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Occupational diseases and injuries among artisanal small scale gold mining workers in Oddo Shakiso woreda, Guji zone of Oromia regional state, Southern Ethiopia

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ACRONYMS AND ABRREVIATIONS

AAU	Addis Ababa University
AFI	Acute Febrile Illness
AOR	Ajusted Odds Ratio
ASGM	Artisanal Small Scale Gold Mining
ASM	Artisanal and Small Scale Mining
ATS	American Thoracic Society
Au	Gold
BMRC	British Medical Research Council
CI	Confidence Interval
CNS	Central Nervous System
COPD	Chronic Obstructive Pulmonary Diseases
COR	Crude Odds Ratio
CVD	Cardio Vascular Diseases
EEITI	Ethiopian Extractive Industries Transparency Initiative
EPHI	Ethiopian Public Health Institute
ESA	Excavation Sifting and Amalgamation
ETB	Ethiopian Birr
FDRE	Federal Democratic Republic of Ethiopia
GMA	Global Mercury Assessment
GTP II	Growth and Transformation Plan II
Hg	Mercury

ILO	International Labor Organization
MOLSA	Ministry of Labor and Social Affairs
MOMP	Ministry of Mine and Petroleum
NORHED	Norwegian programe for capacity building in higher education and research for development
OELV	Occupational Exposure Limit Value
OSH	Occupational Health and Safety
OSHM	Occupational Health and Safety Management
PPE	Personal Protective Equipments
SOP	Standardized Operation Procedures
SPSS	Statistical Package for Social Sciences
TB	Tuberculosis
USD	United States Dollar
UN	United Nation
UV	Ultra Violate light
WHO	World Health Organization

Abstract

Back ground: Mining is an important economic activity; Artisanal and Small scale Gold Mining is widely practiced. This mining activity is known for different occupational exposures but the occupational health status of workers is not adequately understood. The aim of this study was to estimate the magnitude of occupational diseases and injuries of workers in Artisanal and Small Scale Gold Mining in Oddo Shakiso woreda, Oromia, Ethiopia.

Methods: cross sectional study design was employed from April to June 2020. Using simple random sampling technique 403 participants was interviewed. Protein was analyzed using urine dipstick test to explore mercury toxicity and observation checklists were utilized. Linear regression for mercury intoxication and logistic regression for respiratory diseases and injury were applied. Predictor variables with p value <0.05 in multivariate analysis were considered as determinant factors. β coefficients for linear regression and odds ratio for logistic regression with 95% CI were used for the interpretation of results.

Results: the overall prevalence of mercury toxicity was estimated to be 50.4% (95% CI: 45.2%-55.3%), respiratory diseases 40.0% (95% CI: 35.0- 44.9 %) and the incidence of injury was 29%. Mercury toxicity was significantly associated with marital status, years of work experience and exposure to chemicals in mining. Respiratory disease was also associated with alcohol drinking, living with animals in the same house, work experience, excavation sifting amalgamation jobs, and exposure to chemicals and engagement in additional job. The occurrence of injury was associated with work shift, and excavation and sifting job.

Conclusion: High prevalence of occupational diseases and injuries were found. Work-related and behavioral characteristics were significantly associated with the occurrence of diseases and injuries. The health problems of workers might be due to occupational exposure in artisanal and small scale gold mining. Therefore, workers' health protection program including awareness creation and personal protective equipment access should be initiated. Further intervention research should be conducted.

Keywords: Occupational diseases, Artisanal small scale gold mining, mercury toxicity, respiratory diseases and injury

1. INTRODUCTION

1.1. Back ground

Mining is an activity or occupation of extracting a natural element or its compound from the earth (1). Huge numbers of workers are involved in mining (2). Artisanal small scale mining (ASM) is mining activity by an individual or a small group using traditional methods and devices. It is the main income generating activity and plays significant role in modernizing the mining sector in less developed states (3). Though it varies from state to state, artisanal small-scale gold mining (ASGM) is gold mining process by individuals or small groups with limited financial capacity (4).

Globally mining is a wide activity. The number of workers participating in ASGM is increasing from time to time. This increment is particularly seen in developing countries. The reason of this is due to increasing price of gold and wide spread poverty (5). Approximately 10 to 15 million people engage in ASM mining including gold mainly in Africa, Asia, and South American countries (3, 6-15). Gold production by ASGM accounts 20%–30% of the world's total gold product. This activity of mining by ASGM using mercury, contributes for approximately 37% of global atmospheric mercury emissions (5, 16).

In Ethiopia, the mining sector is taken as a priority area for the achievement of growth and transformation plan II (GTP II) (ranging 2016-2020). The country has huge potential of artisanal and small scale gold mining (ASGM) for centuries with close to one million miners getting involved to produce and export about 9 tons of gold annually. With the current market price, this subsector is expected to have a contribution of about 600,000,000 USD (United States Dollar) per annum (17).

International labor organization's (ILO's) diseases list and other literatures have given contextual meaning to occupational diseases. Occupational diseases are chronic disorders that are caused by biological, chemical or physical agents because of engaging in an occupation or job. Disease caused by mercury compounds, asthma, and musculoskeletal disorders are some of the occupational disease lists (18-20).

ASGM has many public health challenges. Exposure to dust, poor ventilation and other dangerous working condition are common problems (2, 21). Though there is no safe level of mercury (22), gold miners use mercury amalgamation as the primary means of gold extraction (23). These miners are prone to mercury induced health problems (6). Respiratory diseases are important challenges in occupational setting. Tuberculosis (TB) is one among the highly risk respiratory diseases for mining workers (24). Globally 22 countries including Ethiopia that use mercury in ASGM have prevalent cases of TB victim miners (25). Asthma, pneumonia and bronchitis are also common respiratory diseases. On the other hand, coughing, wheezing and shortness of breath are the most prevalent symptoms (26). Injury is the other health problem in ASGM. Larger number of injuries occurs here as compared to large scale mining sector (3). It is a major concern in occupational setting especially in sub Sahara Africa. Falling, explosion, fire, collapse of mining sites and rock fallings are common causes of injury in this sector (27).

In Ethiopia, ASGM is the wider sub sector as compared to the available large scale companies in terms of employment (28). But it poses serious public health problems on the mining community(29). However, there is no adequately found and organized data.

1.2. Statement of the problem

Mining is one among the most hazardous jobs (30). ASGM is associated with many challenges because basic infrastructures are not easily accessible in the area (21). Miners are exposed to different disease- causing microorganisms, chemicals and physical hazards (2). Gold mining using mercury amalgamation is a hazardous process (23, 31). Miners do not know the negative health impacts of mercury (5, 27, 32). But they are highly exposed to mercury toxicity (6). Toxicity of nerves, toxicity of immunity, kidneys' toxicity, genetic disorders, physiological impairment, increased cardiac risks and cancer risks are some of the toxic effects of exposure to mercury (33). The toxicity prevalence of mercury in the sector varies by countries but it ranges from 46.7% in Ghana to 72% Zimbabwe (8, 34-36). A study in Tanzania showed 67% of females involved in ASGM and exposed to mercury faced menstrual problems (37). Ethiopia uses about 0.3 tones of mercury annually for ASGM activity (25) but we do not have sufficient information about the possibility of mercury toxicity in the country's mining sector.

Respiratory diseases and injuries are among the concerns in mining. A study in Brazil showed that 22.4% workers developed respiratory problems (38). Phlegm was found to be the most prevalent respiratory symptom accounting (49.1%) followed by breathlessness with 43 % in a study of Tanzania (30). In Denmark, injury causes 3- 6% of absent working hours from all diseases (39) and nearly 97 % injuries occurred in ASM workers (3). Falling, explosion, fire, collapse of mining sites and rock falling are common causes of injury in the sector in Sub Sahara Africa (27). But no sufficient data on mining sectors found in Ethiopia.

ASGM is a challenging activity. Miners have lack of basic knowledge about the harmful outcomes (40). Nearly a third (34.7%) of the study participants missed their work days for over two weeks and 25.0 % of them were not interested about the health and safety issues in their work place (41). There is exposure to mercury but little is known about the magnitude of occupational hazards and injury problems in the sector. There is no adequate information to address the challenges in it (27, 41). The problem is wide but the interventions being taken are less. One study showed that about 86.6% workers did not wear personal protective equipment (PPE)(34). Awareness creations, training as well as occupational health and safety (OSH) practices are poorly practiced in the sector (5, 41).

1.3. Rationale and significance of the study

Though there is large workforce engaged in ASGM, it is a hazardous occupational environment. The health challenges are not addressed well because there is lack of data and insufficient OSH service. Although, using mercury is banned as it is potentially damaging exercise, it is still used in many ASGM running countries. Workers are not aware of the health problems of mercury use. Also they are victims of injury and respiratory diseases. Use of safety equipment and training are poorly practiced in the sector. The concern given to OSH in ASGM setting is low.

The study will be important to estimate the magnitude of occupational disease (mercury toxicity and respiratory diseases) and injury as well to estimate the associated factors that ASGM workers face in their working place. Then it will be helpful to take appropriate intervention measures to prevent, control or reduce those health challenges. It will also have paramount importance in strengthening OSHM practices in ASGM settings. Researchers may use this study as a stepping stone to carry out their task in the area.

2. LITERATURE REVIEW

2.1. The magnitude of occupational diseases and injury in ASGM

Occupational diseases refers to diseases that are exacerbated or caused due to exposure to workplace hazards (42). Workers in mining face different health challenges. A study in Zimbabwe showed that chronic mercury toxicity and injury due to open pits are common problems in mining (43). Another study in Ghana also showed that respiratory problems are prevalent among mining workers. International Labor Organization (ILO) studied about health problems related to occupation. In the study it was found that close to 2.34 million people, including miners, die annually as a result of work-related accidents and diseases. From these, the large segment i.e. 2.02 dies of work related diseases (26).

2.1.1. The magnitude of occupational diseases

2.1.1.1. The magnitude of mercury toxicity

Mercury is a very toxic metal that can exist in different forms. It is widely used in many countries' ASM activity to produce gold. This way of gold production is the main anthropogenic source of mercury emission. Mercury used in this process can be inhaled, ingested or it can have contact with skin so that it can cause different damages (36).

Mercury toxicity can be detected by various types of screening mechanisms. The mount of mercury for which mining workers has been exposed to, can be analyzed from blood, urine, hair, breast milk or liver tissue samples (44). Coordination disorder, ataxia and tremors are typical manifestations of chronic mercury toxicity for 80% highly exposed ASGM miners (43). Excessive salivation, tremor at work, sleep problems at night, gingival bluish coloration, ataxia of gait, heel to shin (leg) ataxia, proteinuria, dysdiadochokinesia, matchbox-test and pencil tapping test are considered as the ten (10) indicators to assess mercury toxicity (45). The magnitude of mercury toxicity showed variation in different studies. According to three studies conducted in Ghana at different times 46.7% (8), 55.5% (34) and 58.4% (35) of ASGM miners were intoxicated by mercury. In Zimbabwe, the prevalence was found to be 72% (36).

Elemental mercury can damage kidneys as it is excreted by them. Mercury vapor can cause frank proteinuria (46) and the presence of proteinuria is suggestive of mercury toxicity (34, 46-48). A comparative study comparing miners and non miners showed that proteinuria (≥0.3 g/L) was observed to be detected by 92.6% and 72.4% respectively (49). Urinalysis for proteinuria value may serve as a screening test to detect renal impairment induced by mercury intoxication. Miners intoxicated with mercury vapor will usually show laboratory sign of proteinuria. The severity is identified by the presence of proteinuria (in the moderate case) and high proteinuria (in the severe case) (48).

2.1.1.2. The magnitude of respiratory diseases

Respiratory diseases are important challenges in occupational setting. Tuberculosis is one among the highly risk respiratory diseases for mining workers. Miners of sub-Saharan Africa are more likely to have higher incidence and prevalence of TB (24) as to any other working population in the world. This accounts 3-7% of the diseases per year. However many countries do not have the data of OSH adequately to design appropriate intervention measures (26).

Though the magnitude varies in different countries, respiratory disorders are major concerns in ASGM. A study showed that asthma is the leading (37.5%) respiratory disease in mining sector. It is followed by pneumonia and bronchitis accounting 14.3% and 9.7% in order. Coughing is the most prevalent symptom (35.4%). Chest pain (25.4%), wheezing (21.2%) and shortness of breath (10.6%) come next to it (26). In another study, 22.4% workers were found to have respiratory symptoms (38). A study in Tanzania showed that phlegm was most prevalent respiratory symptom (49.1%). And breathlessness came next with 43%. The rest was held by cough and wheezing accounting 37.5%, and18.8% in their order (30).

2.1.2. The magnitude of injury

Miners are prone to one or more injuries in ASGM sites. Fractures (30.5%), Contusions (29.1%), lacerations 14%, spinal cord injuries, and neurogenic shock were the major injury types that were frequently faced by the above mentioned workers (3). According to a study conducted in Ghana, abrasions, lacerations, puncture wounds, amputations, dislocations and fractures were the main injury events. More than half of the injury events were lacerations (57%) followed by puncture wounds (13%) and abrasions (11%). Almost 70% of the injuries were the upper/ lower limbs and feet injuries accounted 20%. Head, eyes, ears and face injuries measured 17% (41).

The magnitude of injury is various in different situations. According to a study in Ghana, about 23.5% of miners reported that they faced one or more injury episodes in the past ten years. The majority of respondents (78.9%) experienced a single injury episode in their employment period. And 1,5,13 miners experienced 5, 3, and 2 injury episodes respectively in the last ten years. The over all injury proportion among ASGM workers was 5.4% in a year (41).

A study done in Ghana's Upper East Region on ASGM Community showed that injury rates were 45.5 % and 38.5 % in 2011 and in 2013, respectively (27). In an other study in Denmark, the primary injuries were 25% contusions, 22% open wounds, 19% strain injuries, 18% fractures, 4% concussions, 3% injuries to muscles , 2% burns, and 7% others (39).

2.2. Factors affecting occupational diseases and injury

2.2.1. Factors affecting occupational diseases

2.2.1.1. Factors affecting mercury toxicity

2.2.1.1.1. Socio demographic and behavioral factors

Among the socio demographic factors, educational status has association with exposure to mercury toxicity. A study in Ghana showed that illiterate miners were three times more affected by mercury toxicity than those educated to secondary level of education (34).

Individuals' dietary behavior plays its part in their health status. Fish consumption can cause mercury intoxication. Many fish contain high level of mercury and routine fish consumption is considered as one factor (5). In a study of Indonesia, fish consumption was found to be significantly associated with mercury poisoning (50).

2.2.1.1.2. Occupational factors

Tasks in mining activity have contribution to mercury toxicity. Crushing and amalgamation facilitated the exposure of miners to mercury (5, 35). Studies showed that amalgam burners were considered as highly intoxicated groups (54%) (49). The level of Hg toxicity also had a positive association with the work experience of miners (35, 51).

According to a study in Indonesia, there was significant association of working hours per day, working frequency/ week and working period (experience) with mercury intoxication. Again significant association was found between PPE use and mercury toxicity (50). More than half (65.6%) ASGM miners didn't know hazards of mercury utilization. Majority (97.7%) were not trained about safely handling of mercury. The use of PPE among ASGM miners was insignificant; aprons is not used by 98.0% miners; 91.8% did not use face marks, 93.6% did not use gloves, 90.4% did not use boots, and 91.5% did not use head covering (8).

2.2.1.2. Factors affecting respiratory diseases

2.2.1.2.1. Socio demographic factors

In a study miners aged 30, 30–40, 40–50 and >50 years had asthmatic problem with magnitude of 44.3%, 52.9%, 27.4%, and 32.3% respectively and 19.4% bronchitis victims were > 50 years old. An increase in age by one year increased the possibility of developing asthma but there was an inverse relation with an emphysema development. In this study it was also found that marital status had contribution for exposure to emphysema (26).

Educational status has direct impact on respiratory diseases development. Those mining workers, who were educated to secondary school were much more (55.6%) affected by asthma as compared to those educated to tertiary level (29.8%). Improvement in educational status also decreased the probability of being affected by pneumonia (26).

2.2.1.2.2. Behavioral factors

Respiratory diseases are also affected by behavioral factors. Miners' history of smoking and alcohol drinking behavior contribute for respiratory diseases. In a study of Ghana the 9.1% asthmatic and 18.2% bronchitis cases were smokers. In the same study 44.6% asthmatic cases and 7.1% bronchitis cases were found as alcohol drinkers. Miners, who were alcohol drinkers, had increased chance of having pneumonia and asthma (26). One study done in mining community of Sub Sahara Africa showed that current smokers were significantly affected by phlegm production but other symptoms were not significantly associated. Cooking fuel and cooking sites are associated with asthma and chronic bronchitis (7). Rural and mining communities can be affected by smoke from biomass fuel (5).

2.2.1.2.3. Occupational factors and other medical conditions

Occupational factors affecting respiratory diseases are broad. An increase in experience enhanced the risk of having pneumonia. Exposure to dust and chemicals were also believed to be frequently presented work related causes of respiratory illness with magnitude of 64.1% and 57.9% respectively (26). ASGM workers can develop pulmonary fibrosis, chronic obstructive pulmonary diseases (COPD) and silicosis in 20-45 years after exposure to silica (5). A study in Tanzania revealed that airborne crystalline silica exposure as a major contributor to TB (52).

Tasks are occupational factors that have association with respiratory diseases. A study done in mining community of Sub Sahara Africa showed tasks as among the factors associated with asthma and chronic bronchitis (7). Miners, acutely exposed to mercury while amalgamation, showed signs of toxicity; impairment of pulmonary function and respiratory distress (53, 54).

Respiratory illness history plays role in affecting occupational respiratory diseases. Asthma was found significantly associated with known risk factors; history of allergic rhinitis, eczema and family history of asthma. Family history of allergic problems and smoking history were also the other factors associated with asthma (55).

2.2.2. Factors affecting injury

2.2.2.1. Socio demographic factors

Socio demographic factors contribute for the occurrence of injury. Different studies were conducted in Ghana by diffrenet time but with similar work setting (ASMG). In one study, about 12.0 % females and 2.7 % males were found to be injury victims (41). In an other study, males were more significantly affected by injury than females. In this study it was shown that being male increased the risk of having injury by odds of nine (27).

2.2.2.2. Occupational factors

Falls (25%) and entrapment by collapsing mine pits (22.2%) are the major causes of injury in ASM. The rest crushing, clashes between miners and other factors, drowning, explosions and fires account 19.4, 19.4%, 5.6 %, 5.6 %, and 2.8% respectively (2, 3). In a study of Ghana, more than 70% of the injuries were caused by being hit by an object. The use of tools causes 17.3% of the injury (41). Workers having less than one year work experience are more vulnerable than others; It was responded to be 25.3% (highest), 12.7%, 5.10%, and 4.36% for working experience of < 1year, 1–<5 years, 5–10 and >10 years respectively (41).

The day time and task also affects the occurrence of injuries; 43.8% injuries occurred during the morning shift, 36.4% in the afternoon and 19.8% in the evening/night. Occurrence of injury varies between tasks. Excavation covered 58.7% and crushing 23.1% but no injuries recorded in sifting and amalgamation (41).

Majority (69%) don't know the causes of injury. Nearly 40% of the study participants believe that injury can be prevented. Out of these, 50% think that proper use of personal protective equipments (PPE) can prevent injury (5, 27, 41). Lack of OHS training, financial limitations and inefficient SOPs (standard operating procedures) and enforcement, are major challenges to use PPE. Some mining operators are not willing to invest in OSHM activities (5).

2.3. Conceptual frame work

Conceptual framework is a brief diagrammatic image of the literature review. It in this study the conceptual framework was developed based on the literatures reviewed. This conceptual frame work has three main elements; the socio- demographic factors, occupational/ work related factors and behavioral factors. Its purpose is to show in brief the important exposure variables that may affect the outcome variables in the reviewed literatures.

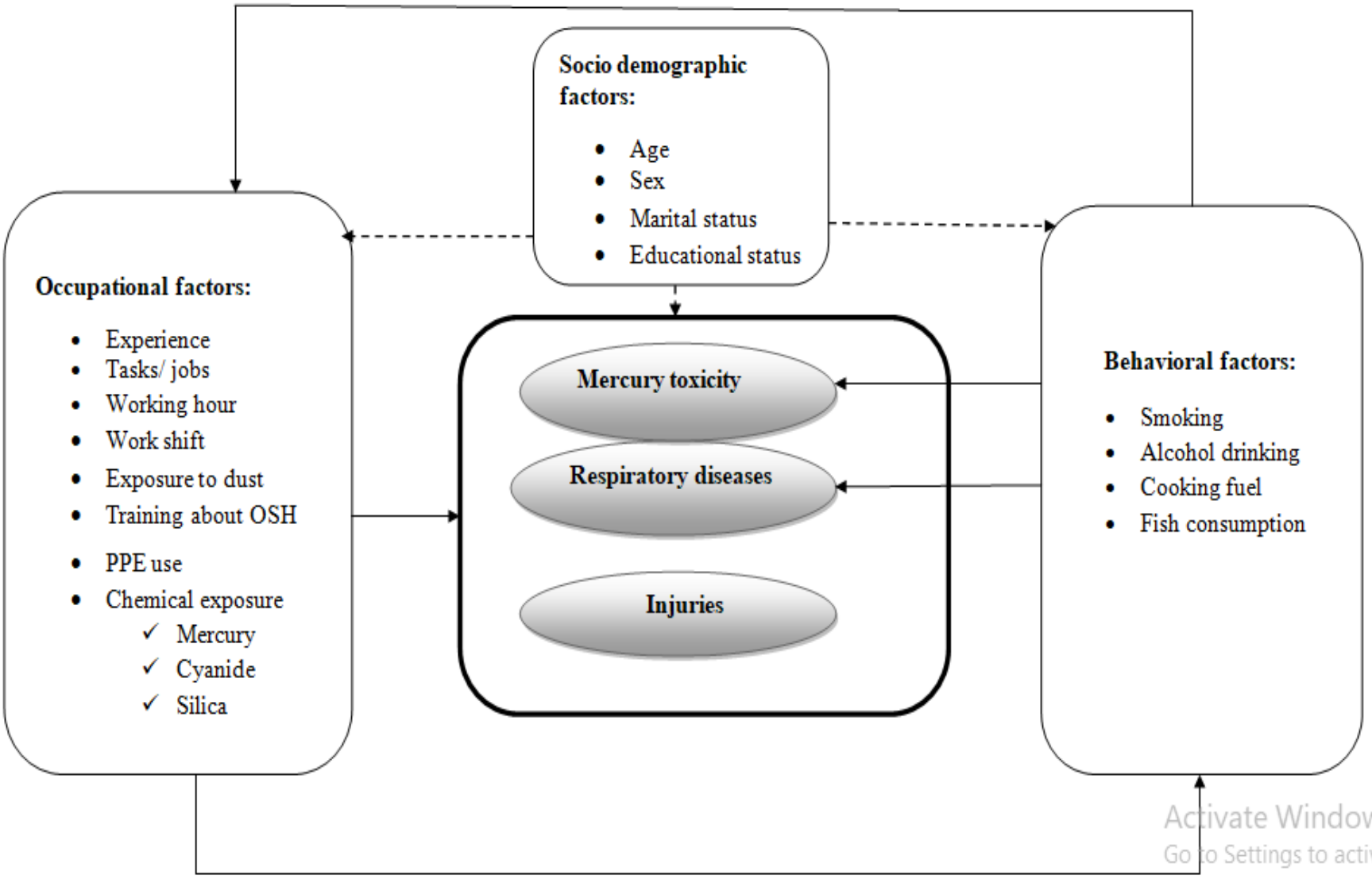

Figure1 Self developed conceptual framework that shows factors affecting occupational diseases and injuries among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2019

3. OBJECTIVES

3.1. General objective

To describe the magnitude of occupational diseases, injuries and associated factors among Artisanal Small scale Gold Mining workers in Oddo Shakiso Woreda, Guji Zone of Oromia regional state, Southern Ethiopia from April to June 2020

3.2. Specific objectives

3.2.1. To determine the prevalence of occupational diseases and injuries (mercury toxicity, respiratory diseases and injury) among Artisanal Small scale Gold Mining workers in Oddo Shakiso Woreda, Guji Zone of Oromia regional state, Southern Ethiopia, from April to June 2020

3.2.2. To identify factors associated with occupational diseases and injuries among Artisanal Small scale Gold Mining workers in Oddo Shakiso Woreda, Guji Zone of Oromia regional state, Southern Ethiopia, from April to June 2020

4. METHODS AND MATERIALS

4.1. Study design and period

In this study, cross sectional study design was employed from April to June 2020.

4.2. Study area

The study was conducted in Oromia national regional state, Guji zone particularly in Oddo Shakiso woreda artisanal and small scale gold mining kebeles. Oddo Shakiso woreda is 139km far away from Negele (the capital of Guji zone) and 490 km from south of Addis Ababa. It is organized by 22 rural kebeles out of which 11 (50%) have ASGM cooperatives. The total population of the woreda was 132,017 of which 66, 537 were males and 65,480 females. There were 65,480 households. The woreda has five health centers and 31 health posts (2019/ 20 Oddo Shakiso woreda health office). About 14% of the population practices ASM (56). Because of the seasonal security problems, the study was allowed to be conducted in three kebeles with the guidance of the woreda mining desk.

Gold mining has long history in the area. It started in 1930's but miners face many health challenges. Respiratory diseases, congenital anomalies, cancer, skin and kidney diseases as well abortion were among the common health problems within 4 km radius of the mining sites (56). There were about70 artisanal small scale-gold mining cooperatives organized formally (2019/20 Shakiso woreda mining desk report).

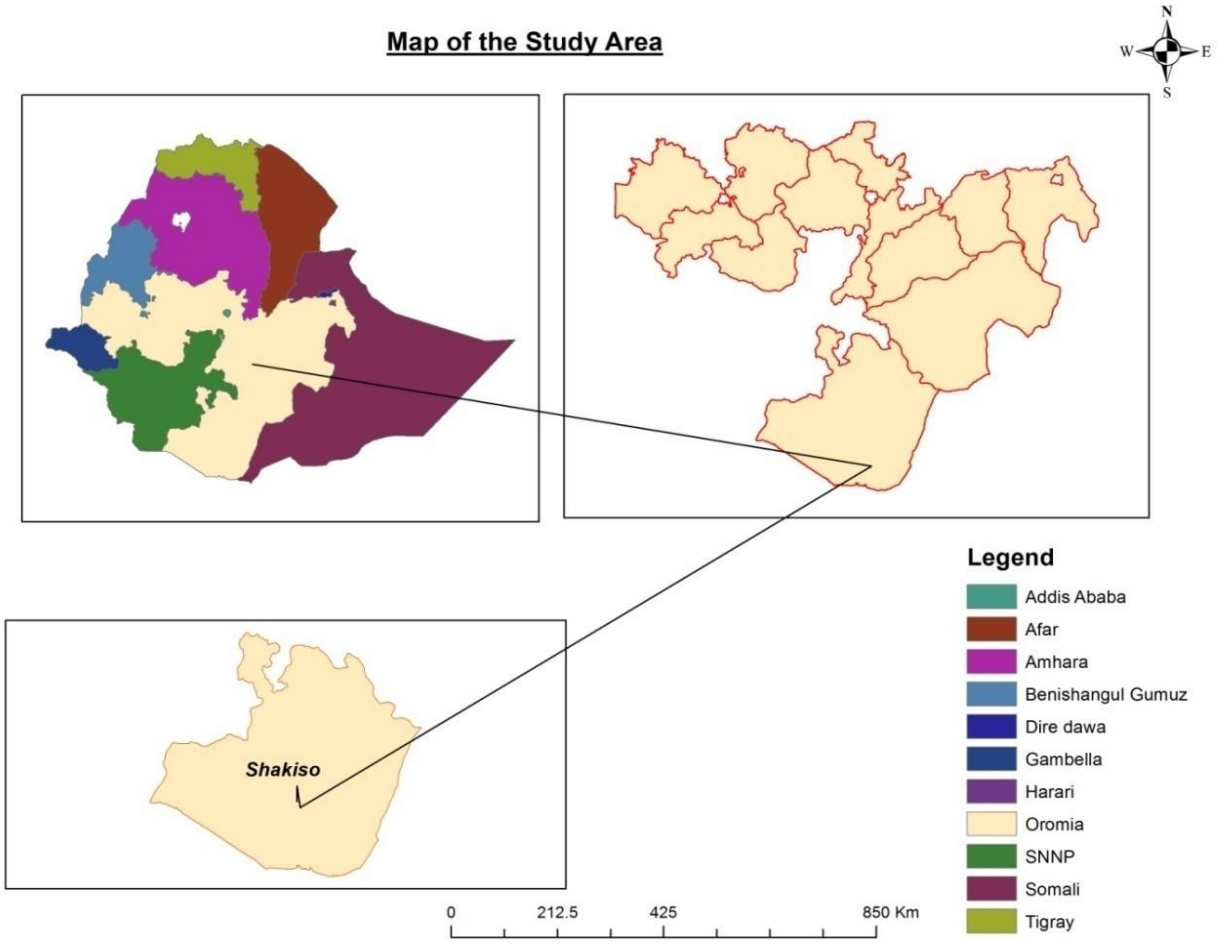

Figure 2 Map of the study area (Oddo Shakiso woreda)

4.3. Population

4.3.1. Source population

The source population included all ASGM workers in the three kebeles, within the woreda, involved in ASGM mining activity at the time of data collection

4.3.2 Study population

This included mining workers who were involved in selected ASGM mining kebeles and interviewed as well gave urine samples

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

Any apparently healthy ASGM workers present at the time of data collection and worked at least for one year (to minimize the impact of frequent migration of workers to/from the mining areas) were included in the study.

4.4.2. Exclusion criteria

Any miner aged less than 18 years old (unacceptable to conduct a research in less than 18 years old children with the routine ethical code of conduct) was considered as non target group. Those miners who were absent at the time of data collection were excluded from the study.

4.5. Sample size determination and sampling methods

4.5.1 Sample size determination

Sample size for objective 1

Since the prevalence of mercury intoxication was 46.7% as a study in conducted in Ghana (8), the sample size was calculated by using single population proportion formula with confidence level of 95% and precision (D) 5%. So sample size was calculated as follows:

$n=(Z\alpha/2)^2 PQ/ D^2 = 1.96^2 X\ 0.47X0.53/0.05^2 = 384$, Where

$Z\alpha/2$ =A standard Z score= 1.96, corresponding to 95% confidence level

P = prevalence mercury exposure = 46.7 ≈ 47 %, Q= 1- P, in this case; 1- 47% = 53%

D= desired level of precision= margin of error, in this case 5%= 0.05

By adding 10% non response rate, the sample size was found to be 422.

A study done in Ghana's Upper East Region on ASGM Community showed injury rate of 45.5 % (27). So P= 0.46 and Q= 0.54. By taking 95% confidence level and 5 % level of precision; $n=(Z\alpha/2)^2 PQ / d^2 = 1.96^2 X0.46X\ 0.54/0.05^2 = 384$. Adding 10%, it gave 422. It was similar to the above result.

Sample size for objective 2

Burning was a significantly associated factor for mercury toxicity. Miners working in burning task were much more affected (87 %) as compared non burners (13 %) (34).

Using double population proportion formula;

$$\mathbf{n = \frac{(Z_{\alpha/2}+Z_{\beta})^2 * (p_1(1-p_1)+p_2(1-p_2))}{(p1- p2)^2}},$$ where

$Z_{\alpha/2}$ = is the critical value of the normal distribution at α/2 for a confidence level of 95%= 1.96

Z_{β} = is the critical value of the Normal distribution at β for a power of 80%= 0.84

$P_{1=}$ proportion of burning workers toxicated by mercury =86.9%= 0.87 and

$P_{2=}$ proportion of non burning workers toxicated by mercury = 13.1%= 0.13, so

$$\mathbf{n = \frac{(1.96+0.84)^2 * (0.87(1-0.87)+0.13(1-0.13))}{(0.87- 0.13)^2} = \frac{2.8^2*(0.11+ 0.11)}{(0.74)^2} = \frac{1.72}{0.55} \approx 3.12= 3}$$

In that case, it was too small to represent the target population by this sample size. So the final sample size of the study was determined by the first objective being **422.**

4.5.2. Sampling methods: Sampling frame and selection of sampling sites

The study was conducted in three kebeles of the woreda with the guidance of woreda mining desk. ASGM activity had three main tasks (working sections); excavation and crushing (E), sifting and washing (S), amalgamation and burning (A). There were about 47 ASGM cooperatives each with an average of 35 members, totally 1645 workers (N) (from 2019/20 Shakiso woreda mining desk report). Study participants (n) were selected by simple random sampling method from each mining site proportional to the number of workers within the tasks using lottery method.

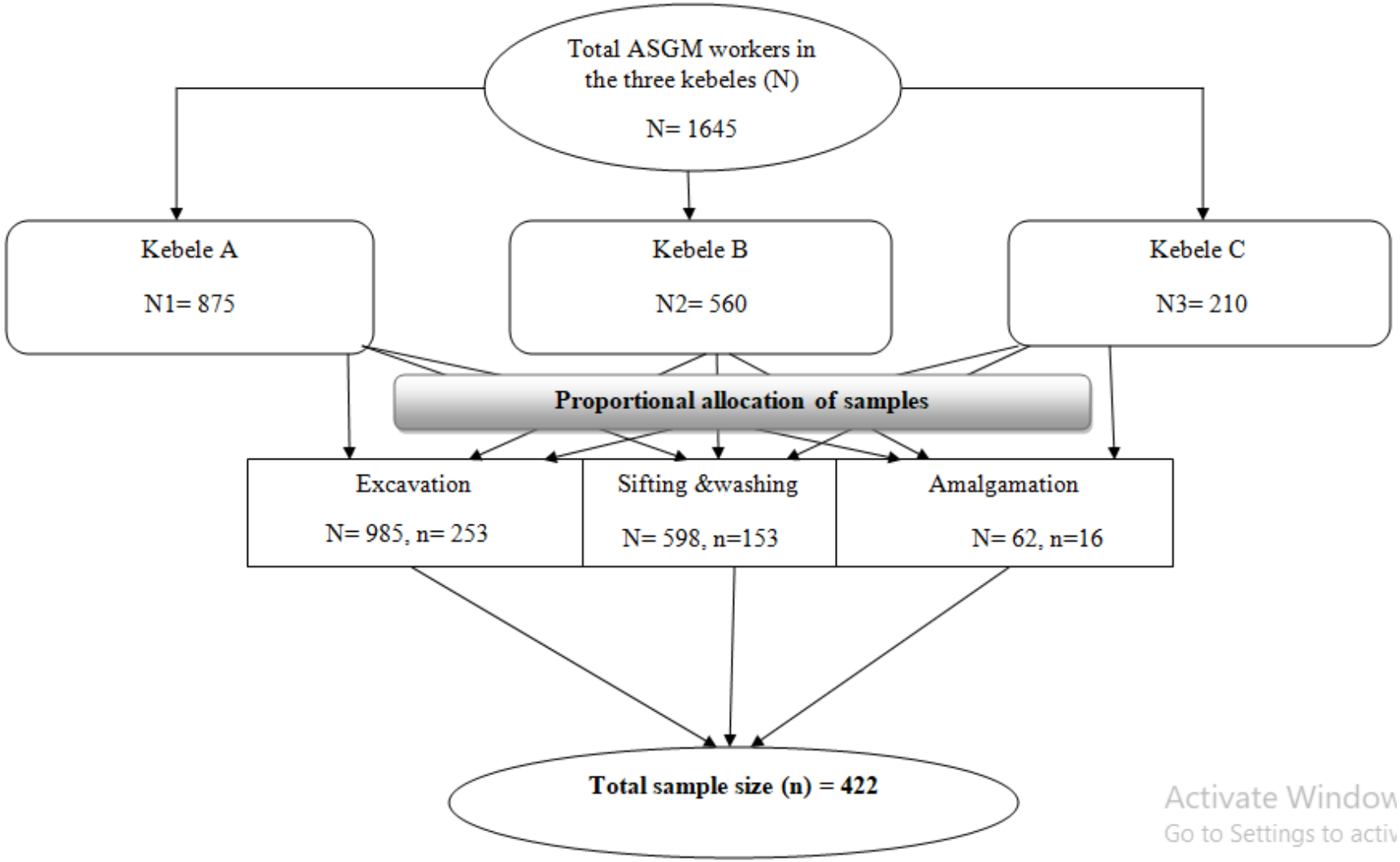

Figure 3 A diagram showing sampling procedures in ASGM tasks of Oddo Shakiso woreda, Ethiopia, May 2020

4.6. Study variables

4.6.1. Dependant variables

Mercury toxicity, **respiratory diseases** and **injury** were the dependent variables.

4.6.2. Independent variables

Socio demographic characteristics; age, sex, marital status and educational status

Behavioral factors; cigarette smoking; alcohol drinking; dietary habit, cooking style

Occupational factors; working period **(**experience), tasks/jobs, working hour, working shift, OHS training, PPE use, exposure to chemicals.

4.7. Study tools and data collection procedures

4.7.1. Study tools

Pretested structured questionnaire adapted from Global Mercury Assessment (GMA) evaluation tool (6, 57), American Thoracic Society questionnaire (ATS) (58) and British Medical Research Council questionnaire (BMRC) (59) were used for primary data collection; urine dip stick test for urinalysis findings was performed; in addition to questionnaire, we used observation checklist which was developed based on hazard analysis check list (60); the observation was supported by photographs taken in the course of the data collection process; well trained data collectors and laboratory professionals from Shakiso health center and from private clinics participated in the study.

4.7.2. Data collection procedures

Data collection questionnaire was prepared in English and translated to Afan Oromo and Amharic language for data collection; again it was translated back to English for analysis; diploma holder nurse, pharmacy technician and laboratory technician were trained and participated in the data collection process; two coordinators were assigned to facilitate the data collection process. After getting informed consent and interviewing, study participants gave urine samples. Random spot of about 20 ml urine sample (34) was collected. Data collection procedure was randomly checked.

4.7.3. Operational definitions

Occupational diseases: mercury toxicity and respiratory diseases among ASGM workers (18)

Mercury toxicity is impairment of body functioning by Hg manifested by the presence of

1. proteinuria ($\geq$ 0.3g/L protein in urine found by urine dipstick test) (49) **or**

2. at least one of the following mercury toxicity indicators; excessive salivation, tremor at work, sleep problems at night, gingival bluish coloration, ataxia of gait and leg (heel- shin) ataxia (45).

Proteinuria: Presence of proteinuria is suggestive of mercury toxicity (34, 46-48)

Respiratory disease is the presence of at least one of the following four (4) chronic respiratory symptoms: Cough, phlegm, wheezing and dyspnea (7).

1. **Chronic cough** coughing usually early in the morning, at night or during the rest of the day or coughing on most days/nights for as much as three or more months
2. **Chronic phlegm** is production of sputum for at least three months in a year
3. **Chronic wheezing** is having whistling breathing sound in the absence of cold
4. **Chronic dypnea (shortness of breath)** difficulty of walking with person of the same age or difficulty of walking on level ground or the need to rest in short walks (7).

Chronic bronchitis: having two respiratory symptoms; chronic cough (for longer than 3 months) and chronic phlegm for (production longer than 3 months) (7).

Asthma: a confirmed respiratory medical disorder told to the miner by a physician

Injury an incident respondents self report as cause to miss work for at least a day excluding the day the injury happened or that cause respondents to seek medical attention/ first aid (61).

Artisanal small-scale gold mining (ASGM) the process of producing gold containing resources manually by individuals, groups or communities (62).

Minamata Convention on Mercury: A global treaty to protect human health and the environment from the adverse effects of mercury(62).

Excavation is extracting gold from the soil by digging underground wells (63).

Crushing is grinding gold containing ore using traditional tools like hammer (62).

Sifting isolating fine and course crush products.

Washing is making the crushed product dissolve in water leaving insoluble mixture.

Amalgamation- mixing of raw gold with liquid mercury to free the gold from its ore (63)

Burning-the final stage, the gold-mercury mixture is heated to evaporate Hg leaving Au (63)

Renal diseases: a disease of kidney or renal system confirmed by a physician

Current smoker is a worker who was regular cigarette smoker at the time of the study or stopped smoking a month ago (58)

Ex-smokers or Former (past) smokers: workers who quitted smoking at least a year ago (64)

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 (64)

Smoker: someone who smoked at least a single cigarette daily for at least a year or smoked at least 20 packs (20x20 pieces) of cigarettes in life time (58).

Never-smokers: miners who smoked less than 100 cigarettes/ lifetime (7)

Rarely drinking is drinking alcohol only on holidays (26)

Regular drinking is drinking alcohol at least weekly (26)

4.8. Data management and quality assurance

Training manual and SOP preparation, coordinator and interviewer training and pre testing the questionnaire were held. The questionnaire was pretested on 5% of ASGM study participants working around Awata River. The pretest was used to check the uderstandability of the questionnaire and to correct it accordingly. Completeness and consistency of data was checked before entry and each questionnaire was coded with unique ID. Again it was cleaned by SPSS using frequency table and cross tabulation. Data was entered to Epi Info version 7.2 and analyzed by SPSS software version 20.

4.9. Data processing and analysis

For the first objective, descriptive statistics; frequency and proportion (for categorical variables), mean and standard deviation (for continuous variables) were used to analyze the prevalence of mercury toxicity, respiratory diseases and injury.

For the second objective, linear regression was applied to predict the association of explanatory variables affecting level of proteinuria, as mercury toxicity indicator. And binary logistic regression analysis was performed for factors affecting injury and respiratory diseases. Those explanatory variables having P value less than 0.25 in bivariate analysis were again analyzed by multivariate analysis. Variables with $P < 0.05$ and 95% confidence level in the multivariate analysis were considered statistically significant. **β (beta)** coefficient was used in interpreting the results of linear regression and **OR (Odds Ratio)** for the logistic regression. Lastly data was presented by tables, figures or narration.

4.10. Ethical consideration

Ethical approval letter was got from AAU Ethical review board and acceptance letter from Ministry of mine, Oromia Mine Bureau, Oddo Shakiso Woreda Mine Office and from respective kebeles; well explained informed consent was got from study participants. In the data collection process, interview was conducted and urine sample was collected only from volunteer participants. Each volunteer participant had equal chance of being interviewed; there was full right to ask any question, refuse or terminate from participation. The study participants were required to spend some portion of their time in the interview and sample collection process. Those whom urine sample was taken from had compensation payment (50 birr for each participant). We tried to arrange appropriate health services by negotiating with Shakiso health center for those found ill of injury and respiratory diseases while the course of the data collection. Data was coded and kept secret to ensure its confidentiality.

5. RESULTS

5.1. Socio-demographic characteristics

Out of the total expected 422 respondents, 403 were completely interviewed making a response rate of 95.5%. Among all the respondents, 317 (79.0%) were males and 86 (21.0%) females. The mean (±SD) age of miners were 30.3(±7.0) with a range of 18 - 50 years. Nearly half of them, 189 (47.0%) were Protestant religion believers followed by orthodox Christians 119 (30.0%). Regarding marital status, 193 (48.0%) were singles. Majority, 292 (73.0%) were educated to primary level. The average number of family size was 3 with a range of 1-15. Monthly average income varied with mean (±SD) of ETB 4775.0 (±1764.0) ranging from 1,000 -10,000 **(Table 1).**

Table 1 Socio- demographic characteristics of ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020 (n= 403)

Variables	Category	Frequency (n)	Percent (%)
Sex	Male	317	79.0
	Female	86	21.0
Religion	Protestant	189	47.0
	Orthodox	119	30.0
	Muslim	54	13.0
	*Others	41	10.0
Marital status	Single	193	48.0
	Married	178	44.0
	Divorced	32	8.0
Educational status	Informal education	86	21.3
	Primary education	292	72.5
	Secondary education	25	6.2
Family size	≤5	302	75.0
	>5	101	25.0
Average monthly income (ETB)	1000- 3500	122	30.0
	3501- 5000	141	35.0
	5001- 6000	68	17.0
	6001- 10,000	72	18.0

***Religions included 'catholic and wake fena'**

- Wake fena is a religion and the followers are called 'wake feta'

ASGM = Artisanal small scale gold mining

5.2. Behavioral and living condition characteristics

Respondents behaved differently and led varied lifestyles. About 22.0 % (89) respondents, were cigarette smokers but 314 (77.9%) were non smokers. With regard to alcohol drinking behavior, 128 (31.8%) drank alcohol regularly; the rest 275 (68.2%) never drank. Nearly all, i.e. 395 (98.0%) of the respondents did not usually consume fish. Besides, 183 (45.4%) cooked at home and138 (34.2%) lived with animals in the same house. Out of those mining workers who cooked at home, 176 (98.3%) used both biomass and charcoal as a primary source for cooking and 7 (1.7%) workers used gas and electricity as primary cooking sources (**Table 2).**

Table 2 Behavioral and lifestyle conditions among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020

Variable	Category	Frequency	%
Smoking **(n=403)**	Ever Smoker	89	22.1
	Non smoker	314	77.9
smoking in years **(n= 89)**	<10	74	83.1
	≥10	15	16.9
alcohol drinking (**n= 403**)	Regular Drinker	128	31.8
	Non drinker	275	68.2
drinking in years **(n= 128)**	< 10	101	78.9
	≥ 10	27	21.1
cooking at home **(n= 403)**	Yes	183	45.4
	No	220	54.6
cooking source **(n= 183)**	Biomass and Charcoal	176	98.3
	Electricity and Gas	7	1.7
Living with animals **(n= 403)**	Yes	138	34.2
	No	265	65.8

5.3. Work related characteristics and other medical conditions

There were different work related characteristics among ASGM workers. The average year of work experience was 9(±6) with the range of 1- 30 years. Among the total respondents, 100 (24.8%) had experience of <5 years, 194 (48.1 %) had 5-10 years and 109 (27.1%) above 10 years. Majority, 261 (64.8%), worked both in the morning and afternoon work shift. More than half of the respondents, 221 (54.8%), was engaged in excavation and sifting job. Out of all miners, 56 (13.9%) had other jobs in addition to mining. All 403 respondents did not take any training about OSH. Nearly all (98.5%) did not use PPE. About 10 % of the workers reported that they used different chemicals including mercury, cyanide and others for mining process **(Table 3).**

There was previous history of respiratory and other medical conditions among mining workers. Out of the total respondents, 14(3.5%) had previous history of asthma. History of renal diseases accounted 39 (9.7 %) but majority of the respondents, 260 (90.3 %) did not have any renal disease. The mean (±SD) Leukocyte count (leu/L) in urine test was 4.4 (±17.7) (**Table 3**).

Table 3 Work related characteristics and other medical conditions among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020 (n= 403)

Variable	Category	Frequency	%
Experience (in years)	< 5	100	24.8
	5-10	194	48.1
	>10	109	27.1
Work shift	Morning	25	6.2
	Afternoon	28	6.9
	Morning and afternoon	261	64.8
	Morning and evening	89	22.1
Tasks	Excavation	87	21.6
	Excavation and sifting	221	54.8
	Excavation, sifting and amalgamation (**ESA**)	95	23.6
Jobs other than mining	Yes	56	13.9
	No	347	86.1
Having contact with chemicals in mining	Yes	41	10.2
	No	362	89.8
Previous history of asthma	Yes	14	3.5
	No	389	96.5
Previous history of renal diseases	Yes	39	9.7
	No	364	90.3

5.4. The magnitude of occupational diseases among ASGM workers

5.4.1. The magnitude of mercury toxicity

Miners responded that they experienced different mercury toxicity indicator- symptoms; 203 (50.4%) had proteinura (protein in urine ≥ 0.3g/L) in urine dipstick test, 53 (13.2 %) and 50 (12.4%) felt excessive salivation and ataxia of leg- discomfort on leg while on movement respectively, 45 (11.2%) experienced tremor at work, 43 (10.7%) had insomnia- loss of sleep, 39 (9.7%) felt ataxia of gait- disturbing movement of walking and 32 (7.9%) faced bluish discoloration of gum **(Table 4**).

Table 4 Mercury toxicity indicator- symptoms of ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020 (n= 403).

Variables	Frequency (yes)	Percent (%)
Proteinura (protein in urine ≥ 0.3g/L)	203	50.4
Excessive salivation	53	13.2
Leg ataxia (discomfort on leg while on movement)	50	12.4
Tremor (shivering) at work	45	11.2
Insomnia (loss of sleep)	43	10.7
Ataxia of gait (trouble walking)	39	9.7
Bluish discoloration of gum	32	7.9

5.4.2. The magnitude of chronic respiratory diseases

Miners experienced different kinds of respiratory symptoms. Chronic cough (117, 29.0%) was the most common presented respiratory symptom. Chronic phlegm (63, 15.6%) was the second ranking complaint followed by chronic dyspnea (48, 11.9%) and chronic wheezing (41, 10.2%). Chronic bronchitis accounted (15.1%). Totally, 161 respondents presented at least one chronic respiratory symptom hence the overall prevalence of chronic respiratory diseases among ASSGM miners was 40.0% (95% CI: 35%, 44.9%) **(Table 5)**

Table 5 Chronic respiratory diseases and symptoms among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020 (n= 403)

Respiratory symptoms	**Category**	**Frequency**	**%**
At least one chronic symptom	Yes	161	40.0
	No	242	60.0
Two chronic symptoms	Yes	79	19.6
	No	324	80.4
Three or more chronic symptoms	Yes	11	2.7
	No	392	97.3
Chronic cough	Yes	117	29.0
	No	286	71.0
Chronic phlegm	Yes	63	15.6
	No	340	84.4
Chronic dyspnea	Yes	48	11.9
	No	355	88.1
Chronic wheezing	Yes	41	10.2
	No	362	89.8
Chronic bronchitis	Yes	61	15.1
	No	342	84.9

5.5. The magnitude of injury

5.5.1. The incidence of injury

The incidence of injury was 29 % for the last one year; 85 (84.2%) faced injury only once and 16 (15.8%) faced twice. Among the injured, 45 (44.6%) got first aid/ medical service and 56 (55.4%) was treated by traditional methods. Majority, 86 (85.1%), missed one or more work days other than the day of injury.

5.5.2. Types of injury

The types of injuries that miners faced were various; abrasion was the leading with 31 (30.7%) followed by19 (18.8%) lacerations and 15(14.9%) punctured wounds **(Table 6)**.

Table 6 Types of injury among ASGM workers in Oddo Shakiso, Ethiopia, 2020

Type of injury (n= 101)	Frequency	Percent (%)
Abrasion	31	30.7
Lacerations	19	18.8
Punctured wounds	15	14.9
Fracture	10	9.9
Spinal cord injury	9	8.9
Dislocation	6	5.9
Neurogenic shock	4	4.0
Amputation	1	1.0
Others	6	5.9
Total	101	100

5.6. Determinant factors associated with occupational diseases

5.6.1. Determinant factors associated with mercury toxicity

In the bivariate linear regression analysis some of the socio- demographic, behavioral, work related and medical condition variables were candidates for multivariate analysis at p value < 0.25; age, sex, marital status, educational status, alcohol drinking, smoking, experience, work shift, tasks, having contact with chemicals in mining activity, medical illness and leukocyte.

In the multivariate linear regression analysis being married (β: 95%CI; -0.221: -0.380, -0.064), work experience (β: 95%CI; 0.071: 0.058, 0.083) and having contact with chemicals in mining (β: 95%CI; 0.201: 0.056, 0.346) were significantly associated with proteinuria at p value <0.05. Workers who were married, more years at work and having contact with chemicals for mining had higher risk of mercury toxicity adjusted for the variables age, sex, marital status, educational status, smoking, alcohol drinking, work experience, work shift, type of job, having contact with chemicals in mining activity, renal diseases and leukocyte count **(Table7).**

Table 7 Linear regression analysis result of proteinuria (g/L) and associated factors among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020

	Bivariate analysis			Multivariate analysis		
Variables	**B**	**CI 95%**	**P- value**	**B**	**CI 95%**	**P- value**
Socio demographic factors						
Age (in years)	0.059	0.052, 0.066	0.0001	0.006	-0.006, 0.018	0.293
Sex (female)	-0.256	-0.404, -0.108	0.001	-0.034	-0.144, 0.077	0.548
Marital status (divorced)	**reference**					
Single	-0.535	-0.647, -0.424	0.0001	-0.124	-0.299, 0.050	0.163
Married	0.395	0.277, 0.513	0.0001	-0.221	-0.380, -0.064	**0.006***
Secondary education	**reference**					
Informal education	0.426	0.282, 0.570	0.0001	-0.020	-0.212, 0.171	0.835
Primary education	-0.344	-0.477, -0.210	0.0001	-0.080	-0.251, 0.090	0.356
Behavioral factors						
Ever smoking **(yes)**	0.166	0.019, 0.314	0.027	-0.071	-0.184, 0.042	0.218
Alcohol drinking **(yes)**	0.188	0.058, 0.319	0.005	0.013	-0.091, 0.117	0.811
Work related factors						
Experience in years	0.078	0.071, 0.085	0.0001	0.071	0.058, 0.083	**0.0001****
Afternoon shift	**reference**					
Morning shift	-0.250	-0.504, 0.003	0.053	-0.040	-0.265, 0.185	0.726
morning and afternoon shift	0.216	0.089, 0.343	0.001	0.004	-0.157, 0.164	0.965

Morning and evening shift	-0.148	-0.296, -0.001	0.049	-0.109	-0.286, 0.068	0.226
Excavation job	**reference**					
Excavation and sifting job	-0.216	-0.338, -0.095	0.001	-0.074	-0.180, 0.032	0.171
[1]ESA job	0.387	0.247, 0.527	0.0001	0.014	-0.114, 0.142	0.832
Having contact with chemicals in mining process **(yes)**	0.574	0.378, 0.770	0.0001	0.201	0.056, 0.346	**0.007***
Medical illness conditions						
Renal diseases **(yes)**	0.153	-0.055, 0.360	0.149	-0.007	-0.146, 0.133	0.926
Leukocyte count (leu/L)	0.003	0.000, 0.007	0.052	0.002	-0.001, 0.004	0.149

[1]ESA- Excavation sifting and amalgamation

∗statistically significant at p value < 0.05

** Statistically significant at p value <0.005

5.6.2. Determinant factors associated with respiratory diseases

In the bivariate logistic regression analysis, several of the socio- demographic, behavioral and work related variables were candidates for multivariate analysis for the chronic respiratory symptoms at p value <0.25 **(Table 8).**

Those variables which were eligible in the bivariate analysis were moved to multivariate analysis. In the final model, each of the chronic respiratory symptoms was significantly associated with the variables; chronic cough with the variables alcohol drinking (OR: 95% CI; 2.068: 1.160, 3.689), work experience (OR: 95% CI; 1.104: 1.024, 1.190), ESA job (OR: 95% CI; 2.443: 1.093, 5.460), and having contact with chemicals in mining activity (OR: 95% CI; 2.593: 1.187, 5.662); chronic phlegm with the variable work experience (OR: 95% CI; 1.130 (1.035, 1.233); chronic wheezing with the variables having contact with chemicals in mining activity (OR: 95% CI; 3.383: 1.351, 8.470) and jobs other than mining (OR: 95% CI; 2.511: 1.053, 5.992); chronic dyspnea with the variables living with animals in the same house (OR: 95% CI; 2.134: 1.046, 4.354); at least one respiratory symptom with the variables living with animals in the same house (OR: 95% CI; 1.890: 1.109, 3.222), work experience (OR: 95% CI; 1.180: 1.086,1.282), ESA job (OR: 95% CI; 3.397: 1.493,7.727) and having contact with chemicals in mining (OR: 95% CI; 11.10: 3.41, 36.10) **(Table 9).**

Table 8 the results of bivariate analysis between chronic respiratory symptoms and associated factors among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020

Variable	Chronic cough	Chronic phlegm	Chronic wheezing	Chronic dyspnea	At least one symptom
	COR (95% CI)	COR (95% CI)	COR (95% CI)	COR (95% CI)	COR (95% CI)
Age	1.118 (1.079, 1.158)	1.111 (1.065, 1.157)	1.132 (1.076, 1.190)	1.150 (1.095, 1.207)	1.147 (1.107, 1.188)
Marital status					
Single	0.260 (0.119, 0.569)	0.483 (0.188, 1.243)	0.287 (0.099, 0.831)	0.111 (0.039, 0.315)	0.239 (0.110, 0.520)
Married	0.310 (0.313, 1.43)*	0.813 (0.324, 2.038)*	0.643 (0.239, 1.730)*	0.539 (0.227, 1.277)*	0.732 (0.341, 1.572)*
Divorced	1.0	1.0	1.0	1.0	1.0
Educational status					
Informal	2.880 (0.988, 8.392)	3.261 (0.705, 15.092)	5.913 (0.746, 46.84)	6.353 (0.804, 50.182)	6.118 (2.096, 17.855)
Primary	1.407(0.510, 3.881)*	1.932 (0.439, 8.499)*	2.05 (0.265, 15.864)*	2.646 (0.345, 20.287)*	2.213 (0.807, 6.068)
Secondary education	1.0	1.0	1.0	1.0	1.0
Family size	1.213 (1.109, 1.326)	1.161 (1.054, 1.279)	1.123 (1.003, 1.256)	1.166 (1.051, 1.294)	1.251 (1.140, 1.372)
Behavioral and living condition factors					
Smoking **(yes)**	1.954(1.193, 3.199)	1.123 (0.596, 2.118)*	1.532 (0.747, 3.141)	1.726 (0.890, 3.346)	2.082 (1.293, 3.353)
Alcohol drinking **(yes)**	2.330 (1.486, 3.652)	1.775 (1.023, 3.078)	1.271 (0.648, 2.492)*	1.336 (0.714, 2.500)*	1.751 (1.144, 2.679)

Animals live with humans	2.061 (1.323, 3.212)	2.110 (1.224, 3.636)	2.456 (1.279, 4.715)	3.118 (1.684, 5.775)	2.596 (1.700, 3.963)
Experience	1.154 (1.109, 1.200)	1.137 (1.089, 1.187)	1.136 (1.082, 1.192)	1.158 (1.104, 1.215)	1.217 (1.162, 1.273)
Tasks					
[1]ESA job	3.828 (1.948, 7.526)	2.321 (1.029, 5.233)	3.600 (1.372, 9.448)	4.068 (1.563, 10.589)	6.402 (3.346, 12.247)
[2]ES job	1.542 (0.829, 2.868)	1.256(0.587, 2.687)*	0.983 (0.369, 2.622)*	1.343 (0.521, 3.467)*	1.487 (0.851, 2.600)
Excavation job	1.0	1.0	1.0	1.0	1.0
Job other than mining **(yes)**	1.432 (0.790, 2.595)	1.796 (0.902, 3.576)	3.444 (1.659, 7.153)	2.695 (1.322, 5.492)	2.455 (1.381, 4.364)
Contact with chemical **(yes)**	4.586 (2.345, 8.967)	3.774 (1.866, 7.633)	6.433 (3.023, 13.691)	5.002 (2.397, 10.44)	17.754 (6.187, 50.95)
History of asthma	0.977 (0.300, 3.180)*	0.406 (0.052, 3.158)*	0.671 (0.086, 5.266)*	0.560 (0.072, 4.377)*	1.132 (0.385, 3.327)*

[1]Excavation sifting and amalgamation

[2]Excavation sifting

*Variables which were not significant at p value < 0.25 in bivariate logistic regression and were not candidates for multivariate analysis

Table 9 Multivariate logistic regression analysis results of chronic respiratory symptoms and associated factors among ASGM workers in Oddo Shakiso woreda, Ethiopia, 2020

Variables	Chronic cough	Chronic phlegm	Chronic wheezing	Chronic dyspnea	At least one symptom
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Age	0.994 (0.924, 1.069)	1.028 (0.942, 1.122)	1.072 (0.963, 1.194)	1.016 (0.912, 1.131)	0.994 (0.924, 1.069)
Marital status					
Single	0.708 (0.255, 1.968)	2.377 (0.674, 8.381)	1.415 (0.332, 6.039)	0.293 (0.076, 1.133)	0.795 (0.265, 2.384)
Married	0.727 (0.286, 1.844)	0.931 (0.308, 2.811)	0.955 (0.272, 3.358)	0.683 (0.230, 2.023)	0.780 (0.270, 2.249)
Divorced	1.0	1.0	1.0	1.0	1.0
Level of education					
Informal education	1.373 (0.393, 4.788)	1.430 (0.271, 7.536)	3.761 (0.382, 37.033)	3.174 (0.311, 32.371)	4.101 (0.971, 17.327)
Primary education	1.435 (0.455, 4.525)	1.837 (0.391, 8.633)	3.439 (0.264, 22.537)	3.175 (0.331, 30.461)	2.931 (0.763, 11.263)
Secondary education	1.0	1.0	1.0	1.0	1.0
Family size	1.099 (0.971, 1.244)	1.055 (0.919, 1.212)	0.919 (0.763, 1.108)	0.963 (0.813, 1.142)	1.018 (0.890, 1.163)
Behavioral and living condition factors					
Smoking **(yes)**	1.024 (0.547, 1.917)	-	0.996 (0.429, 2.315)	1.204 (0.558, 2.597)	1.391 (0.716, 2.704)
Alcohol drinking	**2.068 (1.160, 3.689)***	1.358 (0.723, 2.548)	-	-	1.278 (0.699, 2.336)

Animals live with humans	1.494 (0.889, 2.512)	1.408 (0.759, 2.610)	1.418 (0.660, 3.047)	**2.134 (1.046, 4.354)***	**1.890 (1.109, 3.222)***
Occupational/ work related factors					
Experience	**1.104 (1.024, 1.190)***	**1.130 (1.035, 1.233)***	1.063 (0.960, 1.177)	1.081 (0.981, 1.191)	**1.180 (1.086,1.282)****
Tasks					
ESA job	**2.443 (1.093, 5.460)***	1.374 (0.526, 3.588)	1.575 (0.521, 4.767)	2.364 (0.789, 7.085)	**3.397 (1.493,7.727)****
ES job	1.503 (0.732, 3.084)	1.400 (0.589, 3.330)	1.013 (0.352, 2.917)	1.516 (0.536, 4.291)	1.520 (0.745, 3.098)
Excavation	1.0	1.0	1.0	1.0	1.0
Contact with chemicals **(yes)**	**2.593(1.187, 5.662)***	2.119 (0.921, 4.876)	**3.383 (1.351, 8.470)***	2.479 (0.997, 6.163)	**11.10 (3.41, 36.10)****
Other jobs **(yes)**	1.002(0.499, 2.014)	1.645 (0.745, 3.634)	**2.511 (1.053, 5.992)***	1.796 (0.765, 4.217)	1.864 (0.903, 3.846)

***Statistically significant at p value <0.05

****Statistically significant at p value <0.005

5.7. Determinant factors associated with injury

Socio demographic and occupational related factors were candidates in the bivariate analysis at p value < 0,25. In the multivariate logistic regression analysis, work in morning and afternoon shift (OR: 95% CI; 10.038: 2.189, 46.025) and work in ES job (OR: 95% CI; 4.772: 2.325, 9.793) were significantly associated at p value < 0.05.

Table 10 Logistic regression analysis result of work- related injury and associated factors among ASGM workers in Oddo Shakiso, Ethiopia, 2020

Variable	Bivariate analysis COR (95% CI)	Multivariate analysis AOR(95% CI)	P-value
Age (in years)	0.954 (0.921, 0.988)	0.948 (0.878, 1.023)	0.167
Marital status			
Single	1.816 (0.709, 4.649)	1.097 (0.343, 3.513)	0.876
Married	1.176 (0.452, 3.064)	0.776 (0.273, 2.210)	0.635
Divorced	1.0	1.0	
Work experience	0.960 (0.922, 1.000)	1.023 (0.938, 1.117)	0.604
Working shift			
Morning shift	1.130 (0.147, 8.682)	1.171 (0.145, 9.453)	0.882
Morning and afternoon	6.500 (1.508, 28.019)	10.038 (2.189, 46.025)	**0.003**
Morning and evening	1.646 (0.338, 8.001)	1.453 (0.284, 7.419)	0.654
Afternoon shift	1.0	1.0	
Tasks			
[1]ESA job	0,904 (0.383, 2.133)	1.060 (0.417, 2.694)	0.902
[2]**ES** job	3.698 (1.901, 7.196)	4.772 (2.325, 9.793)	**0.0001**
Excavation job	1.0	1.0	
Other work related factors			
Having contact with chemicals in **(yes)**	0.521 (0.176, 1.541)	0.517 (0.175, 1.527)	0.233
Having contact with chemicals in mining (**no**)	1.0	1.0	
Other job in addition to mining **(yes)**	0.455 (0.208, 0.998)	0.901 (0.370, 2.194)	0.818
Other job in addition to mining **(no)**	1.0	1.0	

[1]Excavation sifting and amalgamation; [2]Excavation sifting

5.8.Observational findings

In addition to questionnaire and urinalysis tools, the study was supported by observational findings in the work place. Photographs of some activities were taken with the willingness of mining workers. In this study all males, females, Youngs and the elderly were involved. As our observation, gold in ASGM process was extracted in two methods.

One method needed going very deeper into the ground on average 30 meter deep to the earth's crust. It was very tiresome because it needed crushing of gold containing rocks with hammer, spade, pan and other local instruments. These gold containing rocks are called quartz; this method of gold extraction was very dangerous; as no miners were observed wearing PPE, they were exposed to dust; this dust may contain organic particles which are potential causes for respiratory diseases; as they got deeper and deeper, their risk of injury was higher because there was a possibility of collapse of mining pits; in addition it was observed that wells which were dug earlier were covered by flood; this covered wells might cause drowning when individuals walk around mining fields (**Figure 4and 5**).

The second method of gold extraction was called placer gold extraction. In this method, gold can be found at superficial ground or along river coasts. This method was not much risky as that of quartz gold production. But it was not safe because here also miners worked with bare foot. Since a pond was used repeatedly for washing of the extracted gold, it may expose to dermatological problems; miner can be injured by sharp stones inside streams as long as they work with bare foot. In addition to respiratory diseases and injury miners were at risk of getting musculoskeletal and other water washed diseases (**Figure 6 and 7**).

In general mining is a hazardous job. But the quartz gold production process was more hazardous as compared to placer gold production process. It required going deeper into the ground upto 30-40 meters depth. Workers got trapped in wells and faced oxygen shortage. No PPE utilization and established first aid service facility for emergency problems.

Figure 4 quartz gold extractions Oddo Shakiso, Ethiopia, June 2020 (**photo by Fentayehu A.)**

Figure 5 an excavation well ≈30 meters deep Oddo Shakiso, Ethiopia, June 2020 (**photo by Fentayehu A.)**

Figure 6 placer gold production processes, Oddo Shakiso, Ethiopia, June 2020 (**photo by Fentayehu A**.)

Figure 7 urine analyses by urine dipstick test in Oddo Shakiso, Ethiopia, June 2020 (**photo by Fentayehu A.)**

6. DISCUSSION

6.1. The magnitude of occupational diseases and injury

This study estimated the magnitude of mercury toxicity among ASGM workers in Oddo Shakiso woreda, Southern Ethiopia. The prevalence of mercury toxicity was estimated to be 50.4% (95% CI: 45.4, 55.1). This finding was comparable with studies conducted in Ghana at different times with 46.7% (8), 55.5% (34) and 58.4% (35). But it showed a relatively lower prevalence as compared with that of Zimbabwe which was 72% (36). This difference might be by the variation of mercury analysis techniques in which proteinuria was used for mercury toxicity estimation in the current study. However the other studies used blood, urine and hair samples to directly analyze the level of mercury in each sample; then the detected amount of mercury was compared with each samples' OELV to determine the prevalence of mercury toxicity (34, 36). But the current study could not directly analyze the level of mercury in bodily samples because no laboratory set up found to run this test.

Respiratory diseases were the other concerns of the study. In this study the prevalence of respiratory diseases was 40% (95% CI; 35.2, 44.9). About 15% of mining workers had chronic bronchitis. These findings were consistent with the study in Ghana where 37.5 % miners had asthma and 10 % had chronic bronchitis (26). This similarity might be due the similarity of work both settings in which case there were no appropriate PPE utilization by mining workers and poor awareness creation about health problems associated with mining.

In the current study, cough was the most presented respiratory symptom with 29.0% followed by phlegm15.6%, dyspnea 11.9% and wheezing10.2%. A study in Ghana revealed that cough was most frequently complained symptom with 35.4% preceding wheezing with 21.2% and dyspnea 10.6% (26). On the other hand a study conducted in Tanzania showed that phlegm was most prevalent respiratory symptom (49 %) and dyspnea came next with 43 %. The rest was held by cough (37.5%) and wheezing (18.8%) (30). The reason for this variation might be the difference of number of sample sizes, genders involved, sampling techniques and data collection techniques employed. The above study mentioned in Tanzania involved 1001 sample samples, male genders, systematic random sampling and the questionnaire was self administered (26).

Injury was found to have a considerable magnitude in the current study. This study showed that among 403 respondents, 85 faced single injury episode and 16 faced two injury episodes in the last one year. So the overall incidence of injury was 29 % in the last one year. This study was inconsistent with that of Ghana for which the incidence was about 5.4% (41). On the other hand, injury rated 45.5 % and 38.5 % in 2011 and in 2013, respectively in the same study area i.e Ghana at different study years (27). The reason for the desparity between the current study and the above studies in Ghana could be due to the fact in one study injury was investigated for the last ten years (41) and convenience sampling technique was employed for other studies (27) but the current study estimated the magnitude of injury for the last one year using simple random sampling method.

Different types of injury were identified among ASGM miners. Abrasion (25.7%), laceration (18.8%), punctured wounds (14.9%) and fracture (9.9%) were the major injury types in this study but in Tarkwa, Ghana, lacerations (57%), puncture wounds (13%) and abrasions (11%) were the common injury types (41). The disparity between these studies may be due the difference in infrastructure in the working environment, in PPE use and study period.

6.2. Factors affecting occupational diseases and injury

In this study different independent determinant factors were identified. Marital status, work experience and uses of chemicals for mining were the independent predictors of mercury toxicity. But other work related and behavioral or living condition characteristics had no significant association with mercury toxicity.

Marital status had association with mercury toxicity. Being married decreased the magnitude of exposure to proteinuria by 0.2 g/L (β = -0.221; 95% CI= -0.380, -0.064) as compared to being divorced. This showed that married workers were protected as compared to divorced workers. This could be explained by the fact that married couples might have network of social relationships, better socioeconomic status, accessible healthy lifestyle and support choices which have potential to protect health as stated by the marriage theory (65).

There was statistically significant association between work experience in mining and mercury toxicity. An increase in experience by a year increased the level of proteinuria by 0.07g/L (β = 0.071; 95% CI= 0.058, 0.083). This finding was in line with the study in Ghana (51). As workers get experienced, they are more likely to be exposed to mercury toxicity because of bioaccumulation and biomagnifications processes.

Use of chemicals for mining activity was associated with mercury toxicity. Mining using chemicals increased the level of proteinuria by 20.1% (β = 0.201; 95% CI= 0.056, 0.346) as compared to not using chemicals. This was much expected because studies showed that mercury and other chemicals such as cyanide are widely used in ASGM activities (66) particularly mercury is used to form a mercury- gold alloy (amalgam) so that the gold is easily separated from the gold ore letting the mercury to evaporate in the course of amalgamation- burning (63).

Though fish consumption was among dietary factors that might affect mercury toxicity as per studies conducted in Ghana (5) and Indonesia (50), in the current study fish consumption didn't show any association. The reason for this could be due to the fact of inaccessibility or no regular fish consumption in the study population and even in the woreda at all.

Miners who did not use PPE were statistically associated with mercury toxicity as to the study in Indonesia (50). But in the current study, nearly all (98.5%) workers did not use PPE and did not show association with mercury toxicity. The discrepancy between the current and the previous study could be due to the very low frequency of PPE users which might create difficulty in running the statistical analysis.

The current study revealed that behavioral and living condition characteristics were statistically significant factors. Alcohol drinkers were at high risk of developing respiratory diseases by odds of 2 (OR: 95%CI; 2.068: 1.160- 3.689) as compared to non drinkers. This finding was in consistence with the finding of a study in Ghana (26). This consistency could be explained by the fact that alcohol drinking affects the natural immunity which may increase the susceptibility of workers to different respiratory diseases.

There were some work related factors associated with respiratory diseases identified in this study. Work experience in mining was significantly associated with respiratory diseases. As experience increased by a year, the likelihood of developing respiratory diseases increased with odds of 1.2 (OR: 95% CI; 1.180: 1.086- 1.282). This study showed comparable result with a study in Ghana (26). The comparability of these studies was expected because as experience increases there will be increased exposure to dust and different work related pollutants which in turn increases the possibility of developing respiratory diseases.

Excavation, sifting and amalgamation (ESA) job was the other work related factor which showed the significant association with respiratory diseases. Those miners who worked in ESA job were 3 times likely (OR: 95% CI; 3.397: 1.493- 7.727) to develop respiratory diseases as compared to those who worked only in excavation. The finding of the current study agreed with the findings of studies in Ghana and South Africa (7, 67). The reason of agreement of these studies might be because of having similar work setting, no PPE use by mining workers and exposure to dust.

Having contact with chemicals in mining process was found to have significant association with respiratory diseases. Those who had contact with chemicals in mining activity were at more risk of developing respiratory diseases with odds of 11 than their counterparts (OR: 95% CI; 11.10: 3.41- 36.10). The current finding was in consistence with studies conducted in Ghana, Tanzania and South Africa (5, 25, 26, 67). The reason for this consistency could be explained by the fact that as miners get exposed to different chemicals the physiological functioning of the respiratory system will be impaired leading to different types of respiratory diseases.

In this study, other additional jobs also showed significant association with respiratory diseases. Mining workers having others additional jobs were 2.5 times likely to develop than those who didn’t have additional jobs (OR: 95% CI; 2.511: 1.053- 5.992). This was reasonable fact because many workers, 56 (about 14%), had other jobs in addition to mining. Majority reported that they engaged in farming activity as an extra job. This could contribute for the development of respiratory diseases. This study showed consistency with a study conducted in Ethiopia which revealed that respiratory diseases had association with farming job (68).

By the current study, all of the socio- demographic characteristics, smoking status and cooking conditions didn't show significant association with respiratory diseases but these factors showed significant association in other studies (5, 7, 26). The disparity of the current study finding and other studies might be because of differences of doses, frequency and duration of smoking and cooking style at home.

Different factors that had significant association with work related injury were identified in this study. Some work related characteristics were identified to be statistically significant factors but all the socio- demographic and behavioral factors didn't show statistically significant association.

Work shift was significantly associated with work related injuries. Miners who worked both in morning and afternoon shift were more likely to get injured with odds of 10 as compared to those who worked in afternoon shift (OR: 95% CI; 10.038: 2.189- 46.025). There was no consistency of findings of this study and that of Ghana (41). This discrepancy might be due to investing of much time working both in afternoon and morning shift in the current study.

Types of jobs were the other work related factors that showed association with work related injury. Miners who worked both in excavation and sifting (ES) job were 5 times more likely to be affected by injury than those who worked in only in excavation (OR: 95% CI; 4.772: 2.325-9.793). The finding of the current study disagreed with that of Ghana (41). The reason for this disagreement might be merging of tasks as well frequent shifting of workers in the current study.
In the current study, none of the socio- demographic characteristics and experience were significantly associated with injury. But being female (41), Having lower level of education and poverty had association with injury (61) in other studies. Experience showed a negative association with injury in a study of Ghana (41). The difference of the the current and other studies might be because of variations in the time period for which the current study identified assessed the occurrence of injury episodes in the past one year.
This study also revealed that awareness creation and PPE use could potentially affect the prevalence of injury because all miners were not trained about any health issue. Though the result is not stistically significant (may be due to very low number of PPE users), it agreed with the findings of Ghana's Upper East Region where awareness creation about OSH and PPE were not accessible (5).

In the current study, it was witnessed that ASGM workers were prone to different occupational diseases and injury. A pool was used repeatedly for longer years; so if there was prior contamination of the pool by mercury, the current workers were more likely to get mercury toxicity. Miners particularly in excavation and crushing section were at risk of getting respiratory diseases becauses there was high exposue chance to fine dust particles (respirable dust) hence can reach the lower part of respiratory system. Since there was no PPE utilization, workers were vulnerable to injury as they work in wells; they could also easily ingest, inhale and have direct contact with different organic dust or chemicals.

6.3. Strengths and limitations of the study

Strengths of the study

This study had some strength; it tried to address the health challenges in the most neglected work place; it also tried to exhaustively identify all factors that might affect the outcome. Urinalysis test was performed by using materials got from an accredited importer and precautions of the test procedure were strictly followed. This was the first study in ASGM setting which might serve as a stepping stone for future research.

Limitations of the study

There were some limitations in this study. Use of proteinuria as mercury toxicity might be affected by biological and other unforeseen conditions. Perhaps there could be false positive and false negative urine test results. The study design used is not strong. Tasks were found important factors affecting occupational diseases but due to the fact that there was irregular and frequent shifting of workers (even in a day) from one task to the other, it was quite difficult to determine which task just affected occupational diseases. Because of security reasons in the area, the study was conducted in three selected kebeles with the direction of Oddo Shakiso woreda mining desk and unable to cover all the kebeles. The study might not clearly identify the occupational factors from the environmental ones.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

Occupational diseases and injury were prevalent among ASGM workers. The overall prevalence of mercury toxicity was estimated to be 50.4%. Respiratory diseases were also the other health problems with magnitude of 40.0 % for the last one year. About 15.1% had chronic bronchitis. Cough was the most prevalent respiratory symptom accounting 29.0% followed by phlegm (15.6%) and dyspnea (11.9 %). Among the four symptoms, wheezing was the least complained (10.2%). The incidence of work related injuries for the last one year was 29.0 %.

Different factors were found associated with occupational diseases. Experience in mining and having contact with chemicals in mining activities were determinant predictors of mercury toxicity; work experience, ESA job and having contact with chemicals in mining activity were determinant factors that could independently affect the development of respiratory diseases; working both in morning and afternoon shift and ES job were the determinants of work related injury in the mining activity.

7.2. Recommendations

Based on the findings of the study, some recommendations were forwarded to the concerned bodies. We strongly recommended the woreda mining cooperatives to modernize the mining process so that workers can work safely and healthy. We also recommended mining cooperatives to use mercury free mining methods. We further suggested research institutions to organize laboratory settings so that researchers can conduct further study using blood, urine or hair samples to directly analyze the biological mercury level. We also recommended woreda health offices to do awareness creation about occupational hazardous. Finally we suggested mining cooperatives to encourage PPE utilization at work places.

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9. ANNEXES

Annex I: Study Information Sheet (SIS) of the proposal

Addis Ababa University

College Of Health Science

School Of Public Health

Environmental and Occupational Health Unit

Occupational diseases and injuries among artisanal small scale gold mining workers in Oddo Shakiso woreda, Guji zone of Oromia regional state, Southern Ethiopia

Background of the study (Summary)

Artisanal and small scale mining is a major economic activity playing great role in modernizing the mining sector. But there are many critical health hazards that mining workers face. Inhalable dust, musculoskeletal problems, chemical hazards, radiations, thermal and noise pollution are common challenges that mining workers usually experience. Occupational disorders are common in low income regions like African and Asian countries as compared to the developed world.

There is no sufficient study conducted on occupational health and safety area in the mining sector in our country. The aim of this study is to estimate the magnitude of occupational diseases and injuries as well to identify associated factors to artisanal small scale gold mining workers.

General objective

To estimate the magnitude of occupational diseases, injuries and associated factors among Artisanal Small scale Gold Mining workers in Oddo Shakiso Woreda, Guji Zone of Oromia regional state, Southern Ethiopia from April- June 2020

Specific objectives

1. To determine the magnitude of occupational diseases and injuries among Artisanal Small scale Gold Mining workers in Oddo Shakiso Woreda, Guji Zone, Oromia region, Southern Ethiopia from April- June 2020
2. To identify factors associated with occupational diseases and injuries among Artisanal Small scale Gold Mining workers in Oddo Shakiso Woreda, Guji Zone, Oromia region, Ethiopia from April- June 2020

Significance of the study

This study will be important in identifying the magnitude and severity of occupational diseases, injuries and associated factors that ASGM workers face in their working environment and then to take appropriate intervention measures to prevent, control or reduce those risks.

Study site and period of the study

The study will be conducted in Southern Ethiopia, Oromia regional state, Guji Zone, Oddo Shakiso woreda artisanal small scale gold mining site from April- June 2020

Study procedures; the study will be conducted by collecting data through trained interviewer administered questionnaire; urine samples will be taken and analyzed using urine dipstick method; additionally observational check list will be utilized; then the collected data will be entered by Epi Info7 and analyzed using SPSS 20.

Risks/Benefits associated with the study

It is expected that study participants will lose small portion of their working time in responding to the interview. Health services will be arranged for those found ill by negotiating with local health facilities. Accessibility for health facilities may be recommended which may make them beneficiaries in the future. Each participant will be paid 50 ETB to compensate their time.

Confidentiality/Justice/Privacy

All workers will have equal chance of being selected to be interviewed and there is a need of taking urine samples from each interview. There will be some compensation payment for those who provide urine sample. Voluntary participation will be a basis for the data collection process and any participant will have the right to question, complain or terminate any time freely. Each participant's information will be kept confidential and coded.

You can contact the investigator for any question you have with the following address.

Fentayehu Abebil (BSc)

Mobile: +2519-53-91-53-19/ 24-78-14-49; Email: fentayehu1@gmail.com

Annex II: Informed consent (English version)

Hello, my name is _____. I come from the research team of Addis Ababa University, college of health sciences, school of public health. I would like to ask you some questions regarding occupational diseases related to your work.

The objective of this study is to assess occupational health problems that the mining workers face and to suggest appropriate recommendations to the concerned bodies. There are researches that show ASGM areas area full of health problems. Injury, respiratory diseases and chemical exposure are among the common ones. Therefore at the end of the study, appropriate recommendation will be provided to the concerned body as per the study findings.

If you are volunteer to participate in the study, we will stay together for about 20 minute for interview and you are kindly requested to give about 20 milliliter urine for laboratory analysis. The information that you will provide will be kept confidential. It will be kept secret and coded. You are free to answer only what you understand, to ask any question, and to terminate participation in the interview.

Are you volunteer to participate? A. Yes --------signature---------- (go to interview)

B. No --------- reason----------

(Skip to the next interviewee)

Informed consent confirmed by

Interviewer: Code_____ Name_____ signature_____

Date of interview_____ Time started_____ Time completed_____

Result of interview: 1**.** Refused 2. Not around 3. Partially completed 4. Completed

Checked by Supervisor: Name_____ signature_____ Date_____

For any inconvenience, contact the principal investigator.

Fentayehu Abebil: 0953915319; email: fentayehu1@gmail.com

Annex III: Informed Consent (Amharic version)

ቃለ መጠይቁን ከማድረግ በፊት የተሳታፊዎችን ፈቃደኝነት መጠቂያ ቅጽ

የሥራው ዓይነት ስም _____

ሰላምታ ፡ እንደ ምን አሉ? እኔ አቶ/ወ/ሮ/ ወ/ት _____እባላለሁ። እዚህ የመጣሁት ይህንን ጥናት የሚያካሂደው የአዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ የህብረተሰብ ጤና ት/ ቤት ክፍል አባል ሁኜ ነዉ።

የጥናቱ ዓላማ ከማእድን ሥራ ጋር ትያያዥነት ያላቸውን የጤና ችግሮች ለማወቅና መፍትሄዎችን በማፈላለግ ለሚመልከተው ክፍል አስተያየት ለመስጠት ነው።

ከዚህ በመቀጠልም ከስራዎ ጋር ተያያዥነት ስላላቸው በስራ ምክንያት ስለሚመጡ በሽታዎች እጠይቅዎታለሁ። እንዲሁም ትንሽ የሽንት ናሙና (20 ሚ.ሊ ያህል) ለምርመራ እንዲሰጡ በአክብሮት እንጠይቅወታለን። እርስዎ የሚሰጡት መልስ እኛ ለምናከናውነዉ የሙያ ደህንትንና የስራ አካባቢ ጤንነትን አገልግሎት ለማሻሻል ከፍተኛ ጠቀሜታ ይኖረዋል።

እርስዎ የሚሰጡት መልስ በምስጢር ይጠበቃል። ለዚህም ሲባል ሥምዎትም ሆነ ማንነትዎ አይጠየቅም። መጠይቁ ለማጠናቀቅ 20 ደቂቃ ያህል ይወስዳል። በጥናቱ የሚሳተፉት ሙሉ ፈቃድኝነት ሲኖርዎት ብቻ ነዉ።

በጥናቱ ለመሳተፍ ፈቃደኛ ነዎት?

1 አዎ ---------። ፊርማ_____(ወደ ጥያቄው መግባት)

2 የለም --------።ምክን ያት_____(ወደ ሌላ ተጠያቂ ይሸጋገሩ።)

የተጠያቂውን ፈቃደኝነት ያርጋገጠው

የጠያቂው መለያ ቁጥር ----------ስም----------ፍርማ----------ቀን----------

መጠይቁ የተሞላበት ቀን----------የተጀመረበት ሰዓት ---------- የተጠናቀቀበት ሰዓት----------

የመጠይቁ ውጤት

1. ተጠያቂዉ ፈቃደኛ አይደሉም 2. ተጠያቂዉ አልተገኙም

3. መጠይቁ በክፊል ተጠናቋል 4. መጠይቁ ሙሉ ለሙሉ ተጠናቋል

የተቆጣጣሪው ስም ---------- ፊርማ ---------- ቀን ----------

ማንኛዉንም መረጃ ለማግኘት ከፈለጉ አጥኝዉን በቀጣዩ አድራሻ ማግኘት ይችላሉ።

ፈንታየሁ አበብል፡ ስልክ 0953915319፣ ኢ_ሜይል፡ fentayehu1@gmail.com

Annex IV: Informed Consent (Afaan Oromoo version)

Iddoo Hoji _____

Maqaa gita hoji _____

Guca hirmaattonni gaffif debii irratti hirmachuun dura fedhii qabaachuu isaa kan gaafatu

Nagenya: Akkam jirtu?

Ani Obbo/Addee/Durbe_____kan asiitti dhufeef qo'annoo gaggeessu yoo ta'u qo'annoon kun kan gaggefamuu miseensa garee Yuunivarsitti Finfinne koolejji Eegumsa Fayyaa Mana Barumsaa Fayyaa Hawaasaa ta'en.

Itti ansuudhaan gita hojii kee waliin walqabatee dhuukubootaa dhufuu danda'an isiin gaafadhaa. Akkasuumas fincaan keessan yaliidhaaf waan barbaaduf akka nuuf keennitan kabajaadhaan isin gaafadhaa. Deebii isiin nuuf laatan tajaajila Oggummaa, Fayyuumaaa fi Nagummaaf foyyeessuuf baye'ee nuu fayyadaa.

Deebii isiin nuu keennitan iccittidhaan isiinif qabnaa. Sababa Kanaan maqaan fi eenyummaan keessan hin ibsamu. Gaafannoo Kana xummurudhaaf daqiqaa 20 fudhataa. Qoo'annaa irratti kan hirmaatan yoo fedhi guutuu qabaatan qofaa.

Qo'aannoo irratti hirmaachuudhaaf feedhi qabdu?

1. Eyyeen ----------(gara gaafitti galu)
2. Hinqabu----------(Sababa feedhii hinqabannee----------(gara nama birootti demaa)

Lakk Eynuumaa gaafii dhi'esaa----------Maqaa ----------

Mallattoo ----------guyyaa ----------

Guyyaan gaafannon ittin gutamee---------- yeroon jalqabamee------- yeroon xumuramee--------

Bu'aan Gaafannoo

1. Gaafatamaan feedhii hin qaban 2. Gaafatamaan hin argamnee

3. Gafannoon cinaan xummurameeraa 4. Gafannoon gutumaan gututti xummurameeraa

Maqaan to'ataa ---------- Mallattoo ----------guyyaa ----------

Ragaalee kamiyyuu argachuuf yoo barbadan bilbilaa asiin gadii kargachuu dandeessuu.

Fantaayehu Abaabil: Bilbila 0953915319 Emaili: fentayehu1@gmail.com

Annex V: Questionnaire (English version)

Questionnaire ID---------- filled by----------

No	Question	Possible answers	skipping	Response code
PART I: socio – demographic characteristics				
101	Age	----------years		
102	Sex	A. male		1
		B. female		2
103	Religion	A. Orthodox		1
		B. Muslim		2
		C. Protestant		3
		D. Catholic		4
		E. Others		5
104	Marital status	A. Single		1
		B. Married		2
		C. Divorced		3
		D. Widowed		4
		E. Separated		5
105	Educational status	A. illiterate		1
		B. read and write		2
		C. elementary (1-6)		3
		D. secondary (7-10)		4
		E. above Grade 10		5
106	Family size	---------- persons		
107	Average level of income/month	----------birr		
PART II: behavioral factors				
201	Did/ do you smoke	A. Never smoke	204	1

	cigarette?	B. A year ago		2
		C. A month ago		3
		D. Still I smoke		4
		E. Other specify----------		5
202	If you are/ were smoker, for how long?	----------years		
203	If you are/ were smoker, how many do/did you smoke daily?	A. _____pieces		
		B. _____packets		
204	Did/ do you drink alcohol?	A. Never drink at all	207	1
		B. Rarely (on holidays)		2
		C. At least weekly		3
		D. Daily		4
		E. ----------other specify		5
205	If you drink/ drank alcohol, for how long?	----------years		
206	If you drink/ drank alcohol, how many do/did you drink daily?	_____bottles		
207	Do you usually (at least weekly) eat fish?	A. Yes		1
		B. No	209	2
208	How long have you eaten fish?	----------year		
209	Do you cook at home?	A. Yes		1
		B. No	212	2
210	What is your source of fuel for cooking?	A. Biomass		1
		B. Charcoal		2
		C. Electricity		3
		D. Gas		4

		E. ----------other specify		5
211	Where do you usually (4 or more days /week) cook?	A. Indoor		1
		B. Outdoor		2
		C. Both		3
212	Do animals live in house with humans?	A. Yes		1
		B. No		2
PART III: Work related factors				
301	How long have you been working in mining?	----------years		
302	When do you usually (≥4 days/week) work?	A. Morning		1
		B. Afternoon		2
		C. Evening		3
		D. Morning and afternoon		4
		E. Morning and evening		5
		F. Afternoon and evening		6
303	Have you worked in excavation?	A. Yes		1
		B. No	307	2
304	How long have you worked in excavation?	---------- Years		
305	How many hours work in a day in excavation?	---------- hrs/day		
306	How many hours work in a week in excavation?	---------- hrs/wk		
307	Have you worked in crushing?	A. Yes		1
		B. No	311	2
308	How long have you worked in crushing?	---------- Years		
309	How many hours work			

	in a day in crushing?	---------- hrs/day		
310	How many hours work in a week in crushing?	---------- hrs/wk		
311	Have you worked in sifting?	A. Yes		1
		B. No	315	2
312	How long have you worked in sifting?	---------- Years		
313	How many hours work in a day in sifting?	---------- hrs/day		
314	How many hours work in a week in sifting?	---------- hrs/wk		
315	Have you worked in washing?	A. Yes		1
		B. No	319	2
316	How long have you worked in washing?	----------Years		
317	How many hours work in a day in washing?	---------- hrs/day		
318	How many hours work in a week in washing?	---------- hrs/wk		
319	Have you worked in amalgamation?	A. Yes		1
		B. No	323	2
320	How long you worked in amalgamation?	---------- Years		
321	How many hours work/ day in amalgamation?	---------- hrs/day		
322	How many hours work/ week in amalgamation?	---------- hrs/wk		
323	Have you worked in burning?	A. Yes		1
		B. No	327	2

324	How long have you worked in burning?	----------Years		
325	How many hours work in a day in burning?	---------- hrs/day		
326	How many hours work in a week in burning?	---------- hrs/wk		
327	Do you have an extra job?	A. Yes		1
		B. No	330	2
328	What is that extra job?	Specify----------		
329	How long have you worked there?	----------Years		
330	Have you taken any training about OSH?	A. Yes		1
		B. No		2
331	Do you use PPE at your workplace?	A. Yes		1
		B. No	333	2
332	If "Yes" for Q. no 331, how often do you use PPE?	A. Always (daily)		1
		B. Usually (≥4 days/week)		2
		C. Rarely (≤ 3 days/week)		3
333	What is your reason for not using PPE?	Specify----------	401	1
334	Do you use head covering?	A. Yes		1
		B. No		2
335	Do you use Google?	A. Yes		1
		B. No		2
336	Do you use face mask?	A. Yes		1
		B. No		2
337	Do you use glove?	A. Yes		1

		B. No		2
338	Do you use apron/gown?	A. Yes		1
		B. No		2
339	Do you use boots?	A. Yes		1
		B. No		2
PART IV: History of chemical exposure				
401	Do you use chemicals in your work?	A. Yes		1
		B. No	403	2
402	If " yes" for Q. no 401, specify	----------		
403	Have you exposure history to cyanide?	A. Yes		1
		B. No	405	2
404	How long exposed to cyanide?	---------- year		
405	Have you exposure history to mercury?	A. Yes		1
		B. No	407	2
406	If you answered "yes" for Q. no 405, for how long?	---------- year		
407	Do you feel excessive salivation?	A. Yes		1
		B. No		2
408	Do you feel tremor (shivering) at work?	A. Yes		1
		B. No		2
409	Do you experience loss of sleep at night?	A. Yes		1
		B. No		2
410	Do you have gum bluish discoloration?	A. Yes		1
		B. No		2
411	Do you feel disturbed	A. Yes		1

	movement of walking?	A. No		2
412	Do you feel disturbed leg movement?	A. Yes		1
		B. No		2
413	Have you been diagnosed with the following diseases in your engagement of gold mining?	A. Renal diseases		1
		B. CVD diseases		2
		C. Diabetes mellitus		3
		D. CNS diseases		4
		E. AFI (malaria, typhoid, typhus)		5
		F. Sinusitis		6
		G. Other specify----------		7
		H. None		8
414	Have you used any medications in the last one month?	A. Yes		1
		B. No	501	2
415	If "yes" for Q no 414, list.	----------		
PART V: Injury related history				
501	Have you faced any injury in this mining activity in the last one year?	A. Yes		1
		B. No	**507**	2
502	If you faced, how many injuries?	Specify ----------		
503	If you were injured, did you get medical service/ first aid?	A. Yes		1
		B. No		2
504	How many work days did you miss due to the injury?	---------- day/s		

505	Which part of your body was injured?	A. Head		1
		B. Ear		2
		C. Eye		3
		D. Face		4
		E. Chest		5
		F. Back		6
		G. Upper extremity		7
		H. Lower extremity		8
		I. Feet		9
		J. Others		10
506	What was the type of injury?	A. Contusion		1
		B. Abrasion		2
		C. Fracture		3
		D. Dislocation		4
		E. spinal cord injury		5
		F. laceration		6
		G. Punctured wounds		7
		H. Neurogenic shock		8
		I. Amputation		9
		J. Other		10
507	What are the causes of the most severe injury in your work place?	A. Falling		1
		B. collapsing of mine pits		2
		C. Clashes between miners & other factors		3
		D. drowning		4
		E. explosions		5
		F. Fires		6
		G. Improper use of tools		7

		H. Hit by objects		8
		I. Assault		9
		J. Workload		10
		K. Alcohol drinking		11
		L. Other		12
PART VI: History of Respiratory Symptoms and diseases				
601	Do you have **cough** in the last one year at least for three months - first thing in the morning **or** - during the day or at night **or** - cough as much as 4-6 times a day for 4 or more days in a week?	A. Yes		**1**
		B. No		**2**
602	Do you have **phlegm** in the last one year at least for three month?	A. Yes		**1**
		B. No		**2**
603	Do you have **whistling** breathing sound in the absence of cold/ flu in the past 12 months?	A. Yes		**1**
		B. No		**2**
604	Do you have **shortness of breath (dyspnea)** at rest in the last 12 months?	A. Yes		**1**
		B. No		**2**
605	Had a doctor told you that you have asthma?	A. Yes		**1**
		B. No		**2**

606	Had a doctor told any of your family members that they have asthma?	A. Yes		**1**
		B. No		**2**
607	Have you had history of any of the respiratory problems?	A. TB		**1**
		B. Acute bronchitis		**2**
		C. Pneumonia		**3**
		D. Allergic rhinitis		**4**
		E. Eczema		**5**
		F. maternal history of smoking during pregnancy		**6**
		G. other specify---------		**7**
		H. none		**8**

Annex VI: Questionnaire (Amharic version)

ቁጥር	ጥያቄዎች	አማራጭ መልሶች	ዝለል	ኮድ
ክፍል አንድ: ማህበራዊና የስነ ህዝብ መረጃ				
101	እድሜ	_____ዓመት		
102	ጾታ	ሀ. ወንድ		1
		ለ. ሴት		2
103	ሃይማኖት	ሀ. አርቶዶክስ		1
		ለ. ሙስሊም		2
		ሐ. ፕሮቴስታንት		3
		መ. ካቶሊክ		3
		ሠ. ሌሎች		5
104	የጋብቻ ሁኔታ	ሀ. ያላገባ/ች		1
		ለ. ያገባ/ች		2
		ሐ. የፈታ/ች		3
		መ. ሚስቱ የሞተችበት/ ባሏ የሞተባት		4
		ሠ. ተለያይተው በአንድ ቤት የሚኖሩ		5
105	የት/ት ደረጃ	ሀ. ማንበብና መጻፍ የማይችል/ የማትችል		1
		ለ. ማንበብና መጻፍ የሚችል/የምትችል		2
		ሐ. ከነኛ እስከ 6ኛ ክፍል የተማረ/ች		3
		መ. ከ7ኛ እስከ 10ኛ ክፍል የተማረ/ች		4
		ሠ. ከ 10ኛ ክፍል በላይ የተማረ/ች		5
106	የቤተሰብ ብዛት	----------		
107	አማካይ የወር ገቢ መጠን	----------ብር		
ክፍል ሁለት: የግል ባህሪያት				
201	ሲጋራ ያጨሳሉ ?	ሀ. በጭራሽ አጭሽ አላውቅም	204	1
		ለ. ከአንድ አመት በፊት		2
		ሐ. ከአንድ ወር በፊት		3
		መ. አሁንም አጨሳለሁ		4

		መ. _____ ሌላ ይገለጽ		5
202	ካጨሱ፣ ለስንት ጊዜ አጨሱ?	ለ_____ዓመት		
203	ካጨሱ፣ በቀን ስንት ያጨሱ?	ሀ._____ ፍሬ		
		ለ._____ ፓኬት		
204	አልኮል ይጠጣሉ?	ሀ. በጭራሽ (ጠጥቼ አላውቅም)	207	1
		ለ. አልፎ አልፎ (በበዓል ጊዜ)		2
		ሐ. ቢያንስ በሳምንት		3
		መ. በየቀኑ		4
		ሠ. _____ሌላ ካለ ይገለጽ		5
205	ከጠጡ፣ ለስንት ጊዜ ጠጡ ?	ለ_____ ዓመት		
206	ከጠጡ፣ በቀን ስንት ጠርሙስ ይጠጣሉ?	_____ ጠርሙስ		
207	ዘወትር (ቢያንስ በሳምንት አንድ ጊዜ) ዓሣ ይመገባሉ?	ሀ. አዎ		1
		ለ. የለም	209	2
208	ዓሣ ለስንት ጊዜ ተመግበዋል?	_____		
209	ቤትዎ ውስጥ ምግብ ያበስላሉ?	ሀ. አዎ		1
		ለ. የለም	212	2
210	ለምግብ ማብሰያነት ምን የሃይል ምንጭ ይጠቀማሉ?	ሀ. የእጽዋት ወይም እንስሳት ቅሪት		1
		ለ. ከሰል		2
		ሐ. ኤሌክትሪክ		3
		መ. ጋዝ		4
		ሠ. ሌላ ካለ ይገለጽ_____		5
211	ምግብ የሚያበስሉት የት ነው?	ሀ. ከቤት ውስጥ		1
		ለ. ከቤት ውጭ		2
		ሐ. ከሁለቱም		3
212	በቤት ውስጥ እንስሳት ከሰው ጋር ይኖራሉ?	ሀ. አዎ		1
		ለ. የለም		2

ክፍል ሦስት: ከሥራ ጋር ትያያዥነት ያላቸው ጉዳዮች				
301	በዚህ የማዕድን ስራ ውስጥ ለስንት ጊዜ ሰራችሁ ?	_____ዓመት		
302	ብዙ ጊዜ (በሳምንት 4 ቀናትና ከዚያ በላይ) የሚሰሩት መቼ ነው ?	ሀ. ጧት		1
		ለ. ከሰዓት		2
		ሐ. ማታ		3
		መ. ጧት እና ከሰዓት		4
		ሠ. ጧትና ማታ		5
		ረ. ከሰዓትና ማታ		6
303	በቁፋሮ ሥራ ውስጥ ሠርተዋል ?	ሀ. አዎ		1
		ለ. አይደለም	307	2
304	በቁፋሮ ሥራ ውስጥ ስንት ጊዜ ሠርተዋል?	_____ዓመት		
305	በቁፋሮ ውስጥ በቀን ለስንት ሰዓት ይሰራሉ?	_____ ሰዓት/ቀን		
306	በቁፋሮ ውስጥ በሳምንት ለስንት ሰዓት ይሰራሉ?	ለ_____ሰዓት/ ሣምንት		
307	በማድቀቅ (መፍጨት) ሥራ ውስጥ ሠርተዋል ?	ሀ. አዎ		1
		ለ. አይደለም	311	2
308	በማድቀቅ ሥራ ውስጥ ለስንት ጊዜ ሠርተዋል?	_____ዓመት		
309	በማድቀቅ (መፍጨት) ሥራ በቀን ለስንት ሰዓት ይሰራሉ?	_____ ሰዓት/ቀን		
310	በማድቀቅ ሥራ በሳምንት ለስንት ሰዓት ይሰራሉ?	ለ_____ሰዓት/ ሣምንት		
311	በማንጻለል (ማበጠር) ሥራ ውስጥ ሠርተዋል ?	ሀ. አዎ		1
		ለ. አይደለም	315	2
312	በማንጻለል ሥራ ውስጥ ለስንት ጊዜ ሠርተዋል?	_____ዓመት		
313	በማንጻለል (ማበጠር) ሥራ በቀን ለስንት ሰዓት ይሰራሉ?	ለ_____ ሰዓት/ቀን		

314	በማንጓለል ሥራ በሳምንት ለስንት ሰዓት ይሰራሉ?	ለ_____ ሰዓት/ ሣምንት		
315	በማጠብ ሥራ ውስጥ ሠርተዋል ?	ሀ. አዎ		1
		ለ. አይደለም	319	2
316	በማጠብ ሥራ ውስጥ ለስንት ጊዜ ሠርተዋል?	_____ዓመት		
317	በማጠብ ሥራ በቀን ለስንት ሰዓት ይሰራሉ?	_____ሰዓት/ቀን		
318	በማጠብ ሥራ በሳምንት ለስንት ሰዓት ይሰራሉ?	_____ሰዓት/ ሣምንት		
319	በማደባለቅ ሥራ ውስጥ ሠርተዋል ?	ሀ. አዎ		1
		ለ. አይደለም	323	2
320	በማደባለቅ ሥራ ውስጥ ለስንት ጊዜ ሠርተዋል?	_____ዓመት		
321	በማደባለቅ ሥራ በቀን ለስንት ሰዓት ይሰራሉ?	_____ሰዓት/ቀን		
322	በማደባለቅ ሥራ በሳምንት ለስንት ሰዓት ይሰራሉ?	ለ_____ሰዓት/ ሣምንት		
323	በማቃጠል ሥራ ውስጥ ሠርተዋል ?	ሀ. አዎ		1
		ለ. አይደለም	327	2
324	በማቃጠል ሥራ ውስጥ ለስንት ጊዜ ሠርተዋል?	_____ዓመት		
325	በማቃጠል ሥራ በቀን ለስንት ሰዓት ይሰራሉ?	_____ ሰዓት/ቀን		
326	በማቃጠል ሥራ በሳምንት ለስንት ሰዓት ይሰራሉ?	_____ሰዓት/ ሣምንት		
327	ከማእድን ማምርት ውጭ ተጨማሪ ሥራ አለዎት?	ሀ. አዎ		1
		ለ. የለኝም	330	2
328	ካለዎት፣ ሥሙ?	ይጥቀሱ_____		
329	በዚህ ሥራ ለስንት ጊዜ ሠርተዋል?	_____ዓመት		

330	ስለ ሥራ አካባቢ ጤንነትና ደህንነት ሥልጠና ወስደዋል?	ሀ. አዎ		1
		ለ. አልወሰድኩም		2
331	በሥራ ቦታ የሥራ አካባቢ ደህንነትና ጤንነት መጠበቂያ አልባሳት ይጠቀማሉ?	ሀ. አዎ		1
		ለ. አልጠቀምም	333	2
332	የሥራ አካባቢ ደህንነትና ጤንነት መጠበቂያ አልባሳትን በየስንት ጊዜ ይጠቀማሉ?	ሀ. ሁልጊዜ		1
		ለ. ባብዛኛው		2
		ሐ. አልፎ አልፎ		3
333	የሥራ አካባቢ ደህንነትና ጤንነት መጠበቂያ አልባሳትን የማይጠቀሙ ከሆን፣ ምክንያት ?	አብራሩ_____	401	
334	የራስ መሸፈኛ ይጠቀማሉ?	ሀ. አዎ		1
		ለ. አልጠቀምም		2
335	የዓይን መከላከያ ይጠቀማሉ?	ሀ. አዎ		1
		ለ. አልጠቀምም		2
336	የአፍና አፍንጫ መከላከያ(ማስክ) ይጠቀማሉ?	ሀ. አዎ		1
		ለ. አልጠቀምም		2
337	የእጅ ጓንት ይጠቀማሉ?	ሀ. አዎ		1
		ለ. አልጠቀምም		2
338	ጋዎን/ ሽርጥ ይጠቀማሉ ?	ሀ. አዎ		1
		ለ. አልጠቀምም		2
339	ቡትስ ጫማ ይጠቀማሉ ?	ሀ. አዎ		1
		ለ. አልጠቀምም		2
ክፍል አራት: የኬሚካል ተጋላጭነትና ቶክሲሲቲ በተመለከተ				
401	ለሥራችሁ የምትጠቀሙበት ኬሚካል አለ?	ሀ. አዎ		1
		ለ. የለም	403	2
402	የምትጠቀሙበት ኬሚካል ካለ፣ ሥሙስ?	አብራሩ_____		
403	በየትኛውም ቦታ ሲያናይድ	ሀ. አዎ		1

	ተጠቅማችሁ ታውቃላችሁ?	ለ. አይደለም	405	2
404	ሲያናይድ ተጠቅማችሁ ከሆነ፣ ለምን ያህል ጊዜ ?	_____ዓመት		
405	በየትኛውም ቦታ ሜርኩሪ ተጠቅማችሁ ታውቃላችሁ?	ሀ. አዎ		1
		ለ. አይደለም	407	2
406	ሜርኩሪ ተጠቅማችሁ ከሆነ፣ ለምን ያህል ጊዜ?	_____ዓመት		
407	ምራቅ ቶሎ ቶሎ ያስተፋዎታል?	ሀ. አዎ		1
		ለ. የለም		2
408	የመንቀጥቀጥና ድካም ስሜት ይሰማዎታል?	ሀ. አዎ		1
		ለ. የለም		2
409	የእንቅልፍ ችግር አለብዎት ?	ሀ. አዎ		1
		ለ. የለም		2
410	የድድ መጥቆር አጋጥሞዎታል?	ሀ. አዎ		1
		ለ. የለም		2
411	የአረማመድ ችግር አጋጥሞዎታል?	ሀ. አዎ		1
		ለ. የለም		2
412	ለመንቀሳቀስ የእግርዎ ቅልጥም ይቸገራል?	ሀ. አዎ		1
		ለ. የለም		2
413	ከነዚህ ከተዘረዘሩት ህመሞች ውስጥ የትኛው እንዳለብዎት በሐኪም ተነግሮዎታል?	ሀ. የኩላሊት ህመም		1
		ለ. የልብ ህመም		2
		ሐ. የስኳር ህመም		3
		መ. የዓእምሮ ህመም		4
		ሠ. ወባ፣ ታይፎይድ፣ ታይፈስና የመሳሰሉት		5
		ረ. ሳይነስ		6
		ሰ. ሌሎች ካሉ ዘርዝሩ_____		7
		ሸ. የለብኝም		8
414	ባለፈው አንድ ወር ውስጥ መድሃኒት ተጠቅመዋል?	ሀ. አዎ		1
		ለ. የለም	416	2
415	መድሃኒት ተጠቅመው			

	ከሆነ፣ የምን መድሃኒት ነው?	አብራሩ_____		
ክፍል አምስት: ከአካል ጉዳት (Injury) ጋር የተያያዙ ሁኔታዎች				
501	በዚህ የማእድን ሥራ ውስጥ **ባለፈው አንድ አመት** የአካል ጉዳት (injury) አጋጥሞዎት ያውቃል?	ሀ. አዎ		1
		ለ. የለም	**507**	2
502	የአካል ጉዳት አጋጥሞዎት ከነበር፣ ስንት ጊዜ?	ይገለጽ_____		
503	የአካል ጉዳት አጋጥሞዎት ከሆነ፣ የህክምና አገልግሎት ወይም የመጀመሪያ ህክምና እርዳታ አግኝው ነበር?	ሀ. አዎ		1
		ለ. የለም		2
504	የአካል ጉዳት አጋጥሞዎት ከሆነ፣ በጉዳቱ ምክንያት ስንት የሥራ ቀናት አሳለፉ?	_____ቀናት		
505	የአካል ጉዳት አጋጥሞዎት ከነበር፣ የትኛው የሰውነት ክፍል ነበር የተጎዳው?	ሀ. ራስ		1
		ለ. ጆሮ		2
		ሐ.ዓይን		3
		መ. ፊት		4
		ሠ. ደረት		5
		ረ. ጀርባ		6
		ሰ. ከትከሻ እስከ እጅ ጥፍር ያለው የሰውነት ክፍል		7
		ሸ. ከዳሌ እስከ እግር ጥፍር ያለው የሰውነት ክፍል		8
		ቀ. ታችኛው የእግር ክፍል (ጫማ)		9
		በ. ሌላ የሰውነት ክፍል		10
506	የአካል ጉዳት አጋጥሞዎት ከነበር፣ የጉዳቱ ዓይነት ምን ነበር ?	ሀ. ስንበር (Contusion)		1
		ለ. የቆዳ መላጥ፣ጭረት፣ መፈግፈግ (Abrasion)		2
		ሐ. የአጥንት ስብራት		3
		መ. ንቅለት(Dislocation)		4
		ሠ. የጀርባ አጥንት (አከርካሪ) ጉዳት		5

		ረ. የተቀረደደ ቁስል (laceration)		6
		ሰ. ጥልቀት ያለው ቁስል (Puncture wound)		7
		ሸ. ራስን መሳት		8
		ቀ. የሰውነት ክፍል መቆረጥ (Amputation)		9
		በ. ሌሎች		10
507	በጣም ከባድ የአካል ጉዳት ምክንያቶች ምን ምን ናቸው ብለው ያስባሉ?	ሀ. መውድቅ/ መንከባለል		1
		ለ. የማእድን ጉድጓዶች መደርመስ (collapse)		2
		ሐ. መጋጨት		3
		መ. ውሃ ውስጥ መስጠም		4
		ሠ. ፍንዳታ		5
		ረ. የእሳት አደጋ		6
		ሰ. መሣሪያዎችን በአግባቡ አለመጠቀም		7
		ሸ. በሌሎች ነገሮች መገጨት		8
		ቀ. ጥቃት(Assault)		9
		በ. የሥራ ጫና (Workload)		10
		ተ. አልኮል መጠጣት		11
		ቸ. ሌሎች		12
ክፍል ስድስት: ከስርዓተ ትንፈሳ ጋር የተያያዙ ህመሞችና ስሜቶች				
601	ባለፈው አንድ ዓመት ውስጥ ቢያንስ ለ3 ወራት ያህል • ጧት ጧት የሚነሳ ወይም • በቀን/ ማታ የሚነሳ ወይም • በቀን 4_6 ጊዜ ለ≥4ቀናት በሳምንት የሚቆይ ሳል ይዞዎት ያውቃል?	ሀ. አዎ		**1**
		ለ. የለም		**2**
602	ባለፈው አንድ ዓመት ውስጥ ቢያንስ ለ3 ወራት ያህል	ሀ. አዎ		**1**

	አክታ ያለው ሳል ይዞዎት ያውቃል?	ለ. የለም		**2**
603	ባለፈው አንድ ዓመት ውስጥ ጉንፋን ሳይኖርዎት የፉጨት ዓይነት ድምጽ (whistling) ከደረትዎ ይሰማዎታል?	ሀ. አዎ		**1**
		ለ. የለም		**2**
604	ባልፉት 12 ወራት ውስጥ ቁጭ ባሉብት የትንፋሽ ማጠር አጋጥሞዎታል?	ሀ. አዎ		**1**
		ለ. የለም		**2**
605	በሃኪም የተረጋገጠ የአስም ህመም አለብዎት?	ሀ. አዎ		**1**
		ለ. የለም		**2**
606	በሃኪም የተረጋገጠ የአስም ህመም ያለበት የቤተሰብ አባል አለ?	ሀ. አዎ		**1**
		ለ. የለም		**2**
607	የትኞቹ የስርዓተ ትንፈሳ ችግሮች ታሪክ አለብዎት?	ሀ. ቲቢ		**1**
		ለ. ብሮንካይትስ		**2**
		ሐ. ሳንባ ምች		**3**
		መ. የአፍንጫ አለርጂ		**4**
		ሠ. ችፌ (Eczema)		**5**
		ረ. የእናትዎ በእርስዎ እርግዝና ወቅት ሲጋራ ማጨስ		**6**
		ሰ. ሌሎች ካሉ ፣ ዘርዝሩ _____		**7**
		ሸ. የለም		**8**

Annex VII: Questionnaire (Afaan Oromoo version)

Lakk	Gaafilee	Deebii filachisan	Darbii	Koodii
Kutaa Tokkooffaa: Odeefannoo hawaasummaa fi dUumataa				
101	Umri	Waggaa----------		
102	Saala	A. Dhi		1
		B. Dha		2
103	Amntaa	A. Ortoodoksii		1
		B. Muslimaa		2
		C. Protestaantii		3
		D. Kaatoolikii		4
		E. Kan biro		5
104	Haala Heerumaa/fuudhaa	A. Hin heerumnee /hin funee		1
		B. Heerumeeraa/Fuudheraa		2
		C. Addan baaneerraa		3
		D. Kan iraa dhu'ee		4
		E. Addaan ba'anii kan mana tokkottii jiratuu		5
105	Sadarkaa barumsaa	A. Dubisuufi Barreesuu kan hindandeenyee		1
		B. Dubisuufi Barreesuu kan danda'u/dandeesuu		2
		C. hanga kutaa 6 ffaa kan baratee/ttee		3
		D. Hanga kutaa 10 ffaa kan baratee/ttee		4
		E. kutaa 10ffaa oli kan baratee/ttee		5
106	Baay'ina maatii	----------		
107	Haama Galii	---------- Qarshii/ Ji'an		
Kutaa lammaffaa: Amala dhunfaa				
201	Tanboo nixuxxuu?	A. Gonkuma hin xuxuu	204	1
		B. Waggaa tokkoon duraa		2
		C. Ji'a tokkoon dura		3
		D. Ammayyuu nan xuuxa		4
		E. ---kan biraa yoo jiraate ibsaa		5
202	Yoo Xuuxxan yeroo meeqaaf	Waggaa/Ji'a ykn Guyyaa ----f		

	Xuuxxan?			
203	Yoo Xuxxan guyyaan hagam Xuxxuu?	A. Firii ----------		1
		B. Paakeettii ---------		2
204	Alkoolii Dhuugduu?	A. Sirumaa	207	1
		B. Ayyaanaaf		2
		C. Toorbaanin		3
		D. Guyyaan		4
		E. ----------kan biraa yoo jiratee ibsaa		5
205	Yoo dhuugdan yeroo meqaaf dhuugdan?	Waggaa/Ji'a ykn guyyaa -----f		
206	Yoo dhuugdan guyyaan Kubaayaa meqaa dhugduu?	---------- Kubaayaa		
207	Qurxxummii Sorattuu? Guyyuma guyyaan(yooxiqaatee torbaanin)	A. Eyyeen		1
		B. Hinjiru	209	2
208	Qurxxummii yeroo meqaaf sorattuu?	Waggaa/Ji'a ykn guyyaa ----f		
209	Mana keesa sorataa bilcheesituu?	A. Eyyeen		1
		B. Mitii	212	2
210	SooraBilcheessuudhaaf human annisaamaalfayyadamtuu?	A. Qooraanyknkoosiihorii		1
		B. Cilee /kasalaa		2
		C. Elektrikii		3
		D. Gaazii		4
		E. Kanbiraayoojirateeibsaa----------		5
211	Sooratakanbilcheesitaneessaa	A. Mana kessa		1
		B. Alatti		2
		C. Lemaanu		3
212	Mana keessatiibeeyiladoonniiwaliinjiratu?	A. Eyyeen		1
		B. Mitii		2
Kutaa Sadaffaa: Dhimmoota haariroo hojiin walqabatee				
301	Yeroo meqaaf hojjatanii?	Waggaa ----------/Ji'a ----------f		
302	Baayi'ee kan hojjatajn hoomi?	A. Waaree duraa/ganama		1
		B. Waaree bodaa		2

		C. Galgalaa		3
		D. Waareeduraa fi Waareebodaa		4
		E. Waareeduraa fi Galgalaa		5
		F. Waareebodaa fi Galgalaa		6
303	Bool'a keesaa hojjatanii jirtu?	A. Eyyeen		1
		B. Hin hojjanne	307	2
304	Hojii Bool'a keesaa yeroo meqaaf hojjatanii jirtu?	Waggaa --------/Ji'a -------f		
305	Hojii Bool'a keesaa guyyaatti yeroo/sa'ati meqaaf hojjattuu?	Yeroo/ Guyyaa ----------f		
306	Hojii Bool'a keesaa toorbaanitti yeroo/sa'ati meqaaf hojjattuu?	Yeroo-/Toorbaan----------f		
307	Hojii daakuu/buulleessu keessatti hojjatani jirtu?	A. Eyyeen		1
		B. Hin hojjanne	311	2
308	Hojii daakuu/buulleessu keessatti yeroo meqaaf hojjatanii jirtu?	Waggaa -------/Ji'a -------f		
309	Hojii daakuu/buulleessu guyyaatti yeroo/sa'ati meqaaf hojjattuu?	Yeroo/ Guyyaa ----------f		
310	Hojii daakuu/buulleessu toorbaanitti yeroo/sa'ati meqaaf hojjattuu?	Yeroo-/Toorbaan---------f		
311	Hojii sooruu/ adda baasuu hojjatanii jirtu?	A. Eyyen		1
		B. Hin hojjanne	315	2
312	Hojii sooruu/ adda baasuu yeroo meqaaf hojjatanii jirtu?	Waggaa -------/Ji'a ------f		
313	Hojii sooruu/ adda baasuu guyyaatti yeroo/sa'ati meqaaf hojjattuu?	Yeroo/ Guyyaa ----------f		
314	Hojii sooruu/ adda baasuu toorbaanitti yeroo/sa'ati meqaaf hojjattuu?	Yeroo-/Toorbaan----------f		
315	Hojii dhiquu hojjatanii jirtu?	A. Eyyeen		1
		B. Hin hojjanne	319	2
316	Hojii dhiquu yeroo meqaaf hojjatanii jirtu?	Waggaa --------/Ji'a -------f		
317	Hojii dhiquu guyyaatti yeroo/sa'ati meqaaf hojjattuu?	Yeroo/ Guyyaa ----------f		

318	Hojii dhiquu toorbaanitti yeroo/sa'ati meqaaf hojjattuu?	Yeroo-/Toorbaan----------f		
319	Hojii walitti makuu keessatti hojjatanii jirtu?	A. Eyyeen		1
		B. Hin hojjanne	323	2
320	Hojii walitti makuu yeroo meqaaf hojjatanii jirtu?	Waggaa ---------/Ji'a ------f		
321	Hojii walitti makuu guyyaatti yeroo/sa'ati meqaaf hojjattuu?	Yeroo/ Guyyaa ----------f		
322	Hojii walitti makuu toorbaanitti yeroo/sa'ati meqaaf hojjattuu?	Yeroo-/Toorbaan----------f		
323	Hojii gubuu keessatti hojjatanni jirtu?	A. Eyyeen		1
		B. Hin hojjanne	327	2
324	Hojii gubuu yeroo meqaaf hojjatanii jirtu?	Waggaa -------/Ji'a -------f		
325	Hojii gubuu guyyaatti yeroo/sa'ati meqaaf hojjattuu?	Yeroo/ Guyyaa ----------f		
326	Hojii gubuu toorbaanitti yeroo/sa'ati meqaaf hojjattuu?	Yeroo-/Toorbaan----------f		
327	Hojii Albuda Omishuun ala hojii biro qabduu?	A. Eyyeen		1
		B. Hin qabuu	330	2
328	Hojii biro yoo qabdan maqaa?	Ibsaa----------		
329	Hojii kana irratti yeroo meeqaaf hojjatanii jirtu?	Waggaa ------/Ji'a ------f		
330	Leenjii Oggummaa, Fayyummaafi nagummaa leenjitanii jirtu?	A. Eyyeen		1
		B. Hin leenjinee		2
331	Meeshaalee Fayyummaa fi nagummaa iddoo hojiitti kennaman ni fayadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu	333	2
332	Meeshaalee Oggummaa, Fayyummaa fi nagummaa iddoo hojiitti yeroo meqaan fayyadamtuu?	A. Guyyuma guyyaan		1
		B. Irra caalaan		2
		C. Darbee darbee		3
333	Meeshaalee Oggummaa, Fayyummaa fi nagummaa iddoo hojiitti yoo hi fayyadamnee ta'ee sababa isaa?	Ibsi----------	401	
334	Kan mataa uwisuu fayyadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu		2
335	Kan Ija uwisuu fayyadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu		2

336	Kan afaan fi funyaan uwisuu (Maaskii) fayyadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu		2
337	Guwaantii haarkaa fayyadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu		2
338	Gaawaanii fayyadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu		2
339	Koophee boottii fayyadamtuu?	A. Eyyeen		1
		B. Hin fayyadamu		2

Kutaa Afraffaa: Dhibbaa keemikaalotaa fi Suummaawaan kan waqabatee				
401	Hojii keessanif keemikaala fayyadamtuu jiraa?	A. Eyyeen		1
		B. Hinjiruu	403	2
402	Keemikaala fayyadamtuu yoo jiraatee maqaa?	Ibsaa ----------		
403	Iddoo kamittuu keemikaala Saanayidii fayyadamtani bektuu?	A. Eyyeen		1
		B. Hin fayyadamnne	405	2
404	keemikaala Saanayidii yoo fayyadamtan yeroo meqaaf?	Waggaa -------/Ji'a--------f		
405	Iddoo kamittuu keemikaala Meerkurii fayyadamtani bektuu?	A. Eyyeen		1
		B. Hin fayyadamnne	407	2
406	Keemikaala Meerkurii yoo fayyadamtan yeroo meqaaf?	Waggaa -------/Ji'a--------f		

407	Haancuufa dadaftanii tuuftuu?	A. Eyyeen		1
		B. Hin qabuu		2
408	Miira dadhabinaa fi hoolachuu isiini dhaga'amaa?	A. Eyyeen		1
		B. Hin qabuu		2
409	Rakkoo hiribaa qaduu?	A. Eyyeen		1
		B. Hin qabuu		2
410	Hidhhin keessan gara cuuqulisaatti jijjiramuu isin mudatee beekaa?	A. Eyyeen		1
		B. Hin qabuu		2
411	Rakkoo tarkanfachuu isin	A. Eyyeen		1

	mudatee beekaa?	B. Hin qabuu		2
412	Mila fi lafee milaa soosoochoosuuf isiin rakisaa?	A. Eyyeen		1
		B. Hin qabuu		2
413	Dhukkuubootaa armaan gadii tareefaman keessaa Ogeessa fayyaatiin isa kam akka ta'ee isiinif himmamee jiraa?	A. Dhibee kallee		1
		B. Dhibee Onnee		2
		C. Dhibee Suukaaraa		3
		D. Dhibee Sammuu		4
		E. Busaa, taayifoyidii, Taayifasii,kkf…		5
		F. Saayinasii, Asmii kan biroo qama hargansuu		6
		G. Kan biro yoo jiraatan ibsii----------		7
		H. Hin qabuu		8
414	Ji'a tokkoon asii qorichaakamiyyuufayyadamtanirtuu?	A. Eyyeen		1
		B. Hin fayyadamnne	415	2
415	Yoo qorichaa fayyadamta ta'ee qoorichii kan maaliti?	Ibsii ----------		

Kutaa Shanaffaa: Odeeffannoo madaa wal kan waqabatee				
501	Hojiialbuudaa kana keessatti waggaa tokkon asii midhaa isiin mudatee beekaa?	A. Eyyeen		1
		B. Hinjiruu	507	2
502	Midhaa isiin mudatee yoo beekee hammamii?	Ibsaa ----------		
503	Midhaa qaamaa isiin mudatee yoo beekee wala'ansaa fayyaa ykn deegarsa fayyaa duraa argatanii jirtuu?	A. Eyyeen		1
		B. Hin jiruu		2
504	Midhaa qaamaa isiin mudatee yoo beekee sababa midhaatin guyyaa meqaa boqoonnaa fudhatan?	Ibsaa ----------		
505	Qaama keessan kamtuu midhamee?	A. Mataa		1
		B. Gurra		2
		C. Ija		3

		D. Fula		4
		E. Laphee		5
		F. Duba		6
		G. Gateetti		7
		H. Gajallaa		8
		I. Qomoo		9
		J. Biroo		10
506	Gosa qama midhamummaa akkamituu isiin mudatee	A. Mallatto		1
		B. Gogaa nafa irraa ka'uu		2
		C. Cabuu		3
		D. Buqaa'uu		4
		E. Lafee dugdaa		5
		F. Kan quncaa'ee		6
		G. Madaa qaama uramee		7
		H. Oftoo'achuu dadhabuu		8
		I. Qama muramuu		9
		J. Kan biro		10
507	Iddoo hojii kessan irratti sababoota midhamuumaa geessan ciccimoon maal maal faadhaa?	A. Kufuu		1
		B. Boola albuudaa garagaluu		2
		C. Walitti bu'uu		3
		D. Bishaan keessa bu'uu		4
		E. Dhooyinsaa		5
		F. Balaa ibiddaa		6
		G. Meeshaalee sirritti osoo hin eegin		7
		H. Wanta biroon rukutamuu		8
		I. Dhibbaa		9
		J. Dhibbaa hojii		10
		K. Dhugaatii		11

		L. Kan biro		12
Kutaa Jahaaffaa: Odeeffannoo Dhibeewwan fi miira hargansuun				
601	Waggaatokkoodarbeekeessattiuta alloowalirraahinciitneeji'asadifqa bduuturtee? - Ganama irratti kan mula'uu ykn - Guyyaa fi galgala ykn - Guyyaan yeroo 4-6f guyyoota 4f fi isa oli /torbaanin	A. Eyyeen		1
		B. Hin jiruu		2
602	Waggaa tokkoo darbee keessatti qufaa goroora qabuu ji'a sadif qabduu turtee?	A. Eyyeen		1
		B. Hin qabuu		2
603	Waggaa tokkoo darban keessatti osoo qufaa hi qabaatiin laphee keessanirraa kan sagalee siqsuu qabuu ji'a sadif qabduu turtee?	A. Eyyeen		1
		B. Hin jiruu		2
604	Ji'oota 12 darban keessatti bakka teessanitti rakkoo harganssuu qabduu turtee?	A. Eyyeen		1
		B. Hin qabuu		2
605	Doktaraan kan mirkanaa'ee dhibee asmii qabduu?	A. Eyyeen		1
		B. Hin jiruu		2
606	Doktaraan kan mirkanaa'ee maati keessan keesaa dhibee asmii namni qabuu jiraa?	A. Eyyeen		1
		B. Hin jiruu		2
607	Rakkoolee sirna harganssuu saan kam qabduu?	A. Dhibee soombaa (TB)		1
		B. Broonkaayitii		2
		C. Dhooftuu soombaa		3
		D. Alaarjii funyaanii		4
		E. Chiifee		5
		F. Haarmeen yeroo na ulfooftuu tamboo xuuxuu ishee		6
		G. Kan biro ibsii ----------		7
		H. Hin jiruu		8

Annex VIII: Standard operation procedures (SOP) of urinalysis

Standard Operating Procedures (SOP) for urine test using urine dipstick (69)

Required materials

1. Urine Test Strips; URS- 10T = 450 pieces
2. Disposable gloves= 600 pairs
3. Mask (reusable)= 8 pieces
4. Absorbent towel for sweeping urine test strip=40
5. Sterile Urine cup =40
6. Safety box for wasting used strips= 3
7. Container for keeping used urine cups for the next day=3
8. Berekina (3%) for cleaning urine containers for the next day= 1000ml
9. Result Form: (69) = 430
10. Test tube (plastic) = 40
11. Alcohol (70%) = 1 Littre

Procedures

1. Make all materials ready for use including covid 19 prevention tools
2. Get ready for preventing Covid 19- applying the universal prevention methods

   2.1.Proper hand hygiene; keeping physical distance; proper mask use
3. Check test strip vial for expire date
4. Wear gloves; collect urine from volunteer participants
5. Mix the urine well
6. Close the test strip vial immediately after every opening
7. Holding the long edge of the test strip, dip the urine with it (for 1 second) immediately
8. Place the test strip, test pads facing up, onto paper towel or pad.
9. Set timer for 60 seconds, hold container upright and test strip vertically.
10. Compare each test pad to the corresponding row of color blocks on the bottle label.
11. Record urine test results onto result record form

Figure 8 a picture of urine dipstick test kit (URS- 10T) used for analyzing level of protein in urine Oddo Shakiso, Ethiopia 2020

Urinalysis test result record form

S. No	**Parameters**	**Reference**		**Observed value**	**Remark**
		Value	**Unit**		
1	Leukocyte	-	Leu/µl		
2	Nitrite	-	-/+		
3	Urobilinogen	0.2	mg/dL		
4	Protein	-	g/L		
5	PH	5	Number		
6	Blood	-	Ery/µL		
7	Specific gravity	1.000	Number		
8	Ketone	-	mmol/L		
9	Bilirubin	-	µmol/L		
10	Glucose	-	Mg/dL		

Annex IX: Observation checklist

An observation checklist- adapted from Hazard analysis checklist (60)

1. Is there any chemical which is used by miners in mining process?	1. Yes	0. No
2. Do miners face exposure to silica while excavation/ crushing?	1. Yes	0. No
3. Do miners use mercury for gold extraction?	1. Yes	0. No
4. Do miners use cyanide for gold extraction?	1. Yes	0. No
5. Are there SOP manuals available for OSHM duty?	1. Yes	0. No
6. Are there safety rules posted in the working area?	1. Yes	0. No
7. Are there shift schedules planned to reduce health risks?	1. Yes	0. No
8. Are workers wearing PPE at the time of data collection?	1. Yes	0. No
9. Do workers use PPE properly?	1. Yes	0. No
11. Are first aid services available for emergency issues?	1. Yes	0. No
12. Is there an OHS expert assigned for emergency response?	1. Yes	0. No
13. Is there an observable dust in work place?	1. Yes	0. No
14. Are there sick/ injured workers while the observation?	1. Yes	0. No

15. Other observational findings, mention if any. ----------

Annex X: CURRICULUM VITAE (CV)

1. PERSONAL DESCRIPTION

- Full name ---------- Fentayehu Abebil Alaminie
- Sex ---------- Male
- Date of birth ---------- July 26/ 1988
- Place of birth ---------- West Gojjam Zone
- Nationality ---------- Ethiopian
- Current location---------- Addis Ababa
- Marital status ---------- married
- Contact address: mobile ---------- 09-53-91-53-19/09-24-78-14-49

  Email ---------- fentayehu1@gmail.com

2. EDUCATIONAL BACKGROUND

- 1989 -1995 E.C Geregera Elementary School
- 1996 -1997 E.C Adet Secondary School
- 1998 -1999 E.C Lake Tana Preparatory School
- 2000 -2003 E.C Haromaya University

3. QUALIFCATION

- BSC degree in Public Health Officer (PHO) from Haromaya University
- Masters degree in MPH from Addis Ababa University (AAU)
- I have been working at different nongovernmental and governmental institutions including health centers starting from April 2011
- I also worked with Addis Ababa University in Covid 19 prevention programs

4. LANGUAGE SKILLS

LANGUAGE	SPEAKING	LISTENING	READING	WRITING
Amharic	excellent	excellent	excellent	excellent
English	excellent	excellent	excellent	excellent

5. ADDITIONAL TRAININGS TAKEN

- IMNCI- Integrated Management of Neonatal and Childhood Illness
- IRT- Integrated Refreshment Training for HEWS
- PMTCT- Prevention of Mother to Child Transmission of HIV/ AIDS
- **Radiation protection** from Ethiopian Radiation Protection Authority (ERPA)
- **SPSS basics**- from AAU college of commerce

6. HOBBIES:

- I am interested in reading medical literatures and bible as well watching comedy films.

Declaration

I, the undersigned student, declared that this original work has never been presented for any degree in this or other universities and all sources of materials used for this thesis have been fully acknowledged.

Name of student: Fentayeheu Abebil (BSc)

Singnature_____

Place: Addis Ababa University

Date of submission_____

This thesis has been submitted for examination with my approval as university advisor.

Name: Mr. Worku Tefera (MPH, PhD candidate)

Signature _____