ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

SCHOOL OF PUBLIC HEALTH

ASSESSMENT OF CHRONIC RESPIRATORY SYMPTOMS AND ASSOCIATED FACTORS AMONG MARBLE FACTORY WORKERS IN ADDIS ABABA ETHIOPIA:

A COMPARATIVE CROSS-SECTIONAL STUDY.

BY EPHREM BOGALE (BSC)

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH.

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ADDIS ABABA ETHIOPIA

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Acronym and abbreviations

COPD	Chronic Obstructive Pulmonary Disease
CRDs	Chronic Respiratory Diseases
AOR	Adjusted Odds Ratio
PPE	Personal Protective Equipment
BMRC	British Medical Research Council
ATS	American Thoracic Society
WHO	World Health Organization

Abstract

Background

Marble used in the sculpturing of statute and the construction of buildings and monuments is metamorphic limestone. Persons employed in carving statues from stone and marble rock are exposed to dust containing particles of calcium carbonate and silica. Marble has been commonly used as a building material since ancient times. During the cutting process about 25-30%, the original marble mass is lost in the form of dust which is suspended in the air and then inhaled by the workers. Dust particles that are inhaled are lodged in the lung and cause chronic respiratory diseases. Therefore, the aim of this study was to assess the magnitude of chronic respiratory symptoms in marble factory workers in Addis Ababa, Ethiopia and to compare it with a control group of Awash Wine Factory workers who had low level of dust exposure.

Objectives:

This study was designed to assess the prevalence of chronic respiratory symptoms and associated factors among marble factory workers in Addis Ababa, Ethiopia.

Methods:

A comparative cross sectional study was done in Addis Ababa, Ethiopia from 21 October 2020 up to 10 January 2021. The Marble factory, which has a high level of dust exposure, and the Awash Wine Factory, which has a low level of dust exposure, were the subjects of a comparative cross-sectional study. The study enlisted 492 participants selected by systematic random sampling method and were interviewed using a modified British Medical Research Council respiratory and American Thoracic Society and National Heart & Lung Institute Division of Lung Disease Respiratory Questionnaire. EPI DATA 3.1 software was used to enter data, and SPSS version 23 was used to analyze it. To determine the relationship between determinant factors and chronic respiratory symptoms, descriptive statistics, bivariate logistic, and multivariate logistic regression analysis were used.

Result:

The mean ages of the participants in the marble factory were 40.41(SD± 9.1) and the mean age of the control group was 40.46 (SD± 9.6). According to the study, the prevalence of chronic respiratory problems was 42.1 percent in marble manufacturers and 16.2 percent in wine factories.

Income below 3000 birr, family history of chronic respiratory symptoms and current smoking habits were variables with bivariate significance but multiple logistic regression analysis showed that age greater than 40, previous respiratory disease confirmed by physician, personal protective equipment, past history of confirmed health problems, service years more than 10 years in the factory, and working hours greater than 48 per week were independent factors that determine the development of chronic respiratory symptoms.

Conclusion:

The present study concluded that workers in the marble industry had a higher chronic respiratory disease compared to controls. To reduce the impact, it is recommended that the workers should, use proper respiratory protective equipment, reduce exposure hours to dust, check health status for early diagnosis and treatment

1. Introduction

1.1 Background

Marble is a metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite (1)**.** Marble used in the sculpturing of statute and the construction of buildings and monuments is metamorphic limestone persons employed in carving statues from stone (2). Marble has been commonly used as a building material since ancient times (3). This material is also used in tiles, countertops, and indoor flooring.

Numerous extensive deposits of marble are generally hill forming and occur throughout northern and western Ethiopia. There is a huge deposit of marble at Daleti 635 Km west of Addis Ababa and this deposit is explored by the National Mining Company (4). Marble has been mined in many parts of Ethiopia and the deposits are exhaustible. Some of the marble is used locally for dimensional stones, whereas the main production is for export. One of the main importers of Ethiopian marble in Italy (4).

Marble can be processed in industries to produce various kinds of marble stones that are used for monuments, interior decorations, statuaries tabletops, and novelties. But the principal application of marble is for exterior building works to provide lasting endurance to walls.

In Addis Ababa, according to a data gained from ministry of trade and industry, there are about 14 marble manufacturing plants of large and small size enterprises that are scattered in the city and they use manpower of more than 4000 in their manufacturing department. In addition to these, many cottage marble manufacturers have no license from known government authority but this study will be done on the legal plants and enterprises.

Marble factory has three main sections: cutting, polishing, and finishing. Machines subjected to cutting and polishing are equipped with a water jet cutting system (5). Marble blocks are cut into smaller blocks to give them the desired smooth shape (3,6). During the cutting process about 25-30%, the original marble mass is lost in the form of dust which is suspended in the air and then inhaled by the workers (3,7). The workers usually inhale a large amount of dust generated by the cutting units, and this dust contains silicon dioxide or free silica (8).

Workers who quarry, grind, polish and install marble are exposed to the dust, which contains particles of calcium carbonate and silica. Prolonged exposure to respirable crystalline silica has long been known to cause one of the oldest known industrial diseases, silicosis. In addition to silicosis, respire-able crystalline silica has been associated with autoimmune disease**,** non-malignant renal disease, cardiac obstructive disease (COPD), and lung cancer. Health risks are associated with exposure to marble dust (9).

Marble dust is a serious occupational health hazard and workers are exposed to intolerable level of dust by operating various machines and engaged in polishing of marble (5). Therefor the aim of this study was to assess the magnitude of chronic respiratory symptoms in marble factory workers in Addis Ababa, Ethiopia and to compare it with a control group of Awash Wine Factory workers who had low level of dust exposure.

1.2 Statement of the problem

Occupational factors make an important contribution to the global burden of disease, where work-related morbidity and mortality not only result in suffering for the worker and his family, but also adds to the overall cost to the society through lost productivity and increased use of medical and welfare services (10).

CRDs are recognized as a major public health problem with an increasing morbidity and mortality (11). Chronic respiratory diseases (CRDs) are recognized as being the major cause for premature death in adult populations worldwide. The prevalence of CRD is increasing everywhere and in particular amongst children and the elderly (12). The burden of CRD has major adverse effects on the quality of life and disability of affected individuals. It has been predicted that the global burden of CRD will increase considerably in the future, even though many preventable CRDs can be controlled with adequate management in both developed and developing countries, as well as among deprived populations (13–15).

In 2012 WHO reported that worldwide non communicable diseases are leading causes of mortality which accounts for 82% of death and among these chronic respiratory diseases, asthma, and COPD

accounts for 4 million or 10.7% of death (16). Chronic respiratory diseases represent public health challenges in both industrialized and developing countries because of their health and economic impacts (17). Chronic respiratory symptoms such as chronic cough, chronic phlegm, wheezing, shortness of breath, and chest pain are manifestations of respiratory problems that are mainly developed as a result of occupational exposures (18). Occupational respiratory diseases account for up to 50% prevalence among workers in high-risk sectors such as mining, construction, and dust-generating works (17).

Marble is a metamorphic rock composed of recrystallized carbonate minerals, most commonly calcite or dolomite. Quarry, grind, polish, and install marble workers are exposed to dust particles as well as contaminated water containing calcium carbonate and silica, among other contaminants. Respire able crystalline silica, nonmalignant renal disease, cardiac obstructive disease (COPD), and lung cancer are all linked to long-term exposure.

Workers who inhale very small crystalline silica particles are at risk for silicosis – an incurable, progressively disabling and sometimes fatal lung disease (19,20). Silicosis results in permanent lung damage. Silica dust particles become trapped in lung tissue, causing inflammation and scarring and reducing the lungs' ability to take in oxygen (21).

The epidemiological study indicated that workers exposed to marble dust have an increased risk of suffering from chronic disease (9). Dust particles that are inhaled are lodged in the lung and cause lung irritation, mucus hyper-secretion initially, followed by lung function impairment, lung inflammation chronic obstructive lung disease, restrictive lung disease, and pneumoconiosis, and so on (22). Often these specks of dust exposed workers developed several chronic respiratory diseases like Asthma and chronic obstructive pulmonary disease (COPD) (23).

The most common respiratory symptom complaints made by marble workers include cough, shortness of breath, chest pain, chest tightness, abnormal breathing pattern (23). In our country, there is much research done on organic dust's effect on respiratory health but there is a lack in the area of inorganic dust. No research has been published regarding the respiratory symptoms and associated factors among marble factory workers. This is a clear gap in the area and therefore, the objective of the study was to assess the magnitude of chronic respiratory symptoms and associated factors among marble factory workers in Addis Ababa Ethiopia.

1.3 Rationale of the study

One of the main areas that are facing the negligence of the government is the workers employed in the marble industries who are deprived of the basic safety measures against occupational hazards (5). In most developing countries like Ethiopia, occupational morbidity and mortality are becoming a serious public health problem (17). In low-income countries, especially sub- Sarah African countries, respiratory problems are the sixth cause of death and most of these problems are due to dust exposure (17). Today, marble is a popular building material used in many architectural projects and to create decorative effects. Because it can be obtained in many sizes and shapes, marble tiles for walls and floors are popular in interior design. Marble has been used throughout history in creating some of the world's most beautiful structures. The construction industry in Addis is increasing, as a result, the use of marble is increasing. Most of the marble factories focus on increasing production without focusing on the health and safety care of workers. Workers of marble factories face a broad spectrum of workplace hazards including chemical, physical, ergonomic, biological, work-related stressors, and safety and mechanical hazards. The prevalence of chronic respiratory problems due to this inorganic dust is not known since there is no previous study in Addis Ababa and even in the country. These were the motives of the principal investigator to do the research.

1.4 Significance of the study

The finding from this study will help marble factories to develop appropriate workplace intervention measures to protect the health of marble factory workers. The study will help policymakers in developing strategies and legislation based on the recommendation. It will benefit marble factory workers themselves to know the hazards in their working environment and how they protect themselves from such hazards. It can also serve as a baseline for future studies.

2. Literature review

Occupational hazards are caused by the people themselves and also from how people behave and due to the interactions between people and the physical workplace, administration, or the outside environment (5). The impairments caused by the people occurred due to biological, psychological, or socio-cultural factors (5).

Marble mining caused air quality pollution of dust. Air pollutions from dust cause fibrosis in the lungs if continuously inhaled. This marble dust belongs to the group of differentiate dust pulmonary disorders due to dust in the form of restriction, obstruction, or mixture of the two (24).

The prevalence of respiratory complaints was influenced and aggravated by occupational exposure, duration of exposure, nature, and type of work and year of experience to the working environment, and so on (25).

2.1 Socio-demographic and respiratory symptoms

There are socio demographic factors that contribute to the development of chronic respiratory symptoms. Age, sex, educational status and income are some of the factors that many literatures reviled on.

Chronic respiratory Symptoms were more in workers exposed to the dust for longer duration as evidenced by more symptomatic worker were among forty-plus age groups (85.71% in 41-50 years and 62.5% in 51 and above respectively (23).

A study done in Nigeria showed that age is an associated factor that can't be modified to prevent the disease and it showed that aged 65-74 (OR= 9.66, 95% C.I 3.43-27.20), age more than 75 years (OR= 3.88, 95% C.I 1.08-13.98) had the strongest association with chronic respiratory symptoms. (26). A study that was done in South Africa also shows that exposed elderly persons had a significantly higher prevalence of chronic respiratory symptoms and diseases than those who were unexposed (27).

A study done in the Dejen cement factory also showed that workers aged ≥ 45 years were more likely to develop chronic respiratory symptoms (AOR = 4.20,95 % CI = 1.94, 9.12) than workers in the age category 18–29 years old (17).

A study done in Ekiti revealed that subjects who were classified as low socioeconomic status were 1.7 times more likely to develop chronic bronchitis (26). Other investigators in Europe and Latin America have reported the association of chronic bronchitis with low socioeconomic status.

The sex of participants was significantly associated with chronic respiratory symptoms among Dejen cement factory workers. Males were more likely to develop chronic respiratory symptoms (AOR = 2.07, 95 % CI = 1.18, 3.63) than females (17).On the other hand, a study done in Ekiti state, Nigeria showed that sex is not associated with chronic bronchitis.

One of the main reasons behind occupational hazards is the illiteracy of the workers. Workers are usually unaware of their basic rights to safe and healthy working conditions. A study conducted in Dejen cement factory showed that workers' whose education level was grade 8 or below were more likely to developed chronic respiratory symptoms than those whose education level was diploma and above (AOR = 4.07, 95 % CI = 1.86-8.92) (17). On the other hand, a study done in Ekiti state, Nigeria, showed that educational status is not associated with chronic respiratory symptoms (28).

A study done among low and middle income countries found that lower education and lower household income were associated with higher odds of having chronic respiratory disease (29).

2.2 Respiratory symptoms and personal protective equipment

A study done in India showed that respiratory problems can cause a lack of a safe working environment and awareness regarding the hazards of working in such conditions without adopting protective measures. But if the marble factories workers use the mask or raping the towel over the mouth and nose they can protect themselves from exposure to dust (22).

Inadequate resources and lack of awareness about the use of Personal Protective Equipment (PPE) also exacerbate the severity and frequency of hazards. A study done on the Bahir Dar textile industry showed that workers who did not utilize their personal protective equipment in the work area were 4.88 times more likely to develop respiratory symptom than those who utilize their PPE in the working area (AOR = 4.88, 95% CI: 1.54-15.45)(30). But on the other hand, the study done in the Dejen cement factory found that PPE use was not statistically significant in relation to the development of chronic respiratory symptoms (AOR = 1.42, 95 % CI =0.92, 2.19)(17).

2.3 Respiratory symptoms and workplace exposure

The workers engaged in the handling of different products that are frequently used to produce quartz surfaces in the marble industry are at a high risk of developing silicosis. Chronic silicosis is the most frequent clinical form and it is related to exposures of at least 10 years(31).

A study done in India shows that the most important factor in the development of silicosis is the dose within five years of respirable silica-containing dust in the workplace setting that is, the product of the concentration of dust containing respirable silica in workplace air and the percentage of respirable silica in the total dust (22).

The service year was also significantly associated with chronic respiratory symptoms. Workers who had work experience greater than five years had the odds of developing chronic respiratory symptoms 5.44 times more likely (AOR = 5.44, 95 % CI = 3.09,9.59) than workers with work experience less than or equal to five years in Dejen cement factory(17).

A study done in marble dust exposure relationship to workers' lung conditions in marble industries showed that areas exposed to dust are more likely to lung conditions decline when compared to respondents in areas not exposed to dust. The greater the exposure to dust in the work environment, the higher the cases of workers experiencing decreased lung function. Other factors besides dust exposure that cause a decrease in lung function status include the habit of wearing personal protective equipment's, smoking, age, years of work, and history of the disease (24)

2.4 Respiratory symptoms and occupational factors

Working departments were significantly associated with chronic respiratory symptoms in the cement factory workers. Employees engaged in cement mill (AOR = 3.72, 95 % CI = 1.92, 7.21) were more likely to develop chronic respiratory symptoms than employees engaged in the raw mill department(17).

Workers who are employed in cutting, grinding, and polishing marble for various purposes experience several other health-related issues like eye, skin, and respiratory problems(31). Service year was significantly associated with chronic respiratory symptoms. Workers who had work experience greater than five years had the odds of developing chronic respiratory symptoms 5.44 times more likely (AOR = 5.44, 95 % CI = 3.09,9.59) than workers with work experience less than or equal to five years in the cement factory (17).

A study done on Flore Mill in Addis Ababa found that there was a statistically significant association between chronic respiratory symptoms and the duration of employment. Workers with work experience >10 years were significantly associated with the development of chronic respiratory symptoms (AOR=2.58, 95% CL; 1.00–6.62) (32)

2.5 Respiratory symptom and environmental factors

Processing of marble results in the formation of marble dust, which is suspended in the air and may then, inhaled by the workers (7). Epidemiological studies indicate that workers exposed to marble dust stand an increased risk of suffering from asthma symptoms, chronic bronchitis, nasal inflammation, and impairment of lung function (33).

Different studies showed that Smoking is one of the environmental factors that contribute to chronic respiratory problems. Prior research's found that women exposed to heavy indoor smoke are three times more likely to suffer from COPD compared to women using cleaner fuels (and therefore exposed to less indoor air pollution). A randomized trial in Guatemala revealed a significant reduction in negative respiratory symptoms among women using improved indoor woodstoves (34).

A study done in Cameroon showed that Women exposed to wood smoke had a higher prevalence of chronic bronchitis (7.6%) compared to the alternative fuel group (0.6%) (35).
Respiratory symptoms and occupational lung diseases are preceded by different symptoms such as shortness of breath, cough, sputum, dyspnea, and wheeze (30). The dustier environment is associated with a high prevalence of chronic respiratory symptoms (30).

2.6 Behavioral factors and respiratory symptoms

A study done in India shows that short-term exposure to marble dust alone does not play any role in the generation of pulmonary disease. Although smoking habits also play an important role in the development of pulmonary diseases along with marble dust, the development of pulmonary diseases occurs earlier than that of the nonsmoker's marble factory workers (7). The workers who are habituated to smoking are also advised to minimize or left their smoking habits to reduce the risk of pulmonary diseases (22). The other study done in Nigeria showed that tobacco smoking (OR= 6.37 95% C.I 2.12-19.14) had the strongest association with chronic bronchitis (26).

The study done in the Dejen cement factory showed that workers who had previous chronic respiratory diseases experienced chronic respiratory symptoms more likely than workers who were free from previous chronic diseases (AOR = 7.79, 95 % CI = 2.02, 30.04) (17)

The study done on pharmaceutical factories in Addis Ababa showed that workers who had a previous history of respiratory diseases were about 3 times more likely (AOR = 3.36, 95% CI = (1.85–6.12)) to develop chronic respiratory symptoms than those who had not and also workers who had a family history of chronic respiratory diseases were about 3 times more likely to develop chronic respiratory symptoms than those who had no disease (36).

The study done in Eboni state Nigeria suggest that chronic exposure to dust from crushing of rocks may increase susceptibility to respiratory problems with tobacco or cigarette smoking and increased length of service as additional predisposing risk factors (37).

Knowledge and attitude is the other behavioral factor that studies deal with its contribution on chronic respiratory symptoms. A study done in marble cutters in India showed that awareness of personal protection and preventive measures against silicosis, such as the use of dust mask, can effectively improve the health status of marble cutting workers (2).

Literatures also shows that there should be certain decisions that made by the management of industry which incur potential hazards to the workers. One of the major issues is the provision of Personal Protective Equipment (PPE) to the workers and the choice of machinery and equipment installed. Similarly, the training imparted to the employees for their safe working operations is also not sufficient (5).

2.7 Conceptual framework of the study

This study's conceptual framework depicts what we expect to find during our investigation. It identifies the factors that are important to our research and shows how they might be related. It was created after analyzing a variety of literatures on the factors that influence persistent respiratory problems.

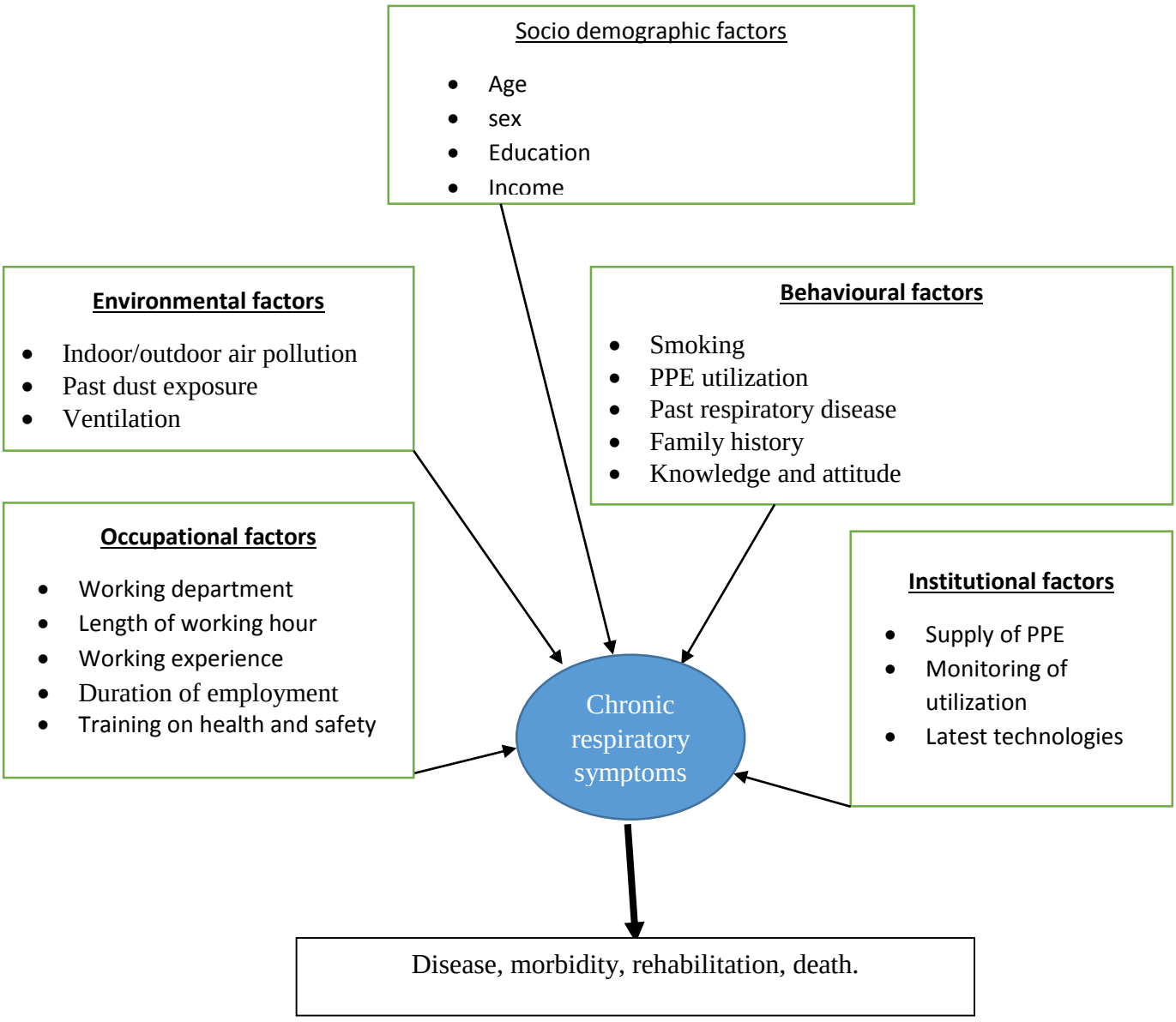

Figure 1 conceptual framework of the study

2.8 Research Hypothesis

Ho = Workers exposed to marble dust have the same risk of developing chronic respiratory symptoms with wine factory workers.

HA= Workers exposed to marble dust have different risk of developing chronic respiratory symptoms with wine factory workers.

3. Objective

3.1 General

To assess the prevalence of chronic respiratory symptoms and their associated factors among marble factory workers in Addis Ababa Ethiopia, 2020.

3.2 Specific objective

- To compare the magnitude of chronic respiratory symptoms between marble factory workers and Awash Wine Factory workers in the year 2020.
- To identify factors associated with chronic respiratory symptoms among marble factory workers

4. Methods and materials

4.1 Study area and period

The study was conducted in three marble factories and one awash wine factory in Addis Ababa. Marble production is increasing in the city especially during the last decades, a number of marble deposits throughout the country have been put in to production in factories located in the capital city Addis Ababa. There are 14 marble factories in the city and the study was conducted from October 21 to January 10, 2021.

4.2 Study design

An institution-based comparative cross-sectional study had been conducted on marble and wine factory workers in Addis Ababa Ethiopia. Wine factory was selected as a control for the comparison since it has dust free environment. Prevalence of chronic respiratory symptoms and associated factors was compared between workers from marble factories and the control less dust exposed wine factory.

4.3 Source population

All marble factory workers of the marble factories in the city of Addis Ababa and Awash Wine Factory workers were a source population.

4.4 Study population

Workers who were systematically selected from the selected three marble factories and Awash Wine Factory for the sample were study populations.

4.5 Sample size determination

For objective one (prevalence of chronic respiratory symptom)

Using the double population formula, the sample size was computed. Previous research on respiratory symptoms and ventilatory function among quarry workers in Edo state, Nigeria, found that the prevalence of cough was 23.7 and 13.5 percent in the exposed and non-exposed groups, respectively. The sample size determined by the methodology was 492, based on a 95 percent confidence level, 80 percent power, and 10% non-response rate

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

Where,

n = the required number of sample size

P1 = proportion of cough among the exposed group from previous study

P2 = proportion of cough among the control group

Z(α/2) = 95%confidence level statistical value (1.96)

Zβ = the desired power of 80% = 0.84

$$n = \frac{(1.96 + 0.84)^2 * (0.237(1-0.237) + 0.135(1-0.135))}{(0.237-0.135)^2}$$

n = 224

Adding 10% of the above sample size was necessary for compensation of non-response and it became 246 for each subjects and a total sample size of 492.

For the second objective (associated factors)

The prevalence of cough among workers who do not use personal protective equipment in Brazil was 57.1 and 0.429 for those who use it.

P1= 0.571
P2= 0.429

$$n = \frac{(1.96 + 0.84)^2 * (0.571(1-0.571) + 0.429(1-0.429))}{(0.571-0.429)^2}$$

n = 192

Adding 10% of the above sample size was necessary for compensation of non-response and it became 211 for each subjects and a total sample size of 422.

Maximum sample size was 492 and we used it as the sample size for this study.

4.6 Sampling procedure

In Addis Ababa, there are 14 marble factories. Three factories were chosen from among these based on their production capacity, involvement of a significant number of working manpower, technological use, and concern for the health of their people resource. The study covered the production department as a functional department. Workers' data from the human resource was used as a sampling frame and then systematic random sampling was done to identify study participants who were eligible.

The study sample that has been determined in the sample size determination were distributed in the three factories according to the proportion number of workers

The study subjects were selected by using a systematic random sampling technique from the sampling frame.

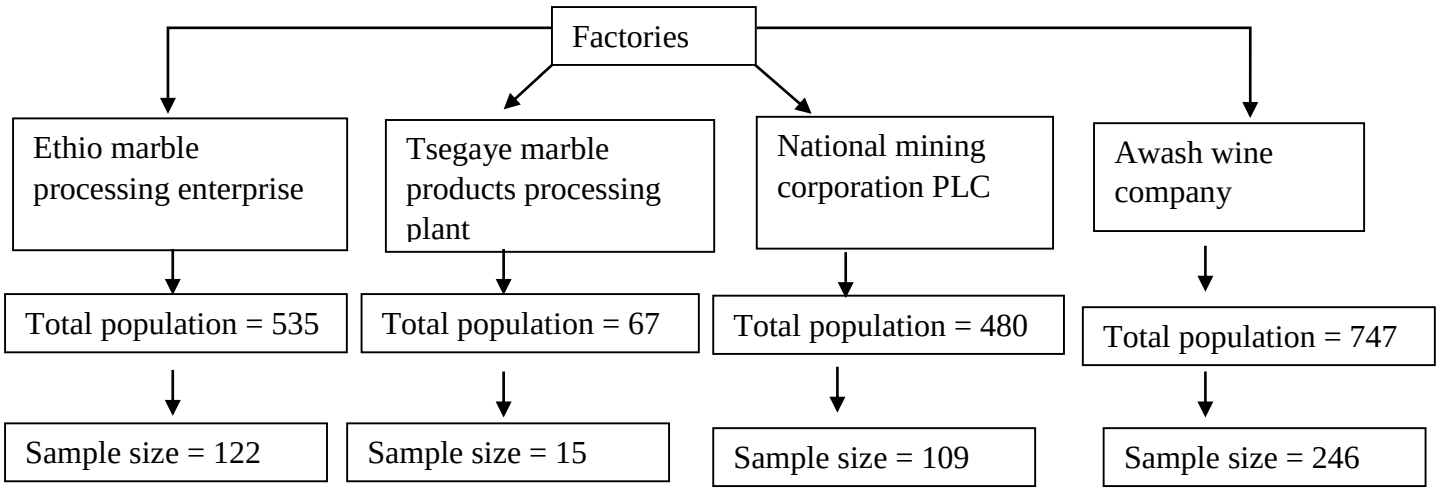

Fig 2:- Number of human resource and respective sample sizes of each factory

4.7 Variables

4.7.1 Dependent (outcome variable)

- Chronic respiratory symptom
  (Chough, phlegm, wheezing, chest pain, shortness of breath)

4.7.2 Independent (exposure variable)

- Socio-demographic factors:- age**,** sex, education, income
- Behavioral factors:- smoking, not using PPE
- Environmental factors:-duration of employment, length of working hours, past dust exposure history
- Past respiratory illness of both the respondent and his/ her family
- Management factors: - provision of Personal Protective Equipment (PPE) to the workers, the choice of machinery and equipment installed, and training imparted to the employees for their safe working operations

4.8 Data collection procedure and tools

Data was collected using a questioner adapted from the British Medical Research Council's (BMRC) respiratory questionnaire and the American Thoracic Society's and National Heart & Lung Institute's Division of Lung Disease Respiratory Questionnaire (38) as well as workplace observation checklists to check for the use of personal protective equipment and the workplace's ventilation status. The questioner have six parts including socio demographic, behavioral and environmental factors. Data was collected through interview and observation. Before data collection, training was given for all 6 data collectors and 2 supervisors. Data collectors were a health science students from Yanet College of health science and supervisors were environmental health professionals.

4.9 Eligibility

4.9.1 Inclusion criteria

Workers who were working for more than a year in the production department.

4.9.2 Exclusion criteria

Administrative workers since they have little or no exposure and workers who were not there during data collection and those below a year of work experience.

4.10 Operational definition

1. Chronic respiratory symptoms :- development of one or more symptom of chronic cough, chronic phlegm, chronic shortness of breath, chronic wheezing and chronic chest tightness which lasts at list three months in one year (17,36).
2. Chronic cough: - development of cough as much as 4-6 times a day happening for most days of the week for at least three months in one year (17,36).
3. Chronic phlegm: - sputum expectoration as much as twice per day for most days of a week for at least three months in a year(17,36).
4. Chronic wheezing :- a state of causing a wheezing or whistling sound during inspiration or expiration at least three months in a year (17,36).
5. Chronic chest tightness: - chest pain with mucus that kept workers off work in the past year (17,36).
6. Chronic shortness of breath: - a discomfort or difficulty breathing in different activities like walking up a slight hill, when undressing, walking at own pace(17,36).
7. Past dust exposure any work experience on dusty environment before the current working position (17,36).
8. Family history of chronic respiratory disease the presence of one or more of the chronic diseases like chronic bronchitis, emphysema, tuberculosis (TB), heart disease, chronic sinus, asthma, and lung cancer in either of the natural parents (mother or father)identified by physicians (17,36).
9. Past chronic respiratory diseases: one or more of respiratory diseases like chronic bronchitis, emphysema, tuberculosis (TB), heart disease, chronic sinus, asthma, and

lung cancer that could be developed before the current working position and identified by physicians (17,36).

10. Current smokers: workers who smoked at the time of the study or had stopped smoking less than one year before (17,36).
11. Ex-smokers: workers who had quit at least 1 year before the study (17,36).
12. Ever smoker: worker who has smoked at least one hundred cigarettes during the course of his/her life, which includes current smokers and ex-smokers (17,36).
13. Personal Protective Equipment (PPE). Utilization of the worker-specialized clothing or equipment worn by employees helps to protect against health and safety hazards (17,36).

4.11 Data analysis

For data entering, editing, cleaning, coding, and checking completeness and consistency, EPI DATA version 3.1 software was utilized. Finally, for data administration and analysis, the data were exported to SPSS version 23. Frequency distribution, means, chi-square, standard deviations, and prevalence were used to describe the data. To examine if there was an association, bivariate and multivariate logistic regression were used.

4.12 Data quality assurance

Data was collected using a standardized questioner and skilled personnel, students from Yanet college of health science, to ensure data quality. Supervisors and investigators verified the data on a daily basis to ensure its accuracy. Before the actual data processing, the lead investigator input 5% of the obtained data twice into the EPI DATA software package to ensure proper entry and preserve data quality.

4.13 Data management

To keep data consistent, the amended questionnaire was translated to Amharic and then returned to English. At the time of data collection the supervisors were checked for completeness and consistency.

4.14 Ethical clearance

The Addis Ababa University College of Health Science School of Public Health's institutional review board granted ethical approval. After a thorough description of the study's goal, each study subject's written agreement was taken. Respondents were aware that there was no potential risk and that their response would result in direct rewards such as money. Confidentiality had been preserved by omission.

4.15 Dissemination of the result

Findings from this study will be submitted to Addis Ababa University, college of health sciences, school of public health, marble and wine factories where the study had done and will be accessed with online through peer review journals.

5. Result

5.1 Socio-demographic characteristics

A total of 471 participants of which 242 from marble factories and 229 from the wine industry with a response rate of 95.7% fully responded to the interview questions. The mean ages of the participants in the marble factory were 40.41(SD± 9.1) and the mean age of the control group was 40.46 (SD± 9.6). The majority of the respondents, 194 (80.2%) and 169 (73.8%) were male in the marble and wine factories respectively. The mean year of experience was 12.58 (SD± 8.5) for marble workers and 12 (SD ± 8) for control groups. The majority of the participants had attended secondary school and above 153(63.2%) from the marble factory and 147(64.2%) from the control group.

Table 1 Socio-demographic characteristics among marble workers and controls January 2021 Addis Ababa Ethiopia.

Socio-demographic characteristics		Marble Frequency N (%)	Wining Frequency N (%)	p-value
Sex	Male	194(80.2)	169(73.8)	0.101
	Female	48(19.8)	60(26.2)	
Age	<= 29	35(14.5)	37(16.2)	0.058
	30 -39	71(29.3)	68(29.7)	
	>= 40	136(56.2)	124(54.1)	
Religion	Orthodox	184(76)	164(71.6)	0.094
	Muslim	34(14)	34(14.8)	
	Protestant	24(10)	31(13.5)	
Marital status	Married	158(65.3)	151(65.9)	0.035
	Single	64(26.4)	59(25.8)	
	Divorced	16(6.6)	15(6.6)	
	Widowed	4(1.7)	4(1.7)	
Educational status	Can't read and write	6(2.5)	6(2.6)	0.055
	Primary	83(34.3)	76(33.2)	

	Secondary	103(42.5)	100(43.7)	
	Diploma and above	50(20.7)	47(20.5)	
Employment condition	Temporary	18(7.4)	17(7.4)	0.005
	Permanent	224(92.6)	212(92.6)	
Monthly income	<3000	151(62.4)	56(24.5)	0.001
	>= 3000	91(37.6)	173(75.5)	
Service year (Work experience)	< 4 years	45(18.6)	39(17)	0.882
	5-9 years	51(21.1)	53(23.1)	
	10 and above	146(60.3)	137(59.8)	

5.2 Behavioral and environmental characteristics

In this study, 28 (11.6%) of the marble and 26 (11.4%) of the wine workers were ever smokers and 10 (4.1%) from the marble factory and 15 (6.5%) are currently smokers.

In this study, 66(27.3%) of the marble and 48(21%) of the control group responded a confirmed chronic respiratory symptoms by physicians and 45(18.6%) of marble and 30(13.1%) of the control group reported their parents were ill with chronic health problems.

The majority of marble workers 232(95.9%) and control groups 221(96.5%) cook their food in their homes only 91(37.6%) of marble workers and 94 (41%) of the control group use electricity as an energy source.

According to this study, 178 (73.6%) of the marble workers and 169 (73.8%) of the control group workers said that they had no training on occupational health and safety. The majority of marble workers and control group 186(76.9%) and 175(76.4%) didn't use personal protective equipment respectively. The study showed that about 50 (20.7%) of the participants among marble work reported that they were exposed to dust in their previous work history, whereas 43 (18.8%) of the wine workers reported they had exposure to dust in their previous workplace. The study also showed that about 187 (77.3%) of the participants among marble work reported that they were

exposed to dust in their current workplace, whereas 21 (9.2 %) of the wine workers reported that they had exposure to dust in their current workplace.

Table 2 Behavioral and environmental characteristics among marble workers and controls in Addis Ababa Ethiopia, January 2021.

Socio-demographic characteristics	Marble Frequency N (%)	Control Frequency N (%)	p-value
Previous respiratory disease			
Participants who have had at least one of the respiratory diseases, n (%)	142(42.1)	37(16.2)	0.001
Family history of respiratory disease (mother and father)			
Participants whose families have had at least one of the respiratory diseases, n (%)	45(18.6)	30(13.1)	0.180
Smoking habit			
Current smoker; n (%)	10(4.1)	9(3.9)	0.078
Ever smoker; n (%)	28 (11.6)	26 (11.4)	0.277
Previous dust exposure history			
Participants who have had previous dust exposure in other factories; n (%)	50 (20.7)	43 (18.8)	0.001
personal protective equipment			
Participants who use personal protective equipment	56 (23.1)	54 (23.6)	0.028
Training			
Participants who had taken health and safety training; n (%)	64 (26.4)	60 (26.2)	0.826
Work place Supervision			
Participants who had supervised at work; n (%)	78 (32.2)	76 (33.2)	0.101

Energy use			
Use electricity for cooking; n (%)	91 (37.6)	151 (62.4)	
Use biomass fuel for cooking; n (%)	94 (41)	135 (59)	0.418

P-value from Pearson chi-square test

5.3 Prevalence of respiratory symptoms

The study showed that the magnitude of chronic respiratory symptoms among marble factory workers was 102 (42.1%) while in wine factory 37(16.2%). The most common respiratory symptom complained by workers in this study was shortness of breath 74 (30.6%) followed by chest pain 70 (28.9%) among marble workers. All symptoms shows a higher magnitude in marble factory workers.

Table 3 – Prevalence of chronic respiratory symptoms among marble workers and controls in Addis Ababa Ethiopia, January 2021.

variable	Marble workers	Controls	Prevalence OR [a] ,(95%CI)[b]	P- value
Cough	64 (26.4%)	18 (7.9%)	4.215 (2.408 – 7.376)*	0.001
Phlegm	56 (23.1%)	11 (4.8%)	5.967 (3.040 – 11.720)*	0.001
Wheezing	43 (17.8%)	8 (3.5%)	5.969 (2.740 – 13.00)*	0.001
Shortness of breath	74 (30.6%)	15 (6.6%)	6.284 (3.481 – 11.34)*	0.001
Chest pain	70 (28.9%)	13 (5.7%)	6.762 (3.620 – 12.632)*	0.001
At least one chronic respiratory symptom	102 (42.1%)	37 (16.2%)	3.781 (2.448 – 5.839)*	0.001

*Note: [a] prevalence odds Ratio, [b] 95% confidence interval and *p ≤ 0.05*

5.4 work place observation

There were lack of natural and artificial ventilation in the work place. Dust was observed in cutting, polishing and finishing departments but wet process was done to reduce the dust and to cool the machine. Most of the machines were oldies and didn't have a sucker. There was a luck of scheduled supply of personal protective equipment and even the supplied ones are poor in quality. Most of the workers didn't use personal protective and they respond that it make them discomfort during work. There was no precaution or recommendation and remedial measures that warn to use personal protective equipment at work place.

5.5 Associated factors analysis

5.5.1 Socio demographic factors

Socio-demographic factors were analyzed by binary logistic regression and it shows that monthly income has an association with chronic respiratory symptoms and workers who earn below 3000 have 1.634 times the odds of developing chronic respiratory symptoms than that of above 3000 monthly payers. All other factors are not associated with chronic respiratory symptoms in the binary logistic regression.

Table 4: bivariate analysis result of socio-demographic factors associated with chronic respiratory symptoms among marble workers and controls in Addis Ababa, Ethiopia, January 2021.

Variables	Respiratory symptoms		COR(95%CI)	P- value
	Yes	No		
Sex				
Male	103 (28.8%)	260 (71.6%)	1.262(0.796-2.000)	0.321
Female	36 (33.3%)	72 (66.7%)	1.00	
Age (in years)				
≤ 29	20 (27.8%)	52 (72.2%)	1.00	
30-39	33 (23.7%)	106 (76.3%)	1.235(0.647-2.359)	0.143
≥ 40	86 (33.1%)	174 (66.9%)	0.778(0.437-1.385)	0.394
Religion				
Orthodox	103 (29.6%)	245 (70.4%)	1.00	
Muslim and others	36 (29.3%)	87 (70.7%)	0.984(0.627-1.546)	0.945
Marital status				
Married	90 (29.1%)	219 (70.9%)	1.00	
Single and others	49 (30.2%)	113 (69.8%)	1.055(0.696-1.599)	0.800
Educational level				
Primary school and below	55 (32.2%)	116 (67.8%)	0.82(0.545-1.233)	0.341
Secondary school and above	84 (28%)	216 (72%)	1.00	

Monthly income				
3000 and above	66 (25%)	198 (75%)	1.00	
Below 3000	73 (35.3%)	134 (64.7%)	**1.634(1.097-2.435)**	**0.016**

Note: 1.00 reference value

5.5.2 Previous and family history of respiratory disease

Previous respiratory disease, family history of respiratory disease, and current smoking habit have a significant association in bivariate analysis. But ever smoking and inappropriate use of personal protectives equipment have no significant association with binary logistic regression.

Table 5: COR of Previous and family history of respiratory disease and behavioral factors associated with chronic respiratory symptoms among marble workers and controls in Addis Ababa, Ethiopia, January 2021.

Variables	respiratory symptoms		COR(95%CI)	p-value
	Yes	No		
Previous respiratory disease				
Yes	65 (67%)	49 (43%)	**5.073 (3.233-7.96)**	**0.001**
No	74 (20.7%)	283 (79.3%)	1.00	
Family history of respiratory disease				
Yes	38 (50.7%)	37 (49.3%)	**3 (1.809-4.975)**	**0.001**
No	101 (25.5%)	295 (74.5%)	1.00	
Current smoker				
Yes	1 (5.3%)	18 (94.7)	**7.911 (1.046-59.849)**	**0.045**
No	138 (30.5%)	314 (69.5%)	1.00	
Ever-smoker				
Yes	17 (31.5%)	37 (68.5%)	1.111 (0.603-2.048)	0.736
No	122 (29.3%)	295 (70.7%)	1.00	
Uses of PPE				
Yes	38 (34.5%)	72 (65.5%)	1.00	
No	101 (28%)	260 (72%)	0.736 (0.467-1.160)	0.187

Note: 1.00 reference value

5.5.3 Work-related factors

The present study found that the development of chronic respiratory symptoms was significantly associated with service year and working hours per week at bivariate analysis. Workers who are working for 48 and above hours are 1.954 (1.308-2.919) times at risk of developing chronic respiratory symptoms than that of working below 48 hours.

Table 6 Crude odds ratio of work-related factors associated with chronic respiratory symptoms among marble workers and controls in Addis Ababa, Ethiopia, January 2021.

Variables	Respiratory symptoms		COR(95%CI)	p-value
	Yes	No		
Service year				
≤ 4	34 (40.5%)	50 (59.5%)	1.00	
5-9	31 (29.8%)	73 (70.2%)	**0.521 (0.313-0.867)**	**0.012**
≥ 10	74 (26.1%)	209 (73.9%)	0.834 (0.507-1.370)	0.473
Working hours per week				
≥ 48	59 (23.1%)	196 (76.9%)	**1.954 (1.308-2.919)**	**0.001**
< 48	80 (37%)	136 (63%)	1.00	
Previous dust exposure				
Yes	32 (34.4%)	61 (65.6%)	0.753 (0.464-1.220)	0.249
No	107 (28.3%)	271 (71.7%)	1.00	
Safety training				
Yes	34 (27.4%)	90 (72.6%)	1.00	
No	105 (30.3%)	242 (69.7%)	1.149 (0.728-1.812)	0.552
Workplace Supervision				
Yes	37 (24%)	117 (76%)	1.00	
No	102 (32.2%)	215 (67.8%)	1.5 (0.968-2.326)	0.070
Energy used at home				
Use biomass fuel for cooking	93 (32.5%)	193 (67.5%)	1.456 (0.961-2.205)	0.076
Use Electricity for cooking	46 (24.9%)	139 (75.1%)	1.00	

5.6 Multivariate analysis

To identify independent predictor variables for the development of chronic respiratory symptoms, variables with, p-value < 0.2 were added at the multivariable logistic regression model.

The binary logistic regression analysis showed that monthly income was significantly associated with chronic respiratory symptoms in univariate analysis. However, the average monthly income of the participants was insignificant in multivariate analysis. Multiple logistic regression analysis showed that age greater than 40, previous respiratory disease confirmed by physician, personal protective equipment, past history of confirmed health problems, service years more than 10 years in the factory, and working hours greater than 48 per week were independent factors that determine the development of chronic respiratory symptoms.

Table 7: multivariate analysis result of factors associated with chronic respiratory symptoms among marble workers and controls in Addis Ababa, Ethiopia, January 2021.

Variables	Respiratory symptoms		COR(95%CI)	AOR(95%CI)	p-value
	Yes	No			
Age (in years)					
≤ 29	20 (27.8%)	52 (72.2%)	1.00	1.00	
30-39	33 (23.7%)	106 (76.3%)	1.235(0.647-2.359)*	0.631 (0.276-1.468)	0.285
≥ 40	86 (33.1%)	174 (66.9%)	0.394(0.437-1.385)	**1.72(1.07-2.74)**	**0.025****
Monthly income					
3000 and above	66 (25%)	198 (75%)	1.00	1.00	
Below 3000	73 (35.3%)	134 (64.7%)	**1.634(1.097-2.435)****	0.775(0.471-1.277)	0.317
Previous respiratory disease					
Yes	65 (67%)	49 (43%)	**5.073 (3.233-7.96)****	**5.073 (3.233-7.96)**	**0.001****
No	74 (20.7%)	283 (79.3%)	1.00	1.00	

Family history of respiratory disease					
Yes	38 (50.7%)	37 (49.3%)	**3 (1.809-4.975)****	0.619 (0.330-1.163)	0.136
No	101 (25.5%)	295 (74.5%)	1.00	1.00	
Current smoker					
Yes	1 (5.3%)	18 (94.7)	**7.911 (1.046-59.849)****	4.936 (0.627-38.833)	0.129
No	138 (30.5%)	314 (69.5%)	1.00	1.00	
Uses of PPE					
Yes	38 (34.5%)	72 (65.5%)	1.00	1.00	
No	101 (28%)	260 (72%)	0.736 (0.467-1.160)*	**2.158(1.189-3.918)**	**0.025****
Service year					
≤ 4	34 (40.5%)	50 (59.5%)	1.00	1.00	
5-9	31 (29.8%)	73 (70.2%)	**0.521 (0.313-0.867)****	1.771 (0.880-3.564)	0.109
≥ 10	74 (26.1%)	209 (73.9%)	0.834 (0.507-1.370)	**2.037 (1.121-3.702)**	**0.020****
Working hour per week					
≥ 48	59 (23.1%)	196 (76.9%)	**1.954 (1.308-2.919)****	**2.198 (1.356-3.561)**	**0.001****
< 48	80 (37%)	136 (63%)	1.00	1.00	
Workplace Supervision					
Yes	37 (24%)	117 (76%)	1.5 (0.968-2.326)*	2.523(1.383-0.758)	0.29
No	102 (32.2%)	215 (67.8%)	1.00	1.00	
Energy used at home					
Use biomass fuel for cooking	93 (32.5%)	193 (67.5%)	1.456 (0.961-2.205)*	0.980(0.600-1.601)	0.935
Use Electricity for cooking	46 (24.9%)	139 (75.1%)	1.00	1.00	

*P-value < 0.2 **P-value < 0.05 and independent predictors for development of chronic respiratory symptoms

6. Discussion

In this study, the magnitude of chronic respiratory symptom was higher in marble factory workers than in wine factory workers 42.1% and 16.2% respectively. The study showed that about 50 (20.7%) of the participants among marble work reported that they were exposed to dust in their previous work history, whereas 43 (18.8%) of the wine workers reported they had exposure to dust in their previous workplace.

The most common respiratory symptom complained by workers in this study among marble workers was shortness of breath 74 (30.6%). This finding is similar to the study conducted in India among marble workers which indicated that the most common respiratory symptom was shortness of breath (26%)(23). A study done in Ebonyi state, southeastern Nigeria, reported a higher prevalence of 47.6% for cough and 40.7% for chest pain among quarry workers (37). Reports from studies among quarry workers in Brazil also showed a prevalence of irritant cough of 57.1% while in Iran, a prevalence of cough of 31.9% was recorded (2). The reason for the difference between the studies could be differences in technological use and variation in the study area.

According to our study marble workers are more at risk of chronic respiratory symptoms than the control group workers. Our finding is consistent with the study done in Egypt that showed workers exposed to chronic inhalation of the dust in marble working processes had a higher prevalence rate of respiratory illness(9).

This study showed that workers aged above 40 years were 1.722 times more likely to develop chronic respiratory symptoms than workers aged below 40 [AOR = 1.72,95 % CI, (1.07-2.74)]. This is comparable with a study done in Dejen cement factory which shows Workers aged ≥ 45 years were more likely to develop chronic respiratory symptoms (AOR = 4.20, 95 % CI = 1.94, 9.12) than workers in the age category 18–29 years old (17). A study done in south Africa also showed that exposed elderly persons had a significantly higher prevalence of chronic respiratory symptoms and diseases than those who were unexposed (27).

In this study workers with work experience of more than 10 years were more likely to develop chronic respiratory symptoms than below 10 years [AOR=2.037, 95% CI, (1.121-3.702)]. The finding from the present study is similar to the study done on marble workers in Besole Village, Indonesia that stated workers who suffer from chronic respiratory diseases are workers with more than 10 years' work period(24). The finding is also consistent with the study conducted on whetstone cutters for 40 years of follow-up showed that more than half of the workers deceased due to chronic diseases and concluded that duration of service is among the influential factors in determining the progression of the disease(39).

The study also showed that those who were exposed for more than 48 hours per week were more likely to develop chronic respiratory symptoms than workers who exposed for less than 48 hours [AOR = 2.198,95 % CI,(1.356-3.561)]. This might be due to exposure to a long time increased dust accumulation in the respiratory system.

In this study workers who had a confirmed chronic respiratory diseases are more likely to experience a chronic respiratory symptoms [AOR = 5.073, 95% CI (3.233-7.96)]. A study done in Dejen cement factory Workers also showed that workers who had previous chronic respiratory diseases experienced chronic respiratory symptoms more likely than workers who were free from previous chronic diseases (AOR = 7.79, 95 % CI = 2.02, 30.04) (17).

This study found that the use of PPE is significantly associated with chronic respiratory symptoms [AOR 2.158 CI (1.189-3.918)], which is a protective factor but the majority 73% of workers didn't use personal protective equipment and the most common reasons for not using personal protective equipment were 54.6% not provided by the company. Studies showed that adherence to PPE use is a preventive factor that results in a decrease in respiratory illness(39). Workers who obey the habit of wearing masks will minimize inhalation exposure while breathing(24). Nwibo et al study 2012 in Ebonyi state Nigeria stated that non-use of PPEs was found among 98.3% of the quarry workers and this is comparable to the situation in our study (37).

Employees who use piece of cloths instead of respirators as a personal protective was significantly associated with chronic respiratory health symptoms among flour mill factory workers. Flour mill

workers who used pieces of cloths had 56% less at risk of developing chronic respiratory symptoms (AOR = 2.29, 95% CI; 1.27–04.13) than workers who did not use pieces of cloths (40). A study done in the Bahirdar textile factory shows that workers who did not utilize their personal protective equipment in the work area were 4.88 times more likely to develop respiratory symptom than those who utilize their PPE in the working area (AOR = 4.88, 95% CI: 1.54-15.45) (30)

7. Strength and limitations of the study

7.1 Strength

- This study was comparative; it can show the magnitude of chronic respiratory symptoms between the two groups.
- This is the first study to assess the magnitude of chronic respiratory symptoms among marble factory workers in Ethiopia.

7.2 Limitations

- Since the study design was a cross sectional it may not describe the cause and effect relationship.
- Participants recall bias on age, past respiratory illness and past dust exposure may over or under estimate the study result.
- Only healthy workers who were present during the data collection were enrolled in the study, which may contribute to underestimating the effect of interest.
- Another limitation can be lung function test and dust level measurement were not done which make more the explanatory of respiratory symptoms.

8. Conclusion

Based on the finding of this study, it can be concluded that prevalence of chronic respiratory symptoms were higher among marble workers than wine factory workers. Age more than 40 years, years of service greater than 10, long working hours of greater than 48 hours per week, previous history of chronic respiratory illness, and lack or inappropriate use of personal protective are associated risk factors for the occurrence of chronic respiratory symptoms.

9. Recommendation

This study will help as an initial point for the area and further studies should be done. Government should give attention to factory workers' health and develop strong measures of qualified personal protective usage by workers and supply by the owners. Reducing exposure hours to dust, checking health status for early diagnosis and treatment, proper usage of personal protective equipment is needed to reduce respiratory problems.

Workers should be trained on protective measures of dust exposures and apply them throughout their life. Shifting of workers is also recommended to reduce long exposure in dusty areas. Owners have to introduce mitigation measures like use of wet processes which reduces the generation of dust, exhaust natural and artificial ventilation in workshops, and provision of qualified personal protective equipment.

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11. Annex

Participant Information sheet

How are you? I am ----------. I came here as a data collector for the investigation done by Ephrem Bogale who is a student in Addis Ababa university for the fulfilment of master of science in public health. You are selected with systematic random selection method from your staffs and by this you didn't get any kind of direct benefits and didn't faced any harm but you contribute indirectly for public health. The responses you give all are kept in secrete and confidentiality is confirmed. By the end of the study the investigator gives a recommendations for concerned bodies and will increase the protective measures in dusty working environments. If you have any suspicions or you need further details you can communicate the investigator and primary advisor.

Investigator

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Primary advisor

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Informed consent form

All the objectives of the study are told me and I also believed the harmlessness of the study and also I didn't expect any direct benefit in terms of many from this interview. The data collector also told me the confidentiality of my responses and also he told me the full addresses of investigator and advisor for further information in need. I am aware of terminating the interview if I am not comfortable. I respond without any influence by believing the significance of my response in chronic respiratory problems occurred in relation to working environment.

Signature ---------- date ----------

Data collector: - Name ----------

Signature ----------

Date ----------

English Version Questionnaire

A questioner modified from British medical research council (BMRC) respiratory questionnaire of Great Britain and American Thoracic Society and National Heart & Lung Institute - Division of Lung Disease Respiratory Questionnaire to Asses respiratory symptoms and associated factors among marble and awash wine factory workers in Addis Ababa, Ethiopia, 2019/2020

Industry type

1. Marble factory
2. Wine factory

Factory code ----------

Respondent's serial number ----------

Date of interview (D/M/Y) ----------

Part 1 :- Socio demographic conditions of the respondent			
S.No	Question	Response	Skip pattern
101	Sex	1. Male 2. Female	
102	Age	--------year (D/M/Y)	
103	Marital status	1. Married 2. Single 3. Divorced 4. Widowed	
104	Educational status	1. Can't Read and write 2. Read and write 3. Primary 4. Secondary	

		5. College and above	
105	Occupation status	1. Permanent staff 2. Temporary staff	
106	Monthly salary	---------- ETB	
Part 2 :- chronic respiratory symptoms related questions			
201 A	Do you usually cough in the morning?	1. Yes 2. No	If no skip to 202 A
201 B	Do you usually cough during the day or night?	1. Yes 2. No	
201 C	Do you cough on most days for as such for three months?	1. Yes 2. No	
201 D	In the past year have you had a period of (increased) cough lasting for three weeks or more?	1. Yes 2. No	
201 E	For how many years you had this cough?	---------- years	
202 A	Do you usually bring up phlegm from your chest in the morning?	1. Yes 2. No	If no skip to 203 A
202 B	Do you usually bring up phlegm from your chest during the day or night?	1. Yes 2. No	
202 C	Do you bring up phlegm from your chest on most days for as such for three months?	1. Yes 2. No	

202 D	In the past year have you had a period of (increased) phlegm lasting for three weeks or more?	1. Yes 2. No	
202 E	For how many years you had this phlegm?	---------- years	
203 A	Are you trouble by shortness of breath?	1. Yes 2. No	If no skip to 204 A
203 B	Do you get short of breath walking with other people?	1. Yes 2. No	
203 C	Do you have to stop for breath when walking at your own pace on level ground?	1. Yes 2. No	
204 A	Have you had wheezing and whistling in your chest at any time in the last year?	1. Yes 2. No	If no skip to 205 A
204 B	Have you had wheezing and whistling sound when you had cold?	1. Yes 2. No	
204 C	For how many years you develop this sound?	---------- years	
205 A	Have you had chest illness with in the last year?	1. Yes 2. No	If no skip to 301 A
205 B	Have you had more than one such illness with in the last one year?	1. Yes 2. No	
Part 3:- Past respiratory illness concerned questions?			

301 A	Have you ever had a chronic respiratory illness confirmed by physician?	1. Yes 2. No	If no skip to 303 C
302 B	If yes for question 301 A which kind of chronic respiratory disease?	1. Asthma 2. Pneumonia 3. Bronchitis 4. Chest illness 5. Heart trouble 6. Other	
303 C	Were either of your natural parents had a chronic respiratory illness confirmed by physician?	1. Yes 2. No	If no skip to 401 A
303 D	Which kind of chronic respiratory disease?	1. Asthma 2. Pneumonia 3. Bronchitis 4. Chest illness 5. Heart trouble 6. Other	
Part 4 :- life style questions			
401 A	Do you smoke now?	1. Yes 2. No	
401 B	If yes: - how many cigarettes per day?	----------	
401 C	If No: - Have you ever smoked as much as one cigarette a day (or one cigar a week or an ounce of tobacco a month) for as long as a year?	1. Yes 2. No	

401 D	Did you cook your food?	1. Yes 2. No	If no skip to 501 A
401 E	Where did you cook?	1. Inside home 2. Outside home 3. In kitchen	
401 F	What kind of energy source do you use for cooking your own food?	1. Charcoal 2. Wood 3. Kerosene 4. Electric 5. other	
Part 5 :- Work area related questions			
501 A	How long have you been working in this factory?	---------- year	
501 B	For how many hours per day do you work in this factory?	---------- year	
501 C	For how many days per week do you work?	---------- year	
501 D	In which department you work now?	---------- year	
501 D	Number of years employed in this occupation?	---------- year	
501 E	Have you worked in other factory that exposed you for dust before?	1. Yes 2. No	
	If yes for question number 501E in which kind of factory?	1. Coffee 2. Textile 3. Cement 4. Flour	

		5. Steel 6. Gas station	
Part 6 :- personal protective related questions			
601 A	Did you wear respiratory protective while you are on work?	1. Yes 2. No	
601 B	Which kind of protective?	1. Mask respirator 2. Full face piece respirator 3. Breathing apparatus 4. Others/specify	
601 C	If your answer for the question number 601A is No, what is the reason for not wearing?	1. Not available 2. Not comfortable for work 3. Not provided by the institution 4. The dust is not harmful 5. Others specify_____	
601 D	Do you ever had occupational health and safety training?	1. Yes 2. No	
601 E	Have you ever been supervised at work for occupational health and safety?	1. Yes 2. No	

Observational checklist

R.No		Yes	No	Remark
1.	Is there adequate ventilation in the workplace?			Natural/Artificial
2.	Is dust observed in the surrounding? In which department?			
3.	Is the machinery modern?			Dust exit
4.	Did the factory supply personal protective equipment			Observe in store
5.	Are they standard in quality?			
6.	Did workers use Personal protective			On job observation
7.	Are there precautions that recommend, guide, and warn to use personal protective?			

Participant Information Sheet (Amharic Version)

ጤና ይስጥልኝ ---------- እባላለሁ፡፡ የመጣሁት በፋብካው ላይ በሚሰራው የመተንፈሻ አካላት የጤና ችግሮችና መንስኤዎቻቸው የሚል የአዲስ አበባ ዩኒቨርሲቲ ተማሪ የሆኑት የአቶ ኤፍሬም ቦጋለን የድህረ ምረቃ ጥናት መረጃ ለመሰብሰብ ነው፡፡ በጥናቱ መጨረሻ ጥናት አድራጊው የጥናት ውጤቱን መሰረት በማድረግ የመፍትሄ አቅጣጫዎችን ለሚመለከታቸው አካላት በማቅረብ የበሽታ ተጋላጭነት እንዲቀንስና የመከላከል አቅም እንዲያድግ ያደርጋል፡፡ በጥናቱ የሚደርስብዎት ምንም አይነት ጉዳት የለም በቀጥታ እሚያገኙትም ምንም አይነት የገንዘብ ድጋፍም የለውም፡፡ በጥናቱ ላይ ተሳታፊ በመሆንዎ ግን በተዘዋዋሪ ለህብረተሰብ ጤና አስተዋፅኦ ያደርጋሉ፡፡የሚሰጡትም መረጃ ሚስጥራዊነቱ የተጠበቀ ሲሆን ለቃለ መጠይቁ ፈቃደኛ ከሆኑ 30 ደቂቃዎችን አብረን እንቆያለን፡፡ማንኛውም እሚያጠራጥርዎት ነገር ካለ ወይም ለተጨማሪ መረጃ ከጥናት አድራጊው እንዲሁም ለጥናቱ ፍቃድ ከሰጡ አካላትና አማካሪ ጋር ውይይት ማድረግ ይችላሉ፡፡

ጥናት አድራጊው

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Informed consent form (Amharic version)

<u>የስምምነት ፎርም</u>

ስለ ጥናቱ አጠቃላይ አላማ ተገልያልኛል፡፡ በጥናቱ ምንም አይነት አደጋ እንደማይደርስብኝና የምሰጠው መረጃ ሚስጥራዊነቱ የተጠበቀ እንደሆነም አውቄያለሁ፡፡ በጥናቱ የማገኘው ገንዘብ እንደሌለ ነገር ግን ይህንን ጥናት ተከፋይ በመሆኔ በስራ ላይ የሚያጋጥሙ የጤና ደህንነት ችግሮች ላይ ትልቅ መፍትሄ ልፈጥር እንደምችል አምኜበታለሁ፡፡ ማንኛውንም አጠራጣሪ ጉዳይ ካጋጠመኝና ተጨማሪ ማብራሪያዎች ካስፈለጉኝ ፈቃድ ከሰጡ አካላት ጋር በቀጥታ መወየየት እንድችል ሙሉ አደራሻ ተሰጥቶኛል፡፡ ካልፈለኩም ጥናቱን ማቋረጥ እንደምችል ተገልያልኛል፡፡ እነዚህን ሁሉ ነገሮች ተገንዘቤና በጥናቱ አሰፈላጊነት አምኜ መልስ የሰጠሁ መሆኑን በፊርማዬ አረጋግጣለሁ፡፡

መረጃውን የሰጠው ፊርማ ---------- ቀን ----------

የመረጃ ሰብሳቢ ፊርማ ---------- ቀን ----------

Amharic version of questionnaire

በአዲስ አበባ ከተማ ባሉ የእምነበረድ ፋብሪካዎች ላይ የቆየ የመተንፈሻ ህመም ምልክቶችን እንዲሁም ተያያዥ ምክንያቶችን በተመለከተ ለሚደረገው ጥናት የተዘጋጀ መጠይቅ 2012 ዓ/ም

የፋብሪካው አይነት

1. እምነበረድ ፋብሪካ
2. ወይን ፋብሪካ

የፋብሪካ ኮድ ----------

የምላሽ ሰጪው መለያ ቁጥር ----------

መጠይቁ የተደረገበት ቀን ----------

ክፍል ፣ - ማህበራዊ ሁኔታን የተመለከቱ ጥያቄዎች			
ተ.ቁ	ጥያቄ	ምላሽ	ይለፍ
101	ፆታ	1. ወንድ 2. ሴት	
102	እድሜ	-------- አመት (ቀን/ወር/ዓም)	
103	የጋብቻ ሁኔታ	1. ያገባ/ች 2. ያላገባ/ች 3. የፈታ/ች 4. የሞተበት/ባት	
104	የትምህርት ደረጃ	1. ያልተማረ/ች 2. ማንበብና መፃፍ 3. አንደኛ ደረጃ 4. ሁለተኛ ደረጃ 5. ኮሌጅና ከዛበላይ	
105	የስራ ሁኔታ	1. በቋሚነት 2. ጊዜያዊ ቅጥር	
106	በወር የሚያገኙት የደሞዝ መጠን	---------- ብር	
ክፍል 2 :- የመተንፈሻ አካላት የጤና ምልክቶችን የተመለከቱ ጥያቄዎች			

201 ሀ	ጠዋት ጠዋት ሳል ያስልዎታል?	1. አዎ 2. አይ	አይ ከሆነ ወደ 202 ሀ
201 ለ	በቀን ወይም በማታ ጊዜ ሳል የስልዎታል?	1. አዎ 2. አይ	
201 ሐ	ይህ ሳል ለ 3 ወራት ያከል ቆይቶብዎታል?	1. አዎ 2. አይ	
201 መ	ላለፈው አንድ አመት ለሶስት ሰምንትና ከዛ በላይ አስልዎታል?	1. አዎ 2. አይ	
201 ሰ	ይህ ሰል ለምን ያህል ጊዜ ቆይቶብወታል?	---------- አመት	
202 ሀ	ጠዋት ጠዋት ከደረት እሚወጣ አክታ ይታይብዎታል?	1. አዎ 2. አይ	አይ ከሆነ ወደ 203 ሀ
202 ለ	ይህ አክታ በቀን ወይም በማታ ጊዜ ይታያል	1. አዎ 2. አይ	
202 ሐ	ይህ አክታ ለ 3 ወራት ያከል ቆይቶብዎታል?	1. አዎ 2. አይ	
202 መ	ላለፈው አንድ አመት ለሶስት ሰምንትና ከዛ በላይ አክታ ነበረብዎት?	1. አዎ 2. አይ	
202 ሰ	ይህ አክታ ለምን ያህል ጊዜ ቆይቶብወታል?	---------- አመት	
203 ሀ	የትንፋሽ እጥረት ችግር አጋጥሞዎት ያውቃል?	1. አዎ 2. አይ	አይ ከሆነ ወደ 204 ሀ
203 ለ	ከሌሎች ሰዎች ጋር በሚራመዱበት ጊዜ የትንፋሽ እጥረት ያጋጥምዎታል?	1. አዎ 2. አይ	
203 ሐ	በራስዎ ፍጥነት በጓዙ ጊዜ የትንፋሽ ማጠር አጋጥሞዎት ያወቃል?	1. አዎ 2. አይ	
204 ሀ	ባለፈው አንድ አመት ውሰጥ ከደረትዎ የማፏጨት ድምፅ ይወጠል?	1. አዎ 2. አይ	አይ ከሆነ ወደ 205 ሀ

204 ለ	ይህ ድምፅ ቅዝቃዜ ሲሰማዎት ይከሰታል?	1. አዎ 2. አይ	
204 ሐ	ይህንን ድምፅ መስማት ከጀመሩ ምን ያህል ጊዜ ሆነዎት?	---------- አመት	
205 ሀ	ባለፈው ፣ አመት ውስጥ የደረት ህመም ነበረበዎት?	1. አዎ 2. አይ	አይ ከሆነ ወደ 301 ሀ
205 ለ	ባለፈው ፣ አመት ውስጥ ከ አንድ ጊዜ በለይ የደረት ህመም ኣጋጥሞዎታል?	1. አዎ 2. አይ	
ክፍል 3:- የቆየ የመተንፈሽ አካል ህመም ታሪክን በተመለከተ?			
301 ሀ	በህክምና ባለሞያ የተረጋገጠ የቆየ የመተንፈሻ አካላት የጤና ችግር ነበረብዎት?	1. አዎ 2. አይ	አይ ከሆነ ወደ 303 ሐ
302 ለ	መልስዎ አዎ ከሆነ የትኛው አይነት የቆየ የመተንፈሻ አካላት የጤና ችግር ነበረብዎት?	1. አስም 2. ኒሞኒያ 3. ብሮንካይትስ 4. የደረት ህመም 5. የልብ ድካም 6. ሌሎች	
303 ሐ	በወላጆ እናትዎ ወይም አባትዎ በህክምና ባለሞያ የተረጋገጠ የቆየ የመተንፈሻ አካላት የጤና ችግር ያለበት ነበር?	1. አዎ 2. አይ	አይ ከሆነ ወደ 401 ሀ
303 መ	መልስዎ አዎ ከሆነ የትኛው አይነት የቆየ የመተንፈሻ አካላት የጤና ችግር?	1. አስም 2. ኒሞኒያ 3. ብሮንካይትስ 4. የደረት ህመም 5. የልብ ድካም 6. ሌሎች	
ክፍል 4 :- የህይወት ዘይቤ ጥያቄወች			
401 ሀ	ሲጋራ ያጨሳሉ?	1. አዎ 2. አይ	

401 ለ	አዎ ከሆነ በቀን ምነ ያህለ ያጨሰሉ?	----------	
401 ሐ	አይ ከሆነ ከዚህ በፊት ቢያንስ በቀን አንድ ሲጋራ ያጨሱ ነበር?	1. አዎ 2. አይ	
401 መ	ምግብ ያበስላሉ?	1. አዎ 2. አይ	አይ ከሆነ ወደ 501ሀ
401 ሰ	ምግብዎትን እሚያበስሉት የትነው?	1. በቤት ውሰጥ 2. ከቤት ውጪ 3. በኩሽና ውሰጥ	
401 ረ	ምገብ ለማብሰለ እሚጠቀሙተየሀይል መንጭ ምንድነው?	1. ከሰል 2. እንጨት 3. ጋዝ 4. ኤሌክትሪክ 5. ሌሎች	
ክፍል 5 :- የስራ አካባቢን የተመለከቱ ጥያቄዎች			
501 ሀ	በዚህ ፋብሪካ ውስጥ ለምን ያህል ጊዜ ሰርትዋል?	---------- አመት	
501 ለ	በቀን ውስጥ ለምን ያህል ጊዜ ይሰራሉ?	---------- አመት	
501 ሐ	በሳምንት ለምን የህል ቀናት ይሰራሉ?	---------- አመት	
501 መ	አሁን የሚሰሩት በየትኛው የስራ ክፍል ነው?	---------- አመት	
501 ሰ	ይህን ሰራ ለምን ያህል አመት ሰርተዋል?	---------- አመት	
501 ረ	ከዚህ በፊት ለብናኝ እሚየጋለጥ ስራ ላይ ሰርተው ያቃሉ?	1. አዎ 2. አይ	
501 ሠ	ለጥያቄ ቁጥር 501 ረ መልሰዎ አዎ ከሆነ በምን ፋብሪካ ውስጥ?	1. ቡና 2. ጨርቃጨርቅ 3. ሲሚንቶ 4. ዱቄት 5. ብረታብረት 6. ነዳጅ ማደያ	

ክፍል 6 :- የስራ ላይ ደህንነት መተበቂ መሳሪያዎችን በተመለከተ			
601 ሀ	በስራ ላይ እያሉ የብናኝ መከላከያ ያደርጋሉ?	3. አዎ 4. አይ	አይ ከሆነ ወደ 202 ሀ
601 ለ	ምን አይነት መከላከያ ይጠቀማሉ?	1. የአፍና አፍንጫ ጭምብል 2. የፊት መሸፈኛ ጭምብል 3. የአየር ማጣሪያ 4. የልብስ ቁረጭ 5. ሌሎች	
601 ሐ	ለጥያቄ ቁጥር 60ነ ሀ መልስዎ አይ ከሆነ እማይለብሱበት ምክንያት ምንድነው?	1. ስለሌለ 2. ስለማይመች 3. ስለማይቀርብልን 4. ጉዳት ስለሌለው 5. ሌሎች	
601 መ	የሰራ ላይ ደህንነት ስልጠና ወስደው ያውቃሉ?	1. አዎ 2. አይ	
601 ሰ	የሰራ ላይ ደህንነት ክትትል ይደረግልወታል?	1. አዎ 2. አይ	