
certificate and above	37(23.7%)	132(83.5%)	
Monthly income			
<=2000	7 (4.5%)	7(4.4%)	0.000^a
2000-4000	92(60.3%)	32(19.0%)	
>4000	57(35.3%)	119(76.6%)	
Uses of RPE			
Yes	14(8.9%)	50(31.6%)	0.001^a
No	142(91.1%)	108(68.3%)	
Ever smokers			
Yes	20(12.8%)	24(15.2%)	0.545^a
No	136(87.2%)	134(84.8%)	
Current smokers			
Yes	15(9.6%)	5(3.2%)	0.019^a
no	141(90.4%)	153 (96.8%)	

Note: a χ^2 test, b independent sample t-test, $p \leq 0.05$, SD: Standard Deviation

5.2 Work related factors among vegetable market workers and office workers

From 314 study participants, 47 (30.1%) of fruit and vegetable market workers and 11(7.0%) of office workers were experienced to dusty working environments before they started this job.

Out, of the fruit and vegetable market workers about 95(60.9%) and 30(19.2%) had a work experience in the market for one up to six years and more than ten years respectively. Five (3.2%) of office workers and 62(39.7%) of market workers were working greater than 8 hours per a day.

Related to working department 48(30.8%) of fruit and vegetable workers were engaged in loading and unloading department.

Majority of fruit and vegetable workers, 111 (71.2 %) and office workers 115(72.8%) used electricity for energy sources at home. Thirty eight (24.4%) of fruit and vegetable workers, and 16(10.1%) of office workers were reported the presence of chronic respiratory disease confirmed by physicians before they have started these job.

There were a significant difference between fruit and vegetable workers and office work participants in terms working department's length of working hours and past dust exposure, $p \leq 0.05$.

No significant difference was found between fruit and vegetable and office work participants in terms of confirmed respiratory diseases,, energy used at home ($p > 0.05$).(table 2)

Table 2: Work related factors and past respiratory illnesses of workers, Addis Ababa city, Ethiopia 2020.

Variables	Fruit and vegetable workers (n=156)	Office workers(n=158)	P-value
	n (%)	n (%)	
Working departments			
Loading and unloading	64(39.8%)	NA	0.001^a
Cleaning	18(11.9%)	NA	
Packaging/sales	76(48.3%)	NA	
Office work	NA	158(100%)	
Working hours per day			
>= 8 hours	106(67.9%)	151(95.6%)	0.002^a
<8 hours	62(39.7%)	7(4.4%)	
Work experience			
1-5 years	89(57.1%)	56(35.4%)	0.001^a
6-9 years	30(19.2%)	55(34.8%)	
≥ 10 years	37(23.7%)	47(29.7%)	
Past dust exposure			
Yes	47(30.1%)	11(7.0%)	0.001^a
No	109(69.9%)	147(93.0%)	
Energy used at home			
Charcoal	32(20.5%)	2(2.2%)	0.003^a
Electricity	124(79.5%)	89(97.8%)	
Previous respiratory illness			
Yes	37(23.7%)	17(10.8%)	0.002^a
No	119(76.3%)	141(89.2%)	

Note: a: χ^2 test, $p \leq 0.05$, NA; Not Applicable.

5.3. Prevalence of chronic respiratory symptoms.

The overall prevalence of chronic respiratory symptoms among fruit and vegetable workers was 73(46.7%) while it was 37(23.4%) among controls (Table 3).The prevalence ratio of all of the chronic respiratory symptoms was significantly higher for the fruit and vegetable workers

compared to controls after adjusting for education, previous and family history of disease, RPD use, year worked in other dusty work places, safety training and work place supervision (Table 3).

The likelihood of a fruit and vegetable market worker developing at least one respiratory symptom was 2.73 times statistically significantly higher than that of office workers worker.

Table 3: Prevalence of respiratory symptoms in fruit and vegetable and office workers, Addis Ababa city, 2020.

Variables	fruit and vegetable market worker (N =156)	office workers (N =158)	Prevalence ratio (95%CI)	p-value
	n (%)	n (%)		
Cough				
Yes	56(35.3%)	17(10.8%)	4.61(2.47-8.23)	0.000
no	100(64.7%)	141(89.2%)	1	
Cough with sputum				
Yes	25(16.0%)	13(8.2%)	2.12(1.04-4.33)	0.034
no	131(84%)	155(91.8%)	1	
Wheezing				
Yes	22(14.1%)	11(7.0%)	2.19(1.025-4.69)	0.039
no	134(85.9%)	147(93%)	1	
Breathlessness				
Yes	32(20.5%)	13(8.2%)	2.87(1.44 -5.72)	0.002
no	124(79.5%)	145(91.8%)	1	
Chest pain				
Yes	23(14.7%)	12(7.6%)	2.104(1.00- 4.394)	0.044
no	133(85.3%)	146(92.4%)	1	
At least one chronic respiratory symptoms				

Yes	73(46.7%)	37(23.4%)	2.87(1.772-4.66)	0.000
no	83(53.3%)	121(76.6)	1	

Note: CI, confidence interval, “n”: Number of study participants.”1”; constant (Office workers)

5.4. Respiratory protective devices

Respiratory protective devices were given for fourteen 14(8.9%) of fruit and vegetable workers and business owners as well. However, 50(31.6 %) of office work participants used respiratory masks. The main reasons mentioned by the respondents for none use of PPE were not provided 134(85.9%) for fruit and vegetable workers and 79(50%) of office worker participants and 28(17.7%) of office workers believed that no harmful dust particles in the office. (Figure 4).

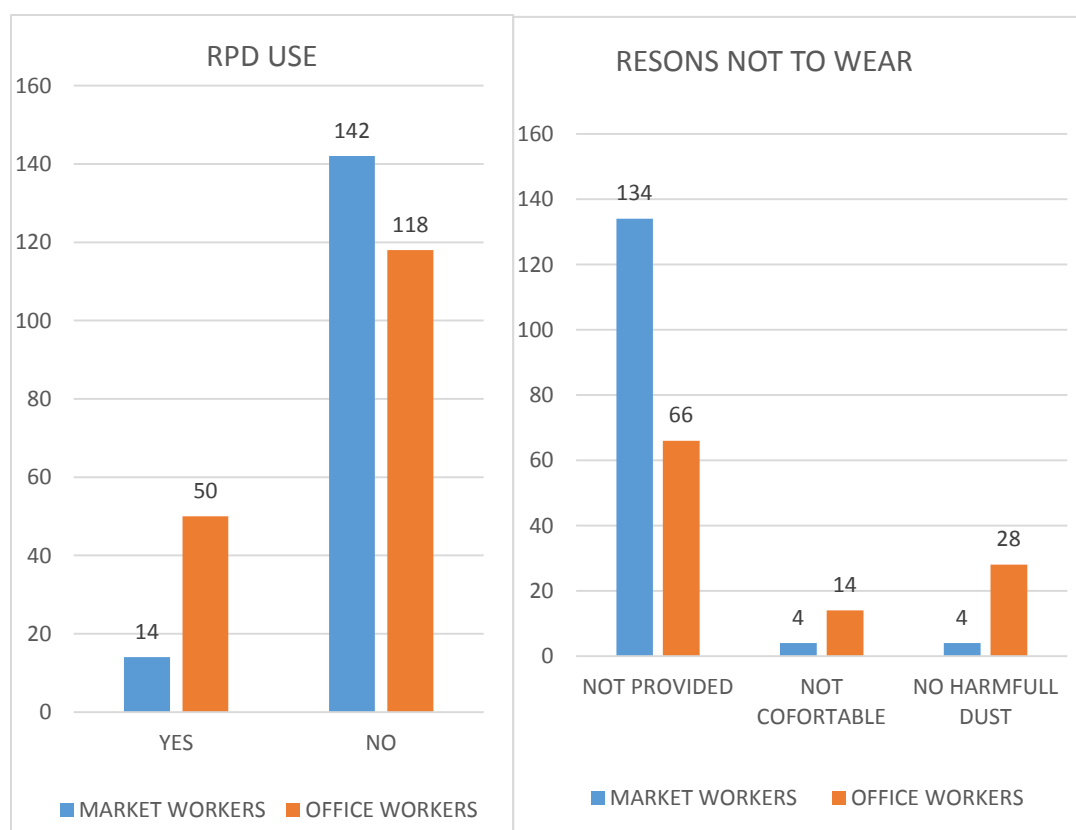


Figure 5: respiratory protective device availability and the reason not used by the workers, Addis Ababa Ethiopia, 2021.

5.5 Work place observation

Observational findings of the study showed that fruit and vegetable wastes as well as dusts were accumulated on the walls of different working sections of the market shops, presence of stray animals in the area, decomposition and decay of agricultural products and due to lack of appropriate waste disposal materials, artificial and natural ventilation.

Regarding personal protective equipment usage fruit and vegetable market managers did not provide sufficient respiratory protective device for the workers.





Figure 6. Picture of waste disposal problems and Loading and unloading department workers in fruit and vegetable workers Pictured by (Yidnekachew Ale.)

5.6 Factors associated with chronic respiratory symptoms

5.6.1 Socio demographic factors

Socio demographic factors were assessed using binary logistic regression. Accordingly, sex, age, religion, education and income were associated with respiratory symptoms at bivariate level (Table 4). Chronic respiratory symptom was significantly associated with sex. Male respondents were 2.26 times (COR=2.26, 95% CI: 1.29-3.94) higher odds of developing chronic respiratory symptoms compared to female respondents. In addition, workers who had primary and below levels of education had 2.003 times (COR=6.69, 95% CI: 3.919-11.44) 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 4).

Table 4: Crude odds ratio of socio demographic factors associated with chronic respiratory symptoms among market workers and controls in Addis Ababa, Ethiopia, 2020.

Variables	At least one chronic respiratory symptoms		COR(95%CI)	p-value
	Yes	No		

Sex				
Male	89(80.9%)	133(65.2%)	2.26(1.298-3.94)*	(0.004)
Female	21(19.1%)	71(34.8%)	1	
Age (in years)				
≤ 29	32(29.1%)	77(37.7%)	1	
30-39	23(20.9%)	70(34.3%)	0.80(0.481.43)	(0.003)
≥ 40	55(50.0%)	57(27.9%)	2.32(1.33-4.04)	(0.001)
Educational status				
Primary school and below	60(54.5%)	31(15.2%)	6.69(3.919-11.44)	(0.001)
Secondary school and above	50(45.5%)	173(84.8%)	1	
Marital status				
Married	70(63.6%)	113(55.4%)	1.41(0.87-2.27)	0.158
Single and others	40(36.4%)	91(44.6%)	1	
Monthly income				
≤2000	7(6.4%)	7(3.4%)	1.72(1.07-2.74)	0.33
2000-4000	39(31.5%)	85(41.7%)	0.83(0.48-1.43)	0.37
>4000	64(58.2%)	112(54.9%)	1	

Note: 1.00 reference value

5.5.2. 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 bivariate analysis ($p < 0.05$). Workers who engaged in loading and unloading department were 9.9 times ($COR = 9.90$, 95% CI: 3.47-14.5) higher to develop chronic respiratory symptoms compared with workers who engaged office work and packaging/sales department (Table 5). Working hour per week and previous dust exposure and service years ≥ 10 was also another variable that showed significant association with development of chronic respiratory symptoms at bivariate level (Table 5). But, and energy used at home were not associated with chronic respiratory symptoms (Table 5).

Table 5: Crude odds ratio of work related factors associated with chronic respiratory symptoms among fruit and vegetable market workers and controls in Addis Ababa, Ethiopia, Dec. 2020.

Variables	At least one chronic respiratory symptoms		COR(95%CI)	p-value
	yes	No		
Service year				
1-5	24(21.8%)	121(59%)	1	
6-9	38(34.5%)	47(23.0%)	4.01(2.05-8.01)	0.107
≥ 10	48(43.6%)	36(17.6%)	6.72(3.63-12.43)	0.000
Working hours per day				
<8 hours	46(41.8%)	11(5.4%)	1	0.000
≥8 hours	64(58.2%)	193(94.6%)	12.61(6.16-25.80)	
Working departments				
Loading and unloading	38(31.7%)	13(6.7%)	9.9 (3.47-14.5)	0.000
Cleaning	15(12.5%)	5(2.6%)	10.01(3.67-14.70)	0.000
Packaging /sales	21(17.5%)	64(33.0%)	1.1 (0.29-3.20)	0.966
Office work	36(38.3%)	122(57.7%)	1	
Previous dust exposure				
Yes	68(61.9%)	78(38.3%)	2.61(1.75-3.79)	0.000
No	42 (39.1%)	126(61.7%)	1	
Safety training				
Yes	6(5.5%)	68(33.3%)	1	
No	104(94.5%)	136(66.7%)	8.66(3.62-20.75)	0.000
Work place Supervision				
Yes	5(4.5 %)	61(29.9%)	1	
No	105(95.5%)	143(70.1%)	8.95(3.479-23.06)	0.000

Energy used at home				
Charcoal and others	30(17.5%)	71(34.8%)	0.70(0.2851.22)	0.155
Electricity	80(82.5%)	133(65.2%)	1	
Uses of RPE				
Yes	4(3.6%)	60(29.4%)	1	
No	106(96.4%)	144(70.6%)	11.04(3.89-31.32)	0.000

Note: 1.00 reference value.

5.7 Multivariable Analysis

To find independent predictor variables for contracting of chronic respiratory symptoms, variables that have valuable relation at bivariate level, p -value <0.05 were added at multivariable logistic regression model.

At same time , the bivariable and multivariable analysis results compiled in (Table 5) stated that sex, age and educational status of respondents were significantly associated with chronic respiratory symptoms ($p \leq 0.05$)., However, marital status of the respondents was insignificant in univariate analysis ($p \geq 0.05$).

And also from socio-demographic factors educational status (primary education and less) of workers, age and sex were significant in multivariable analysis. Workers whose education level was primary (Grade 1-8) and below were more likely to develop chronic respiratory symptoms than workers whose education level was secondary (Grade 9-12) and above (AOR= 1.34, 95 % CI = 0.78-2.32). And also male respondents had 2.11 times (AOR=2.11, 95% CI: 1.12-3.98) higher odds of developing chronic respiratory symptoms than female respondents.

Working department, and working hours per a day were significant in both univariate ($p \leq 0.05$) and multivariable ($p \leq 0.001$) analysis. However, smoking habit (ever and current smokers) and energy used at home (electricity and charcoal) was not significant in both univariate and multivariable analysis. However, past dust exposure were associated with chronic respiratory symptoms in univariate analysis ($p \leq 0.05$) (Table 5).

Working departments were significantly associated with chronic respiratory symptoms among fruit and vegetable market workers in multivariate analysis. Workers who were engaged loading and unloading (AOR = 3.20, 95% CI = 0.90-11.40) were more likely to develop chronic respiratory symptoms than workers engaged in cleaning and packaging/sales sections.

Service years in the market was significantly associated with chronic respiratory symptoms. Workers who had work experience 6-9 years (AOR= 1.73 , 95 % CI = 0.71-4.19) and ≥ 10 years (AOR= 7.16 , 95 % CI = 2.52-20.30) had the odds of developing chronic respiratory symptoms 1.73 and 7.16 times more than workers who had work experiences between 1-5 years respectively.

Length of working hours per a day was also significantly associated with chronic respiratory symptoms in the univariate analysis ($p \leq 0.001$). Workers who stay greater than 8 hours per a day (AOR= 3.91, 95% CI, 1.586-9.65) were more likely to develop chronic respiratory symptoms than those who had 8 hours or less (Table 5).

Table 6: Multivariable models of factors associated with chronic respiratory symptoms among fruit and vegetable market workers and controls in Addis Ababa, Ethiopia, May, 2020.

Variables	At least one chronic respiratory symptoms		COR(95%CI)	AOR(95% CI)
	yes	no		
Sex				
Male	89	133(65.2%)	2.26(1.29-3.94)	2.11(1.12-3.98) *
Female	(80.9%) 21(19.1%)	71(34.8%)	1	1
Age (in years)				
≤ 29	32(29.1%)	77(37.7%)	1	1
30-39	23(20.9%)	70(34.3%)	0.80(0.48-1.43)	1.92(0.87-4.24)
≥ 40	55(50.0%)	57(27.9%)	2.32(1.33-4.04)	2.25(1.05-4.85)
Educational status				
Primary school and below	60(54.5%)	31(15.2%)	6.69(3.919-11.44)	1.34(0.78-2.32) **
Secondary school and above	50(45.5%)	173(84.8%)	1	1
Monthly income				
≤ 2000	7(6.4%)	7(3.4%)	1.72(1.07-2.74)	3.01(1.34-6.76) *
2000-4000	39(31.5%)	85(41.7%)	0.83(0.48-1.43)	1.39(0.35-5.48)
>4000	64(58.2%)	112(54.9%)	1	

Service year				
1-5	24(21.8%)	121(59%)	1	1
6-9	38(34.5%)	47(23.0%)	1.64(0.898-3.02)	1.73(0.71-4.19)
≥ 10	48(43.6%)	36(17.6%)	6.72(3.63-12.43)	7.16(2.52-20.30)**
Working hours per day				
<8 hours	46(41.8%)	11(5.4%)	12.61(6.16-25.80)	3.91(1.586-9.65)**
≥8 hours	64(58.2%)	193(94.6%)	1	1
Working departments				
Loading and unloading	38(31.7%)	13(6.7%)	9.9 (3.47-14.5)	3.20(0.90-11.40)**
Cleaning	15(12.5%)	5(2.6%)	10.01(3.67-14.70)	1.41(0.28-7.14)
Packaging /sales	21(17.5%)	64(33.0%)	1.1 (0.29-3.20)	1.05(0.098-11.3)
Office work	36(38.3%)	122(57.7%)	1	1
Previous dust exposure				
Yes	68(61.9%)	78(38.3%)	2.61(1.75-3.79)	0.05(0.02-0.18)
No	42(39.1%)	126(61.7%)	1	1
Safety training				
Yes	6(5.5%)	68(33.3%)	1	1
No	104(94.5%)	136(66.7%)	8.66(3.62-20.75)	2.118(0.32-13.66)
Uses of RPE				
Yes	4(3.6%)	60(29.4%)	1	1
No	106(96.4%)	144(70.6%)	11.04(3.89-31.32)	2.09(0.44-9.75)

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

5.8. Microbial load

The results of air culture in terms of growth of bacteria and fungi found in various culture media at their incubation temperature are shown in Table 7. On doing the microbial sampling of air, bacterial and fungal concentration was found to be significantly higher in the air of vegetable market as compared to air in the workplace of controls.

Table 7: Results of air culture in terms of growth of Bacteria and fungi

	Parameters					
	Aerobic plate count				Yeast and mold	
	Vegetable market			Work place (control)	Vegetable market area	Work place (control)
	Market 1	Market 2	Market 3			
Site 1	230 CFU	400 CFU	240CFU	10 CFU	Too numerous to count	nil
Site 2	180 CFU	270CFU	210CFU	NIL	Too numerous to count	nil
Site 3	290 CFU	330 CFU	325CFU	10 CFU	Too numerous to count	nil
control	nil	nil	nil	nil	nil	nil
Average	234 CFU	334CFU	258CFU	7 CFU	Too numerous to count	nil
Overall average	276 CFU			7 CFU	Too numerous to count	nil

“CFU” = colony forming unit, “TNTC” = Too numerous to count,

6. DISCUSSION

In this study, we compared the prevalence of current respiratory symptoms between fruit and vegetable market workers and a reference group of office workers. We found that fruit and vegetable market workers had increased prevalence of chronic respiratory symptoms, cough (35.3%) vs. (10.8%) phlegm (16.0%) vs. (8.2%) wheezing (14.1%) vs. (7.0%) breathlessness (20.5%) vs. (8.2%) chest pain (14.7%) vs. (7.6%) in fruit and vegetable market participants than the reference group respectively. The current results were to some degree in agreement with researches done in India and Republic of Iran which are reported a higher existence of chronic respiratory symptoms like cough, cough with sputum, wheeze and breathlessness among fruit and vegetable workers compared to controls (9) (10).

Various factors such as collection of agricultural items from diverse sources, spraying of fruits and vegetables with water leading to suspension of microorganisms in the air, decomposition and decay of agricultural products, and poor sanitation and improper waste disposal may be responsible for generation of organic dust and thus compromised respiratory status of fruit and vegetable workers exposed to them.

Personal protective equipment utilization practice of the fruit and vegetable workers suggested a lower frequency. However, some of workers harmonized in opinion on the relevance of PPE wearing for to keep themselves from bio-aerosols, but the market owners do not provide PPE for workers and which is in similarity with the result of comparative cross sectional research released from India (27).

Even if there is a limited studies on chronic respiratory symptoms among vegetable market workers, we can see discrepancies in the case of the overall prevalence chronic respiratory symptoms between this study and the study which are released from India and Iran ((7), (10)). It may be their difference of using of PPE, the ventilation system they used and how to collect wastes they generate.

When we added in multivariable analysis model we have realized that sex was independently associated with development of chronic respiratory symptoms from socio demographic factors. So that we found Male respondents had 2.11 times (AOR=2.11, 95% CI: (1.12-3.98) higher chance of contracting chronic respiratory symptoms than female respondents. But the current finding is not

in line with the paper which was released from Thailand, which stated that female respondents had more chance of getting a problem of chronic respiratory symptoms(28).

But similar finding is found to be consistent with the thesis paper done in Ethiopia Dejn town(17).

In the current study, lesser academic status was significantly associated with chronic respiratory symptoms than those who were having higher education status. In these study for example, those who are attending primary education of has 7.43 (4.1-13.47) times more likely to develop the respiratory symptoms than those who are attended certificate and above. This result was concordant with thesis conducted in Ethiopia (17). This might be as a result of a higher education gives an awareness about how to safe guard themselves from health effects associated with their work.

In addition, workers who were engaged loading and unloading were 2.74 times AOR=2.74, 95% CI; (1.76-4.25) higher to develop chronic respiratory symptoms compared with those packaging/sales departments. This result is in agreement with studies conducted in comparative cross sectional studies in Ethiopia (12), (15)). However, this is inconsistent with study taken place in Dejen town(12). This might be as result of how frequent they using RPD, safety trainings and work place supervision differences.

Regarding the work experience issues employees who had experience of 6-9 years and ≥ 10 years were significantly associated with chronic respiratory symptoms. This result was consistent with the judgment that made from researches released from Iraq and Egypt ((29), (22)). This might be because of the increased amount of dust retention in respiratory system associated with extend exposure at work places.

On doing the microbial sampling of air, bacterial and fungal concentration was found to be significantly higher in the air of vegetable market (276 CFU/ m³) as compared to air in the workplace of controls (7 CFU m³). The finding was partly lined with the study in India that Fungal and bacterial concentrations in market air (0.36 x 10⁵ to 2.45 x 10⁵ CFU/m³ and 1.13 x 10⁵ to 1.042 x 10⁶ CFU/m³ respectively.),were much more (p<0.001) than control residential air (0.28 x 10³ to 0.40 x 10³ 1.042 x 10⁶ CFU/m³ respectively). And also the current study (276 CFU/ m³ vs7 CFU m³) partly consistent with the other study in India that is coagulase- negative

staphylococci >25 colony- forming unit (CFU) at incubation temperature of vegetable market vs. 10–12 CFU of the control at incubation temperature (7, 9).

The reason that bacterial and fungal concentration was found to be significantly higher in the air of vegetable market as compared to air in the workplace of controls ,is may be due to the decay of agricultural Commodities(11). In addition spraying of fruits and vegetables with water leading to suspension of microorganisms in the air, presence of stray animals in the area, decomposition and decay of agricultural products, and poor sanitation and improper waste disposal may be responsible for generation of organic dust and thus caused respiratory symptoms among participants exposed to them.

7. STRENGTH AND LIMITATION OF THE STUDY

7.1 Strength of the study

- ❖ As far as my knowledge concerned, it is the first investigation in Ethiopia to determine both the prevalence of chronic respiratory symptoms and related factors belonging to large scale fruit and vegetable market workers.
- ❖ The study was Comparative study design
- ❖ Indoor microbial concentration counting was done

7.2. Limitations of the study

- ✚ Lack Respondent's action or fact of calling back the information that the interviewer need might have affect the generalized finding for reported age, past dust exposure and past respiratory disease.
- ✚ Since the study was cross sectional, it is difficult to investigate temporal relation between outcomes and associated factors.

8. CONCLUSIONS

Having a basis on the result of this research, it can come a conclusion that, the respiratory symptoms were shown a rise among vegetable workers than office workers. So we can say that exposure of bio-aerosols in a working place of vegetable market is associated with chronic respiratory symptoms. So there is a requirement of formulation of safety guidelines in the area.

Education level, duration of exposure (service years), work departments and length of working hours are the associated factors for existence of chronic respiratory symptoms. Majority of participant employees in fruit and vegetable workers were did not have respiratory protective device.

In general, the results of this study concluded that working in fruit and vegetable market without proper respiratory protective device has an adverse effect on respiratory health of the workers.

9. RECOMMENDATION

Based on the final result of the material the following recommendations coming next.

For Ministry of Labor and Social Affairs (MOLSA)

The Ministry of labor and social affair jointly with Ministry of health and Ministry of industry should have scheduled and continuous work place supervision and awareness creations to guarantee the health and wellbeing of workers in large scale fruit and vegetable market.

For the market owners.

The fruit and vegetable market shop owners should provide all the necessary respiratory protective devices like masks for the workers.

The fruit and vegetable market owners should implement urgent measures to reduce environmental Bio aerosol exposure in the market like concrete walls and roads, frequent waste collection in modern bins and mechanized disposal of vegetable waste in the long run.

For the workers

The fruit and vegetable market workers should habituate respiratory protective device particularly face masks if provided by the owners while on work to minimize the harmful health effects of the bio aerosols (organic dusts).

For researchers

It is advisable to conduct further research with more suitable study design like prospective cohort study and larger sample size to characterize the association between bio aerosol exposure and chronic respiratory symptoms among large scale fruit and vegetable markets.

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ANNEXES

ANNEX I. PARTICIPANT'S INFORMATION SHEET

My name is _____. I am working as a data collector for the study conducted in this vegetable and fruit market by Yidnekachew Alemu who is studying for his 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 prevalence of respiratory symptoms and their associated factors among fruit vegetable market (green grocer) workers, Addis Ababa Ethiopia, 2020.

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 results will be used as evidence and input to reduce the potential health risk of exposure to fruit and vegetable markets in Addis Ababa compare with office work.

Procedure and duration: I will be assessing chronic respiratory symptoms by using Questionnaires, that needs your full cooperation and this may take about 20 to 30 minutes, and the procedures will take place in your working environment.

Risks and benefits: Risk of participating in this study is nil since the study does not need collecting any samples. There would have no any direct benefits for being study participant but indirectly the findings from this research will important for improving occupational health safety practice, information for the market and for scientific knowledge.

Confidentiality: All information forwarded 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: This research project will be reviewed and approved by the ethical committee of the Addis Ababa University. For any inconvenience, problem and more information you can contact the committee through the address below.

Yidnekachew Alemu,

Mobile: +251-911567522,

Email: yidnekachew2017@gmail.com.

Addis Ababa University, School of Public Health.

ANNEX II. INFORMED CONSENT

Detail information about the study explained to me. I have understood that the objective of this Study is to assess chronic respiratory symptoms, and associated factors in Workers of fruit and vegetable (green grocers).

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.

In addition, 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 III, ENGLISH VERSION QUESTIONNAIRE

Addis Ababa University Health Science Collage, School of Public Health

A questionnaire designed to Assess Chronic Respiratory Symptoms and associated risk factors among (green grocers) fruit vegetable market place workers in Addis Ababa, Ethiopia 2020.

1. Data collection date: _____

2. Status of workers market workers = 1 office workers = 2

3. ID number of subjects' _____

Part 1- Socio-demographic data

S. No	Question	Possible Response	Remark
4	Sex (observe)	1. Male 2.Female	
5	What is your age in completed years?	_____ (Years)	
6	What is your marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
7	What is your religion?	1. Orthodox 2. Muslim 3.Protestant 4. Catholic 5. Others (Specify)_____	
8	What was the highest level of Education you attend?	1. Illiterate 2. Can read and write 3.Education Grade_____	
9	How much is your average monthly Income in Ethiopia birr?	_____(Complete in Ethiopia birr)	

Part 2-Availability and Utilization of Personal Protective Equipment (PPE)

S. No	Questions	Possible Responses	
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10	Do you usually wear respiratory protective Devices while at work?	1. Yes 2. No	
11	If yes Which of the following type of protective devices did you use? (choose all that you apply in your working area)	1 Mask respiratory 2. Full face pieces respiratory 3. Breathing apparatus 4. others_____	
12	If Q 9 answer is "No "Select the most appropriate reasons for not using	1. Not available 2. Not comfortable for work 3. Not provided by the market shop owner 4. The organic dust is not Harmful 5 Others Specify -----	
13	Do you ever have occupational health and safety training?	1. Yes 2. No	
14	Do you ever been supervised at work place on occupational safety issues?	1. Yes 2. No	

Part-3 Behavioral Status

Ever smoker: - a person smoked at least 100 cigarettes in his entire life.

Currently smoker: - a person who smoke cigarettes every day or some days.

s.no	Questions	Possible answers	
15	Have you ever-smoke cigarette?	1. Yes 2, no	
16	Do you smoke Cigarette Currently?	1. Yes 2, no	
17	How many cigarettes do you normally smoke per day now?	_____ (No of cigarettes)	

18	For how many times smoke per week?	_____ (Times/day)	
19	For how long have you been smoking?	_____ (In years)	

4, Occupational history			
20	For how long have you been working in this work?	_____ (Years & months)	
21	For how many working hours per day you have been working in this work	_____ (Hours/day)	
22	For how many working days 'per a week you have been working in this work?	_____ (Day/week)	
23	Which section are you working now?	Department	How long
		Cleaning	
		Packaging	
		Loading	
		Office work	
24	Have you ever worked in other dusty types of work?	1. Yes 2, No	
25	If Q 27 answer is "Yes", for how long have you worked in any of the following types of work? (In years/months).	Work	Service year
		Chip wood Factory	
		Textile factory	
		Tannery work factory	
		Coffee processing	
		Others -----	
26	If Q 27 answer is "Yes" indicate which	Department	How long

	Section and for how long? (in years & months) (Multiple answer is possible)	Cleaning		
		Machine Operating		
		Packaging		
		Loading		
27	Are you normally cooking food at home?	1, Yes	2, No	
28	If Q 29 is "Yes" where is cooking Normally taking places in your home?	1. Inside house 2. Outside house in open area 3. In a kitchen		
29	What type of energy do you use in your home for cooking?	1. Charcoal 2. Fire wood 3. Kerosene 4. electricity		

Part 5 - Respiratory symptoms Cough

I am going to ask you some questions mainly about your chest. I would like you to answer Yes or No wherever possible

A cough: - is experience of a cough for 4 days or more per a week for at least three consecutive months in one year.

30	Do you usually cough in the morning?	1.yes 2.No	
31	Do you usually cough during the day or at night?	1.yes 2.No	
32	Do you usually cough for 4 days or more per a week?	1.yes 2.No	
33	Do you usually cough for 3 consecutive months or more during the year?	1.yes 2.No	
34	For how long have you had this cough?	_____ Year/month	

A Cough with sputum production related questions

A Cough with sputum :- is sputum expectoration on most days of the week (5 days) for at least three 3 consecutive months in one year

35	Do you usually cough with sputum first	1.yes 2.No	
----	--	------------	--

	thing in the morning?		
36	Do you usually cough with sputum during the day or at night?	1.yes 2.No	If “No” to the above questions skip this
37	Do you usually cough with sputum for 4 or more days in a week?	1.yes 2.No	If “No” to the above questions skip this
38	Do you cough with sputum on most of days for as much as 3 consecutive months or more in a year?	1. Yes 2. No	If “No” to the above questions skip this

s.no	Breathlessness related questions Breathlessness :- is a discomfort or difficult to breathe in different activities		
39	Are you troubled with shortness of breath When hurrying or walking uphill?	1. Yes 2. No	If “No” go to Q 42
40	If Yes Q 39 Have, you had trouble of Breathlessness while walking with a Person of the same age.	1. Yes 2. No	
41	For how long have you been this short of breath?	_____(In years)	

Wheezing Related Questions

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

42	Do you have wheeze/whistling/ sound in your chest?	1. Yes 2.No	If “No” go to 45
43	When you have wheeze/whistling/ sound in your chest?	1. 1. In the daytime 2. 2. In the morning 3. 3. At night	

44	For how long has this wheezy sound persisted?	-----years	
Chest pain Related Questions			
45	In the past three years, have you experienced any chest illness that kept you off duty, or in bed?	1. Yes 2.No	If “No” go to 48
46	If you get a cold, does it usually go to your chest?	1. Yes 2.No	
47	Did you produce phlegm with any of these chest illnesses?	1 Yes 2.No	
Part 6 Past respiratory illness			
48	Have you experienced any respiratory illness, Which is confirmed by a physician?		
49	Have you ever had any of the following Respiratory illness? (Mention all you had)	1. Asthma 2.Tuberculosis (TB) 3. Any other chest illness 4.Chronic bronchitis 5. Lung cancer	

ANNEX IV. OBSERVATIONAL CHECKLIST FOR PPE USAGE AND WORKPLACE VENTILATION

PPE usage

- | | | |
|--|-----|----|
| 1, Is required equipment provided, and used? | Yes | No |
| 2, is there a written procedure for the selection, use and Maintenance of PPE? | Yes | No |
| 3. Are the areas requiring PPE usage properly identified by warning signs? | Yes | No |

Workplace conditions

- | | | |
|---|-----|-----|
| 1. Is the work place well ventilated / fresh air movements? | Yes | No |
| 2. Is the ventilation system appropriate for the work performed? | Yes | No |
| 3. Is distributors of fruits and vegetable use safe trucks to deliver for the markets | Yes | No? |
| 4. Do you have occupational health and safety training? | | |

Observation of documents	Yes	No
--------------------------	-----	----

Solid waste collection tools

Definition of Standardized solid waste collection tools - new, closed and opened by leg pressing.

Definition of not Standardized solid waste collection tools – old, perforated, viable for rodents and flies and not opened and closed by leg pressing.

1. What is your solid waste collection tool?

- 1, standardized
- 2, not standardized

Annex V Information sheet (Amharic version)

የስምምነት ማስወቂያ ቅጽ

ስሜ ይባላል፡፡ እዚህ የተገኘሁት የአዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የህብረተሰብ ጤና ሳይንስ ትምህርት ቤት የድህረ-ምረቃ ተማሪ የሆኑትን ይደነቃቸዋል፡፡ እሳቸውም አትክልትና ፈራፍሬ ገበያ ወስጥ በሚሰጡ ስራተኞች የመተንፈሻ አካላት ችግርና መንስኤዎቻቸው ዘርያ ላይ ጥናት በመስራት ላይ ይገኛሉ፡፡ ይህንን ጥናት ለማሳደግ ተሳታፊ የሚሆኑትን በሎዩሪ የናጣጥ አወጣጥ ምልመላ ሲካሄድ እርሶ በዚህ ጥናት እንዲሳተፉ የተመረጡ ስሆን ጥናቱ በሚካሄድበት ወቅት የመተንፈሻ አካላት ችግሮች መንስኤዎቻቸው ላይ ዳሳሳ ለማድረግ ለጥናቱ የተዘጋጀ መጠይቅ እጠቀማለሁ ይህም የእርሶን ሙሉ ትብብር የሚጠይቅ ይሆናል፡፡ ስለሂደቱም አጭር ገለጻ ይደረጋል፡፡ ልኬቱ የሚካሄደው ሥራ በታሪኬ ከ 20 – 30 ደቂቃ ነው፡፡

የምትሰጠኝ መረጃ ሁሉም ምስጢራዊነቱ የተጠበቀና ቅፅ ላይ ስም አይሰፍርም፡፡ ከጥናቱ በቀጥታ የሚገኙት ጥቅም የለም፡፡ ነገር ግን በተዘዋዋሪም ጥናቱ በአትክልትና ፈራፍሬ ገበያ ላይ በሚሰጡ ስራተኞች ላይ የሚታዩ የመተንፈሻ አካላት ችግሮች ለመከላከልና ለመቆጣጠር ትልቅ አስተዋፅኦ ይኖረዋል፡፡ በተጨማሪም ለቀጣይ ምርምር መሰረት በመሆን ያገለግላል፡፡

እንዲሁም ይህንን ጥናት መሰረት በማድረግ መንግስትና የተለያዩ ባለድርሻ አካላት ትኩረት በመስጠት ችግር ላይ የራሳቸው አስተዋፅኦ እንዲያደርጉ ይረዳል ብዬ አስባለሁ፡፡ ስለዚህ የእርሶ ተሳትፎ ለዚህ ምርምር ጠቃሚ ነው፡፡ በዚህ ምርምር መሳተፍ ምንም አይነት ጎንዮሽ ጉዳት አይኖረውም፡፡ ስለዚህ በጥናቱ መሳተፍም ለእርሶ መብት ነው፡፡ ከጥናት ጋር ተያያዥ ጥያቄ ካለዎት ወይም ተጨማሪ መረጃ ከፈለጉ ከአዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የህብረተሰብ ጤና ሳይንስ ትምህርት ክፍልን ወይም ጥናት አድራጊውን በሚጠቀሙ አድራሻ ማግኘት ይቻላል፡፡

ጥናት አድራጊ ፡ ይደነቃቸዋል

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Annex VI. Informed consent (Amharic version)

የስምምነት መዋዋያ ቅጽ

ጥናቱን በሚከተለው አካል ስለጥናት በቂ መረጃ ተሰጥቶኛል፡፡ የዚህ ጥናት ዓላማም ከአትክልትና ፈራፈሬ በሚወጣ ጥሩ ያሆነ ሽታ እንዲሁም የአትክልትና ፈራፈሬ ተረፈ ምርት በአተነፋፈስ ስርዓት ላይ ያለውን ተጽእኖ መለካት መሆኑን ተረድቻለሁ፡፡ ከኔ የሚወሰደው መረጃ በእኔ ላይ ምንም ዓይነት ጉዳት የማይሰከትልና መረጃውን ለጥናት ዓላማ ብቻ እንደሚውል ተረድቻለሁ፡፡ ማንኛውም እኔን የተመለከተ መረጃ ሚዛን ጥራዊነቱ የተጠበቀ ነው፡፡ እንደዚሁም በጥናቱ ለመሳተፍ ፍቃደኛ ካልሆንኩ በጥናቱም ለመሳተፍ እንደማልገደድ ነገር ግን በዚህ ጥናት መሳተፌ ለሳይንሳዊ ዕውቀት ጠቃሚ መረጃ የማበርከትና ወደፊት በዚህ ዙሪያ ለሚሰሩ ሰራዊቶች መሰረት የሚሆኑ ግብዓት መስጠት እንደምችል ተረድቻለሁ፡፡ በመሆኑም በዚህ ጥናት ላይ ለመሳተፍ የተስማሙ መሆኔን በፊርማዬ አረጋግጣለሁ፡፡

የተሳታፊው ፊርማ..... ቀን

የመረጃ ሰብሳቢው ስምና ፊርማ..... ቀን

Annex VII. Amharic version questionnaire

አዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የሕብረተሰብ ጤና ትምህርት ቤት

ቃለ-መጠይቅ የተደረገበት ቀን _____

1. የስራ ቦታ ኮድ _____
2. የተሳታፊ ሁኔታ አትክልትና ፈራፍሬ ወስጥ የሚሰጡ = 1 የቢሮ ስራተኞች = 2
3. መለያ ቁጥር _____

ክፍል አንድ፡ - ማህበራዊ ሁኔታ መሰረት

ተ.ቁ	ጥያቄዎች	ምሳሌ	ምርመራ
4	የተሳታፊ የታወቁ የምንድን ነው?	1. ወንድ 2. ሴት	
5	እድሜዎን ስንት ነው?	1. _____ (በመጠቀሚያ)	
6	የጋብቻ ሁኔታ	1. ያላገባ (ች) 2. ያገባ (ች) 3. የፈታ (ች) 4. የተለየ (ች) 5. የሞተበት (ባት)	
7	ሐይማኖትዎ ምንድን ነው?	1. ኦርቶዶክስ 2. መስሊም 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ ካለ ይግለፅ _____	
8	ከፍተኛው የተከታተሉት የትምህርት ደረጃ?	1. ያልተማረ /ች 2. ማንበብና መጻፍ 3. የክፍል ደረጃ _____	
9	አመቺ ወርሃዊ ገቢ በብር ምን ያህል ይሆናል?	_____ (በኢትዮጵያ ብር ይግለፁ)	

ክፍል 2. የመከላከያ አካል አዳጋ መከላከያ መሪ

ተ.ቁ	ጥያቄዎች	ምሳሌ	ምርመራ
11	በስራ ላይ የብናኝ መከላከያ ልብስ ይለብሳሉ?	1. አዎ 2. አለብኝም	አለብኝም ካሉ ወደ ጥያቄ 13 ይለፉ
12	ቁጥር-11 መልስዎ አዎ ከሆነ ምን ዓይነት (ከአንድ በላይ መልስ ይሾላል)?	1. የአፍ/አፍንጭ ሽፍፍ 2. ጭምብል (የፊት ሽፍፍ) 3. የአየር ማጣሪያ መሪ 4. ሌላ ካለ ይጥቀሱ _____	
13	የብናኝ መከላከያ ልብስ የሚለብሱበት	1. ጭሽ ስለሌለ	

	ምክንያቱ ምን ድን ነው?	2. ለመልበስ ስለማይመች 3. በስራ ላይ ስለማይቀረብ 4. ጎጂ ብናኝ ስለሌለ 5. ሌላ ካለይጥቀሱ_____	
14	የሥራ ደህንነት ስልጠና ወስደዋል?	1. አዎ 2. አልወሰድኩም	
15	በስራ ደህንነት ጠፍ ጉዳዮች ላይ ክትትልና ድጋፍ ተደርጎ ሎት ያወቃል?	1. አዎ 2. አያወቅም	

ክፍል 3. የአኗኗር ዘይቤጋር የተያያዙ ጥያቄዎች

ተ.ቁ	ጥያቄዎች	ምሳሌ	
15	በህይወተዎ ሲጋራ አጭክዉ ያቃሉ?	1. አዎ 2. አላወቅም	አላወቅም ካሉ ወደ ጥያቄ ይለፉ
16	በአሁኑ ጊዜ ሲጋራ ያጨሰሉ?	1. አዎ 2. አላጨሰም	
17	በቀን ስንት ሲጋራ ያጨሰሉ?	_____ (በቁጥር)	
18	በሳምንት ስንት ጊዜ ሲገራ ያጨሰሉ?	_____ (በጊዜ)	
19	ለምን ያህል ዓመት ነዉ ሲገራ ያጭኑት?	_____ (በዓመት)	

ክፍል 4. የሥራ ሁኔታ

20	ከዚህ በፊት ለብናኝ ሊያጋልጥ የመቻል ሌላ ሥራ ስረተዉያዉቃሉ?	1.አዎ 2.ተጋልጨአላወቅም	መልስዎ ተጋልጬ አላወቅም ከሆነ ወደ ጥያቄ 22 ይለፉ
21	መልስዎ ለጥያቄ 20 አዎን ከሆነ የስራ ቦታና ለምን ያክል ጊዜ ስርተዉ ነበር? (ከአንድ በላይ መልስ መስጠት ይቻላል)	የስራቦታ	ለምን ያክል ጊዜ
		1.የእንጨት ፋብሪካ	
		2.የጨቃጨቅ ፋብሪካ	
		3.የቆዳ ፍብሪካ	
		4.በናመጪፈያ/ማበጠፊያ	
		5.ሌላ ካለ	
22	አሁን በመስሩበት ቦታ ምን ያክል ጊዜ ስርተዋል?	_____ (በዓመት/ወር ይግለፁ)	
23	አሁን በመስሩበት የስራ ቦታ በቀን ምን ያክል ሰዓት ይሰራሉ?	_____ (በሰዓት)	

24	አሁን በሚከተሉት ስራ በሳምንት ስንት ቀን ይሳራሉ?	_____ (በቀን)			
25	በአትክልትና ፍራፍሬ ገበያ ወስጥ ለምን ያክል ጊዜ ስርተው በር?	_____ (በዓመት/ወር ይግለፁ)			
26	አሁን የሚከተሉት በየተኛው የሥራ ክፍል ለምን ያክል ጊዜ ስሩ?	የሰራ ክፍል	ለምን ያክል ጊዜ		
		1.ጽዳት			
		2.ሽያጭክፍል			
		3.መጫንና ማወረድ			
		4.የቢሮ ስራ			
27	ከአሁን በፊት በአትክልትና ፍራፍሬ ገበያ ወስጥ ለዓመት ወይም ከዓመት በላይ ስርተዎት ወቅሉ?	1.አዎ 2.አልሰራሁም			መልስዎአልሰራሁም ከሆነ ወደጥያቄ 29 ይለፉ.
28	ለጥያቄ 27 መልስዎአዎ ከሆነ በየተኛው የሥራ ክፍል ለምን ያክልጊዜ ስርተው በር? (ከአንድ በላይ መልስ መስጠት ይቻላል)	የሰራ ክፍል	ለምን ያክል ጊዜ		
		1.ጽዳት			
		2.ሽያጭክፍል			
		3.መጫንና ማወረድ			
29	ምግብ እቤት አብስለው ነው የሚጠቃመት?	1. አዎ2. አይደለም			መልስዎ አይደለም ከሆነ ወደ ጥያቄ 32 ይለፉ
30	መልስዎ ለጥያቄ 29 አዎ ከሆነ ምግብ የሚከተሉት ቦታ የት ነው?	1. እቤት ወስጥ 2. እደጅ ክፍት ቦታ ላይ 3. ኮሽና ወስጥ			
31	ምግብ የሚያበስሉት ምን በመጠቀም ነው?	1. ከሰል 2. እንጨት 3. ነጭጋዝ 4.በኤሌክትሪክ			

ክፍል 5. የአተነፋፈስ ስራአትን የተመለከቱ መጠይቆች

S.No	ጥያቄዎች	ምሳሌ	
ሳል በተመለከተ			
32	አብዛኛው ጊዜ ጧት ያስለ ይታል?	1. አዎ 2. አያስለኝም	

33	አብዛኛው ጊዜ ቀን ወይም ሌሊት ያስለዎታል?	1. አዎ 2. አያስለኝም	
34	አብዛኛው ጊዜ በሳምንት 4 ቀን ወይም ከዛ በላይ ያስለዎታል?	1. አዎ 2. አያስለኝም	
35	አብዛኛው ጊዜ ለተከታታይ 3 ወርና ከዛ በላይ በ 1 አመት አስለዎት ያወቃል?	1. አዎ 2. አያወቅም	
36	ይህ ሳልለምን ያክል ዓመት ነበረብዎት?	_____ ዓመት	
አክታያለበት ሃልን በተመለከተ			
37	አብዛኛው ጊዜ ጥቅ ከመኝታዎት ሲነሱ አክታያለበት ሳልነበረብዎት?	1. 1. አዎ 2. የለብኝም	
38	በአብዛኛው ጊዜ አክታያለበት ሳልነበረብዎት ወይም በሜታ ጊዜ ነበረብዎት?	1. 1. አዎ 2. የለብኝም	
39	አብዛኛው ጊዜ 4 ቀን ወይም ከዛ በላይ በሳምንት አክታያለበት ሳልነበረብዎት?	1. አዎ 2. የለብኝም	
40	በአመት እንደዚህ አይነት አክታያለበት ሳልነበረብዎት አብዛኛው ቀን ለተከታታይ ሶስት ወር ነበረብዎት?	1. አዎ 2. የለብኝም	
የማንከራፋት ድምፅ በተመለከተ			
41	ከደረሰ የማንከራፋት ድምፅ የሚገኝበት ድምፅ ያሰማው ደይ?	1. አዎ 2. የለብኝም	
42	ከደረሰ የማንከራፋት ድምፅ የሚገኝበት ድምፅ የሚመዘገብ ነው?	1. ጠቅላይ 2. ቀን 3. ሌሊት	
43	የሚገኝበት የማንከራፋት ድምፅ ማን ማስተካከል ይገባል?	1. _____ ዓመት	
ትንፋሽ ማጠርን በተመለከተ			
44	ደረጃ ወደ ላይ ወይም ተራራ ሲወጡትን ፋሽ ያጥራል?	1. 1. አዎ 2. አያጥራኝም	
45	ከዕድሜ አቸከሮች ዓይነቶች ጋር ሲሄዱ ትንፋሽ የማጠር ስሜት ይሰማዎታል?	1. 1. አዎ 2. አያጥራኝም	
46	ትንፋሽ ማጠር ከጀመረዎት ምን ያክል ዓመት ሆነዎት?	_____ ዓመት	
የደረሰ ህመምን በተመለከተ			
47	ባለፉት ሦስት አመታት በደረሰ ህመም ምክንያት ስራ ቀርተዋል (ተኝተዋል) ያወቃል?	1. አዎ 2. አላወቅም	አላወቅም ካለው ደግሞ

			50 ይለፉ
48	በአብዛኛው ለቅዝቀዜ በሚጋለጡበት ጊዜ የደረሱት ህመም ይሰላማቸዋል?	1. አዎ 2. የለም	
49	የደረሱት ህመም አከታኝነት ያወቃል?	1. አዎ 2. የለም	

ክፍል ስድስት ፡ - ከዚህ በፊት የነበረ ህመምን የተመለከቱ ጥያቄዎች

ተ/ቁ	ጥያቄዎች	መልስ	
50	በሀኪም የተረጋገጠ የመተንፈሻ ህመም ነበረብዎት?	1. አዎ 2. የለብኝም	የለብኝም ካሉወደ ጥያቄ 52 ይለፉ
51	ከተዘረዘሩት ህመሞች ውስጥ የትኞቹን ታመሙ ነበር?	1. አስም 2. የሳንባነቱ ቀርሳ (ቲቢ) 3. ብሮንካይቲስ 4. የልብ ችግር 5. የደረሱት አካባቢ ችግር	