

Occupational Health and Safety in Ethiopia: A review of Situational Analysis and Needs Assessment

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Abstract

Background: The current rapid economic development has brought changes in workplaces in developing countries, including Ethiopia. The organization of occupational health and safety services is not yet resilient enough to handle the growing demands for workers' health in the context of industrialization. There is limited information on the gaps and needs of occupational health service in work place in Ethiopia.

Objectives: The present review article describes the existing profile of occupational safety and health services in Ethiopia and identifies the existing gaps and needs in the services.

Methods: Secondary data sources were reviewed using a structured checklist to explore the status of occupational safety, health services and related morbidity. Local literature was consulted in order to describe the type of prevalent work related hazards, patterns of industries and of workforce. Published articles were searched in Google, Google scholar, PUBMED and HINARI databases. Relevant heads of stakeholder organizations and experts were interviewed to verify the gaps that were synthesized using desk review.

Results: Ethiopia is an agrarian country that is industrializing rapidly with a focus on construction, manufacturing, mining, and road infrastructure. An estimated work force of about two million is currently engaged in the public and private sectors. Male population constitutes the majority of this workforce. Most of the work force has basic primary education. Commonly observed hazards in work place include occupational noise and dust of various types in manufacturing sectors and chemical exposures in flower industry. Injury in both the agriculture and the manufacturing sectors is also another work place hazard commonly observed in the country. A lack of information made assessing workplace exposures in detail difficult. Noise exposure was found to be high with the potential to seriously impact hearing capacity. Exposure to dust in textile and cement factories greatly exceeded international permissible limits. There is a high level of work place injuries. This often leads to an extended loss of productive working days. Occupational safety and health services were found to be inadequately organized. There is a limited practice in exposure assessment and monitoring. This happens to be true despite the existing favorable environment in areas of policies and regulations.

Conclusion and Recommendation: There is a severe scarcity of peer-reviewed literature related to workplace exposures and their impact on workplace health and safety. No adequately skilled manpower is available. The internal infrastructural capacity is so weak that it cannot help to identify and assess hazards in the workplace. Monitoring system and laboratory investigation is limited despite the presence of favorable policy and regulatory frameworks. Addressing these gaps is of immediate concern. [*Ethiop. J. Health Dev.* 2015;29(Special Issue):46-55]

Introduction

Globally, the traditional way of producing goods and commodities has been revolutionized since the advent of the industrial revolution. This has made workplace to become the concern of the public health sector. This concern seems to have emerged from the duty to protect workers from adverse effects. According to the estimate made by ILO, about 330 mln accidents annually occur globally. Also, 160 mln workers are estimated to suffer from work related diseases that lead to a death toll of 2 million workers and loss of 4% of world's annual GDP (1). The global burden of diseases that could be attributed to occupational risk factors was about 0.9million Daily Adjusted Life Years (DALYs), or 2.5% of global DALY's in 2010 (2). The rate of health damage is expected to increase, given the global growth in urbanization and industrialization in developing countries. While this is a benefit acknowledged to improve the livelihood of mankind,

there are negative consequences in terms of the effect it may have on workers' health and on the immediate environment. This side effect is felt to be faced if an effective and sustainable interaction between development and environment is not in put place.

There are international labor conventions on occupational safety and health that are required to be adopted and ratified for the maintenance of workers' health through policy, regulatory framework and provisions of enforcement by UN member countries. Ethiopia has ratified about 20 ILO conventions, including core conventions such as - Occupational Safety and Health Convention, 1981 (No. 155) (3). These conventions are the basis to develop laws in areas of work protection.

Ethiopia has had a regulation on Occupational Safety and Health (OSH) since 1940's. The Ministry of Labor

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and Social Affairs (MOLSA) is the state organ that regulates workers' safety and health in work places, both private and state owned. MOLSA and its regional networks have organizational structure lined to the periphery. Ethiopia is one among the many countries from around the world that have adopted ILO Convention No 155 of 1981 in 1991 which resulted in two major regulations: Labor Proclamation No. 377/2003(4) and Labor Proclamation No. 515/2007 on public civil servants(5). The national level policy on Occupational Safety and Health (OSH) has recently been developed and approved (July 2014) by the Central government.

Ethiopia is moving fast towards industrialization and civil reform to advance productivity (GTP) (6). According to the Annual Report of the Confederation of Ethiopian Trade Unions released in 2012, at the time the report was released, there were 702 undertakings that absorbed 370,000 workers (7). The informal economic sector in urban communities is growing faster than is expected. This may be due to the booming of micro-enterprises organized in different sectors (construction, social services) (6).

In the Growth and Transformation Program, (i.e., a national policy document) it is anticipated that Ethiopia will place industrialization at the forefront to be a middle income country. For this to happen, textile and garment, leather and leather related products are among the priority areas of industry. Similarly, flower and floriculture industries, cement, metal and metal products, and the production of green energy through renewable energy sources are other priority areas identified as the starting points of industrialization.

The impact of industrialization on the national GDP has been estimated to have grown, on average, about 11% over the last five years (2005/6-2006/2010) (6). This was expected to maintain the same trajectory until 2015 and the year beyond. This growth has hugely impacted poverty to decline from 39% in 2004/5 to 28% in 2011/12.

The industrial sector grows, on average, about 14.9% per year during the first three years of GTP (8). In GTP II, the growth rate is planned to reach at least 18%, the focus being placed on the manufacturing sectors. The annual growth rate of the sector was planned to be 24%, on average. In light of the rapid growth of industrialization and urbanization in the country, it is important to know the existing situation and the gaps of OSH. The knowledge helps to maintain sustainable development that safeguards both the work force in the work place and the immediate environment.

Published information on the status of OSH at the national level is very limited. Even the limited amount that is available is not updated to accommodate the dynamics of workplace exposures and the introduction of new technologies. The purpose of the current review is, therefore, to describe the existing situation of OSH and identify knowledge gaps and challenges that may constrain the progress of OSH in the country. The information from this review is anticipated to serve the

Ministry of Labor and Social Affairs (MOLSA) and its partners to develop relevant interventions and maintain a decent and safe work environment in Ethiopia.

Methods

A structured review questionnaire that covered key areas of OSH for the Ethiopian context was prepared and used for data collection. The data was subsequently enriched through consultative meetings with concerned stakeholders who were engaged in worker's safety and health. The review used both manual and online searches. The manual search consisted of systematic acquisition of various types of on-shelf reports on OSH, mainly from the Ministry of Labor and Social Affairs and the Ministry of Health (MOH). In addition, relevant information was collected using uniform abstraction form from Medline and HINARI databases, and Africa Journal online using Google and Pub Med search engines. Targeted key words and bibliographies of recent key publications were used to conduct a focused search for the review. The authors of this review made the preliminary assessment of inquired themes of OSH and synthesis of findings.

Heads of OSH units and Experts of MOLSA were interviewed using open-ended semi-structured interview guidelines. This helped to check consistency of the findings between the desk review and views of the authorities. Additional data was sought using a checklist by a walk-through inspection of five large scale factories to observe and document the existing practices and the local implementation process of the policy of OSH. Health service heads and Safety Officers at the factory level were consulted to document the OSH services provided to workers.

Information on key concerns was first organized and summarized by themes using a table matrix. This was followed by checking the consistency and subsequent search for additional data whenever there was any evidence of ambiguities and lack of clarity. Repeated and iterative reading made to identify key gaps that may require attention in areas of OSH services, training, research, exposure assessment, and capacity building. The review study was approved at Department level through the School of Public Health of Addis Ababa University.

Results

Characteristics of Work Places: The work force in Ethiopia is generally administered under two laws: government employees governed by Federal Civil Servant Proclamation No.515/2006 (5) and production related employees governed by MOLSA of the labor proclamation No.377/03 (4). An estimated half million workers are engaged in the scope of labor proclamation, while 1.3 million belonged to the civil service sector (9). The country's economy is greatly liberalized towards privatization with the exception of strategic industries such as banking for foreign investors and telecommunication. Ethiopia is a primarily an agrarian country with only about 1% of the total employed workforce engaged in the manufacturing, construction, and mining sectors (personal communication).

Work places with at least ten workers per employer are targets of OSH regular services by inspectors of MOLSA. Workplaces are generally classified into nine major industrial groups, among which agriculture employed 85%. The share of the manufacturing sector with construction and mining accounted for 6.6% of the workforce (10). There are three broad types of industrial scales based on the number of workers and the type of machinery: large and medium scale industry, small scale, and micro-enterprises. A small scale manufacturing undertaking typically involves fewer than 10 workers. The use of power driven machine characterizes manufacturing undertakings. About 85% of the 43,338 surveyed undertakings were grain mills, furniture and metal works. The majority of the employed were males (90%) and 40% were unpaid family members with an average of 3.2 workers per undertaking (11).

A large and medium scale manufacturing establishment employs 10 or more workers and typically operates with power driven machines. The 2010 national survey (n=2170) indicated employment opportunity for about 176,000 people with a skewed geographic distribution. About 40% of them were found in the capital city of Addis Ababa, and majority were involved in the manufacture of food, beverages, non-metallic products such as textiles, and manufacture of furniture (12).

Workplaces with fewer than ten workers operating with or without machines belong to micro-enterprises. Work places characterized as micro and small enterprises usually operate with limited capital and human resources. They collectively employ a large labor force. They are considered as strategic to the development of a productive private sector in the country.

Other workplaces commonly classified as informal economic sectors often lack the capacity to meet the minimum labor standards required by the labor law. Informal sectors in Ethiopia are either home or individual-based enterprises. They operate on a very small scale and without governmental support in training and capacity building. They provide significant employment opportunities. However, they operate without a business license under relatively poor health and safety working conditions. CSA data indicates that about 51% of the urban labor force is engaged in the informal business sector (13).

Overall, there is a large gender disparity in employment. The national census in 2007 indicated males had about 20% higher employment rates than females (14). The national Labor Force Survey also indicated the dominance of males of 85% compared to 69% (n=31.4 mln) (10).

Other socio-economic determinants of employment include employment by residence. Manufacturing and service industries are typically concentrated in urban settings while about 82% of employment is found in rural areas in the agricultural sector the primarily agrarian nature of the country's economy is a cause for this type of employment (10).

Exposures to Hazards in Industrial Work Places and Associated Health Risks: The nature of exposures of workers to workplace hazards depends on the type of work. Studies on occupational exposures using standard measurements are rare in the context of Ethiopia. Aerial cotton dust measurements using Anderson dust sampler fitted with a vertical elutriator at Bahir Dar Textile Mill showed the presence of increased dust (seventeen times greater than the USA, OSHA PEL 0.2 mgm/m³) in the blowing and carding sections. Cotton dust concentration in the weaving section had the smallest concentration in the work flow. Even this 'smallest' is itself more than 4 times than the OSHA PEL. A significant positive correlation was observed between the occurrence of byssinosis & chronic bronchitis and level of cotton dust in these workstations (15).

An aerial cotton dust measurement in the work place of Akaki Textile Factory found in the outskirts of Addis Ababa indicated significant variation by workstations. MIE Data RAM 4 (Data-logging Real Time Aerosol Monitor 4, USA) was used to do this aerial cotton dust measurement. The dust concentration varied: 2 mg/m³ in the weaving section, 5.6mg/m³ in drawing section, 8mg/m³ in the carding section, 32 mg/m³ in the blowing section, with a mean respire-able dust size of 4.0 µm (16). These concentrations were more than 10-150 times greater than the PEL of OSHA of USA, assuming the workers could have spent 8 hours in such work environment.

The development of cement production is one of the sectors that have grown significantly, from 3 to currently 20 factories. More than 10,000 workers are involved in this sector (17). Exposure to cement dust is a growing concern in cement production. A recent study has revealed personal exposures to total respire-able dust exposure to be 549 mg/m³ and 6.8 mg/m³ in the Muger factory, and 153 mg/m³ and 2.8 mg/m³ in the Mossebo factory. The respire-able dust concentration was much in excess of the personal exposure limits of 1.0 mg/m³ of the recommended standard of American Conference on Governmental Industrial Hygienist (18). The same study indicated that increasing dust concentration had a strong association with increased respiratory symptoms and reduced lung functions.

According to the GTP of Ethiopia, small-scale enterprises that generally employ 5-50 workers per undertaking represent a strategic economic sector. Such enterprises are expected to transform into medium and large scale manufacturing sectors (6). They also have a larger proportion of employment countrywide. Available observational studies characterized hazards as excess noise (24%), air borne dust (57%), heat stress (14%), electric hazards (57%), and inadequate use of personal protective devices (36%) (19). Occupational health and safety practice was assessed in 25 small micro enterprises (SME). Data was gathered using direct observation and worker interviews. Commonly observed hazards included poor ergonomics (heavy manual lifting), slippery and unlevelled work surfaces,

excessive noise and dust, UV radiation, vibration, and electrical hazards (20).

Noise is another occupational hazard. This generally characterizes workplaces. Noise level measurements in 42 workstations in five factories (2 cotton and 3 metal) indicated 57% of the measurements exceeded OSH PEL level (21). In one textile factory, the level of hearing loss was significantly associated with personal noise level >85dBA and type of work stations (spinning and weaving) (22).

Factors related to the intensity of work were found to be important determinants of health in work places. Close to 60% of the surveyed textile workers had a sleep disorder, which was significantly associated with rotating shift work, external environmental noise, and working in the spinning department (23). Self-evaluation about the work organization can be used to estimate activities related to OSH interventions. About 40% of the respondents were not satisfied with their work place environment. Reasons for their dissatisfaction included limited provision of personal protective equipment (PPE), given the work place was typically hot, dusty and noisy (23).

The acquisition of adequate knowledge to recognize hazard signs in work place is important to prevent accidents. Acquiring this is dependent on training and literacy. The level of recognizing at least one safety sign was about 69%, while 52.3% had some kind of orientation in OSH (24). The level of literacy in the labor force was only 32% (10).

The construction sector, with a focus on housing and road infrastructures is growing very fast. Small scale studies and observations in the sectors indicate ergonomic related health risks such as back pain, eye and body injuries. The construction work place is characterized by repetitive movement of body parts. Working in open air, and the presence of excess noise and dust are also other characteristics of such work places. Inadequate awareness of occupational hazard, limited use of PPE at the work place, and poor personal hygiene were noted to be contributing factors to excess exposures such as unsafe work environment, dust and noise (25). A recent study confirmed these findings. The use of personal protective devices, poorly organized work places, lack of job satisfaction was commonly observed behaviors among workers of housing construction. Similarly, behavioral factors such as smoking and alcohol use were significant predictors of injury among the workers (26).

Workplace Exposure in Agriculture: Ethiopia is a country that is dependent still on subsistence farming, and this jeopardizes food security. There are national economic development plans to make the country food self-sufficient through large scale modern farming that use both rain harvesting and irrigation (6). The development of the flower and horticulture industry is another area where productivity in agriculture is expected to increase. Ethiopia now stands 2nd to Kenya in Africa in exporting cut-flowers (27). This creates a significant employment opportunity and foreign

currency earning. The flower industry makes a significant contribution to the growth of the national economy. An intensive use of fertilizers and pesticides is generally the characteristic of the flower industry. In addition, the associated health effects are largely unknown or poorly defined in Ethiopia.

Different applications for spraying of pesticides are operational in the field. The level of post exposure plasma and erythrocyte cholinesterase increased by 80% and 28% respectively in the study among state farm workers that used air plane to spray pesticides. The post-exposure level of cholinesterase was considerably higher from its baseline, indicating a significant exposure of workers to organo-phosphorous insecticide. Worker ignorance about the toxicity of pesticides, poor personal hygiene, and the total absence or improper use of personal protective devices was found to be determinants of pesticide exposure (28). The mean plasma cholinesterase activity among sprayers, pest-assessors and supervisors was lower than that among the controls (29). The knowledge of the use of personal protective devices (PPE) and the need for medical checkups and training were found to be very low in a study among farm workers in 5 state farms located in the Rift Valley of Ethiopia. This is mainly true for farms where organophosphates are intensively used to control pests.

The same study indicated the presence of inadequate practices of hygiene and sanitation of the sprayers. The sprayers largely used non-standard PPE (respirators, gloves, goggles, aprons, hats) and worn out gloves. The surveyed workers were illiterate. They could not read and understand the labels on pesticides. This means that they could not take the necessary precautions to protect themselves from exposure (30). Small farm holders had low awareness of how to use and store pesticides. The level of their personal protection was inadequate. This observation is consistent among small farm holders who are entirely dependent on the use of pesticides including the use of the obsolete ones (DDT) (31). The systems of purchasing, handling, using or distributing pesticides were unregulated. Those who use pesticides in their agriculture, including the people who use DDT, were either illiterate or not trained to use personal protective devices (32, 33).

About 50,000 workers are engaged in flower farms (33). Very few studies have data on the health risks among workers in the flower industry. Two studies, one single cross sectional, the other a comparative cross sectional, consistently showed the relative increases in symptoms of respiratory and skin disorders. For example, the extent of the symptoms of respiratory and skin disorders among the study subjects in flower farms was 1.8 to 3.5 times, respectively, greater than the general population. General illness symptoms (headache, fatigue, sleeping disturbance, and body irritation) were very common (34, 35). Respiratory and dermal symptoms were found to be higher among greenhouse workers compared to the control population (33). Symptoms of pesticide poisoning such as headache, fatigue, skin irritation, loss of appetite, and weakness were observed among

pesticide sprayers in Kenya. This is similar to what is observed among workers in flower farm in Ethiopia (31).

The prevalence of injuries in agriculture is an important area that affects productivity. The overall occupational injury prevalence rate was 783 per 1000 exposed workers per year in a state farm located in the northeastern part of Ethiopia. Injury was the main factor for the loss of 6,153 workdays, or an average of 11.4 days per injured worker per year. Factors such as working for more than 48 hours per week, absence of health and safety training, sleeping disorder, alcohol consumption, job dissatisfaction, and absence of protective devices were noted to be the major responsible factors for occupational injuries (36).

Exposure assessment in the work place in institutions is often undermined in Ethiopia. Available studies often focused on biological exposures like assessing HIV and hepatitis. The lifetime of needle stick and sharp injuries were found to be 30.5% and 25.7%, respectively (n=475), in a 10 hospitals study (37). Exposures to blood and body fluids, and substandard practice of infection prevention were found to be important factors among health care workers in public health facilities (38). Another study reported that the prevalence of needle stick and sharp injury for the preceding one year prior to the survey was about 31% (n=344). Contributing factors included extended work burden, lack of training on OSH, dissatisfaction with the work environment, low perception of risk and extended working hours (39). The rate of hepatitis B and C among clinical waste handlers significantly differed from that of non-clinical waste handlers. A significantly more exposure rate was observed among clinical waste handlers. This is an indication of occupational exposure (40).

Workplace Injury in Factories: Magnitude and Related Factors: Information on occupation-related diseases and injury or accident is not systematically recorded, evaluated, or monitored in the Ethiopian work setting. The Ethiopian Labor proclamation of 377/ 2003 (41) contains definitions and provisions on occupational accidents and occupational diseases (Article 97 and 98). It does not, however, indicate how data should be generated and systematically monitored and evaluated. Only a few studies describe occupationally related injuries and illnesses. The rate of injuries among factory workers using cross-sectional designs in Addis Ababa varied by studies, with reports of 80 per 1000 exposed population, (n=4462) (42), and 65 per 1000 exposed population (n=16,610) (43). A case-control study among 3,100 textile factory workers in Addis Ababa found an incidence rate of 200 injuries per 1,000 exposed workers per year (44). In the study, 50% of the injuries were caused by machinery and getting struck by objects. The finger is the most frequently injured body part. Limited use of PPE, workers' lack of training and poor lightning in work places were among the causes of such injuries. In addition, workers' low level of education, their age, work shift, and working places (weaving or spinning

sections, for example) were factors associated with increased risk of work textile factory injuries.

A case-control study in two large textile factories found that the work force of the factories is composed of male workers of less than 30 years old who often have poor health, job-related stress, sleep disturbance and no or very little safety training. These symptoms are also considered to be significant predictors of occupation-related injury (45). Most of the factors were shared among workers of both small and medium scale manufacturing establishments (46).

The prevalence of injury among workers engaged in operations in two metal factories was 333 per 1000 per year. Flying objects, falling, and machinery caused 43% of the injuries. Workplace hazards including unguarded machines, splitting materials, metal sparks, molten metal, excessive heat, and slippery and unlevelled floors contributed to the occurrence injuries in the factories (47). Operational plans on OSH and IEC materials were reported to be non-existent in these factories.

The rate of injuries among small and medium scale industries seemed to be relatively high. A cross-sectional study in small and medium manufacturing establishments in Gondar Zuria in 2004 found that the annual and two-week prevalence rates of work-related injury were 335 and 120 per 1000 exposed workers, respectively. These injuries involved mainly hands, fingers, and eyes. Duration of work, extended weekly work (> 48 hours per week), lack of work place supervision, sleep disorder, job dissatisfaction, and job categories were identified as the major determinants of injury in the workplace (46).

Small-scale businesses play a significant role in the provision of day-to-day community needs. These include flourmills, edible oil mills, metal, furniture, and construction works. One comparative cross-sectional study indicated that the prevalence rates of major respiratory diseases were higher among mill workers, compared to the general population, even after the potential confounding factors (age, smoking, and gender) were controlled (48).

The Labor Proclamation has provisions for the need of work related injuries to be centrally collected, analyzed and systematically disseminated to the public. This function, however, is not regularly sustained by the Ministry of Labor and Social Affairs. Available injury statistics for the period of 1993 to 2003 indicates that the rate of injury varied from 63 to 82 per 1000 exposed workers. The accident fatality rate varied from 0.1 to 0.23 per 1000 exposed workers. The number of days lost due to injuries varied from 192 to 681 per 1000 exposed workers (3). These figures are high, even without accounting for low data quality due to incomplete and inconsistent records.

The Provision of Occupational Safety and Health Services: The Ethiopian Labor Proclamation has a provision requires the employer to have an obligation to safeguard workers from accidents and injuries. The

proclamation also requires that the employer provide regular health services including during worker injury and sickness. It further requires that Safety Committees be established in each factory to advise the management on matters of preventing injuries and accidents. Delegates from the management and workers' union are thought to be members of the committee. The number of members of the committee typically varies between five and seven. The activity is mainly managed by a Safety Officer, who organizes periodic safety inspections, documents OSH provisions and follows up the recommendations of the Committee.

The existing practice of preventing hazards is limited to only personal level. Mainly, preventing hazards focuses on the training of workers and providing them with personal protective devices. Source control and the use of hazard path modification such as exhaust ventilation are rarely observed in work places. There are variations between the existing and the new investments in the practice of OSH. Enterprises that have started to use modern technology in recent times seem to protect workers better, compared to those who use the older technologies (personal observation). In the context of the older technologies, workers manually apply chemicals. They use manual heavy lifting. They also have inefficient local ventilation systems to control dusts.

Workers' health care service is provided using two approaches. One is using stand-alone health facility while the other is using referral health facility. The type of standalone health facility varies from first aid services to the mid-level type of clinics such as the type used in the Berhanena-Selam Printing Press to higher level hospitals such as is used in the Wonji Sugar Factory. The majority of the undertakings use first aid services or mid-level type of clinics. There is a referral system in cases where the lower health level providers fail to address the needs of the worker. Hospital-level service is equipped with all of the necessary instruments and materials to provide standard medical services as prescribed by the Ministry of Health regulations.

In most cases, a health service at the enterprise level is managed by a full-time nurse or health officer with other assistant staff. A part-time medical doctor on a weekly visit schedule of about 4 to 6 hours per week attends referral cases. These facilities mainly provide curative services for injured and sick workers. Health education and HIV care and support are provided by the factory level clinics in coordination with government health offices. Screening of workers for early detection of work related symptoms, exposure measurement (such as dust level, noise, vibration, toxic chemicals in body fluids, etc.) are not the usual practices of the health facilities. Lack of training of health professionals in exposure assessment, occupational medicine and nursing with the limited capacity in exposure assessment are the current challenges in the maintenance of workers' health.

The Ministry of Labor and Social Affairs of Ethiopia, with its seven Regional Offices, provides inspection

services and expert advices on OSH. Regular inspections are made based on priority hazards. The employer is obliged by law to implement the experts' 'advice upon receiving the inspectors' notification. Inspections, however, are not generally followed with exposure assessment in work places. Routine measurements of hazards such as industrial noise and dust are rarely done due to limited training, lack of skill in measurement and non-existent instrumentation at the factory level. This happens to be the case although employers have the responsibility to let workers know and that the employees have the right to know their exposure level by law (4).

Major accidents accompanied with serious injuries and fatalities are investigated for underlying causes and associated factors. Serious injuries and poisoning are managed by hospitals and insurance companies for treatment and compensations. Injuries are reported to MOLSA to be compiled and reported back to enterprises. The formal identification and documentation of occupational diseases that can be used for worker's compensation is not known well, and as a result, not practiced in the country. There is inconsistency in collecting, analyzing, and reporting countrywide relevant hazard and health related data. The need for organized national, or even regional, database is of a major concern. OSH-related data at the factory and enterprise levels are collected manually and often stored in hardcopies. Not much use can be obtained from such simple databases.

Commonly Observed Morbidity at the Enterprise Level:

The labor proclamation indicates provisions for documenting and notifying occupational diseases. This is because of the inadequate system that has been established in the areas of health related information in the context of workplaces between concerned stakeholders (3). However, staff members of factory clinics observe and document both communicable and non-communicable diseases routinely. The majority of workers complain of fatigue and abdominal and respiratory problems. Occupationally related diseases are also observed (personal communication), including contact dermatitis in painting units and workplaces using chemicals. Chronic obstructive lung diseases (asthma, chronic bronchitis) in dusty work places, severe eye problems in workplaces and loss of hearing in noisy environments are among occupation related complaints commonly heard. These are not yet formally recorded as occupational diseases, but are based on long-term observations. More recently, non-communicable diseases such as hypertension and diabetes have been observed at factory clinics (observation of morbidity reports).

Policy and Regulatory Frameworks: The Ethiopian Constitution (49) is the foundation for the governance of OSH. It has numerous articles that ensure the protection of citizens and workers from environmental and work related hazards. The Ethiopian Labor proclamation has established the provisions of OSH in work places. The proclamation clearly indicates the duties and responsibilities of the three parties: employer, employee and the government inspectors as

stakeholders (4). There are OSH directives and guidelines used by OSH inspectors and safety officers to ensure the protection of workers (50).

Collective agreement made between an employer and a Trade Union is mandatory for a factory that operates under the Labour Proclamation. The agreement document is a cornerstone that explicitly indicates the provision of OSH at respective workplaces. OSH-related agreements include responsibilities of partners, safety measures, leave (annual, sick, study, etc.), working duration and hours, fire safety, provisions of personal protective devices, sanitary facilities, and health services.

Ethiopia has committed herself to exercising ILO Conventions. Twenty conventions are ratified and addressed in the labor proclamation (3). Selected examples of these ILO conventions include:

- Elimination of forced labor: convention 29/1930 and 105/1957
- Freedom of association and the right to collective bargaining: convention 87/1948 and 98/1949
- Abolition of child Labor: convention 138/1973 and 182/1999
- Elimination of discrimination in employment: convention 100/1951 and 111/1958
- Weekly rest (Industry): convention 14/1921 and 106/1957
- Occupational safety and health: convention 155/1981.

The Federal Government has recently approved national OSH policy. However, a lack of local policy statements at the enterprise level and the existence of inadequate awareness of the existing regulatory provisions are challenges that still require immediate attention to reflect the National level of OSH Policy.

Human resources in OSH: There are currently (by July 2013, MOLSA Source) 284 labor inspectors with diverse educational background in Ethiopia. About 38% (107) of the inspectors have training at the B.Sc. level in natural sciences (biology, physics, and chemistry), and 43% (123) have a B.A. level training in the social sciences. A total of 10% (29) of the inspectors have on-the-job training in OSH. The federal and regional OSH structures are filled with degree holders (basic science and social science), while the Wereda (district) level has diploma and certificate holding personnel in the areas of technical and vocational education. A formal training degree (B.Sc.) in OSH was initiated at the University of Gondar in 2006, but was terminated in 2011 due to low demand from related stakeholders. With regard to regional distribution, close to 95% of the labor inspectors are based in larger regions where factories are highly concentrated: Addis Ababa (28%), Tigray (27%), Oromia (18%), Amhara (13%), and Southern Nations (9%). Lack of formal training on OSH at various levels of cadres (certificate to at least MSc in OSH) and use of exposure assessment are the bottlenecks for the human resource development in Ethiopia.

Discussion

This review addressed various dimensions of occupational safety and health with a particular emphasis on the Ethiopian context. Clearly, Ethiopia is in a transition period from agriculture-based economy to the industry-led one. There is therefore a need for the country to build infrastructure that meets acceptable standards needed to protect workers and the environment, with the focus on the industrial sector.

Globally, 85% of the workers in the country do not have access to occupational health services (229). In developing countries, only about 5% of those in the work force have access to some kind of OSH services (51).

The United Nations Assembly urged a Universal Access to all workers, including the informal sector by 2017 (30). Ethiopia is expected to meet this international commitment. Obviously, poor OSH leads to increased, but preventable, illnesses and deaths. Developing countries shoulder a burden of losing up to 10% of their GDP because of work related injuries and diseases (17). Although there is no local study on the cost implication of work related health burden, perhaps the economic burden in Ethiopia may not be different from the international estimates of 4% global GDP and 10% GDP in developing countries (17).

Ethiopia took the initiatives to protect workers in the country by adopting OSH regulations as early as the 1920's (3). The Ethiopian Labor Standard Proclamation was made possible in 1964. This was updated in 2006 with the view to suiting the provisions of the Ethiopian constitution in reference to labor protection. The provisions indicated in the labor proclamation are very clear and explicit in their goals of meeting the needs of international conventions on occupational safety and health convention No .155/1981. There are a number of guidelines to assist the implementation of the proclamation. Ethiopia seems to find herself in a good position in terms of having OSH laws based on the convention mentioned earlier.

The development of policy on OSH in Ethiopia is an important step towards contributing to a healthy and safe workplace environment. The Ministry of Labor and Social Affairs has been at the forefront of initiating the development and approval of the OSH policy. The policy addresses the OSH needs in emerging industrial sectors such as flower and cement industries. Local enterprises are expected to develop a local OSH Policy that harmonizes the relationship between the industry and the worker's health on one hand, and the environment on the other hand. The heavy dependency on the collective agreement cannot bring the desired change unless preventive measures are taken on the basis of monitoring and evaluation of exposures at the work place.

The findings in this paper clearly demonstrate that the challenges in the implementation of the provisions of regulations remain unsolved. This is partly due to the poor understanding of the laws by employers or

investors. Employers or investors might care more about the profits they can earn than the expenses required for the provision of OSH services. This is similar to the situation in other African countries where firms had shown less attention to the enforcement of the provisions of OSH inspectors (8). The training capacity of OSH inspectors in terms of using measurement based hazard evaluation is an area of concern.

OSH inspectors are also handicapped due to a lack of adequate access to hazard measuring equipment. There is also limited knowledge and skill of using the equipment. There is a similar observation in many African countries (8). The absence of exposure measurement technology and of appropriately trained human resource has a consequence that deprives the workers of their right to know the status of exposure within which they are working (52).

The capacity of generating OSH related knowledge that can support industrial sectors is very limited. Only few sporadic articles on injuries, dust and noise related illnesses were available for review. The articles were generated directly or indirectly by academic institutions through their faculty or graduate level theses and/or dissertations. Lack of a strategic plan for research on OSH in the industrial sector has led to a persistent gap in research practice. Developing countries need to harmonize their research agenda and the industrial sector growth in the context of globalization. They need to consider the workers' health as a central concern in this regard (53).

The need for the development of human resources is an area of concern in the development of OSH services. OSH inspectors are expected to have a minimum of formal training on safety, hygiene, hazard recognition and evaluation, and the delivery of expertise in sanitation. The majority of the inspectors do not possess such formal training even at the certificate level on recruitment. This has huge implications for building a relationship of mutual trust between companies and inspectors. The initiative taken by the University of Gondar to train B.Sc. holding inspectors at the MPH level of inspectors in 2006 is greatly acknowledged, even though it was terminated in 2011. The failure to continue the training of the B.Sc. program due to challenges implies the disharmony in needs of trained human resources. There are countries like South Africa, Kenya and Tanzania that rely on trained OSH inspectors to build the system of occupational hazard recognition, evaluation and control in work places (31, 54).

The use of field equipment to measure hazard is the right way to assess work place exposures. The use of measurements along with direct observation of the likely sources of hazards and the behavior of workers are useful tools to design respective control measures. There are now OSH Regional MOLSA Offices (Addis Ababa, Oromia) in Ethiopia that have started procuring equipment such as noise and dust meters, measuring intensity of illumination and indoor microclimate variables. While this is a good start, the limited knowledge people have and the inadequacy of the skill

in using any new instruments is likely to threaten the credibility of the findings from the use of these pieces of equipment. In addition, the ability to link hazard measurements using appropriate time scale and space is also lacking. All of these challenges can easily be solved if there is a structured and consistent training program based on the needs and priorities of MOLSA, the Trade Unions, and relevant Employers' Associations.

The strength of the organizational structure that is designed both at the central and at the peripheries to maintain the workers' health is an area of concern as well. Establishing relevant units with respective adequate human resources, materials, and finance for research and inspection seems very limited. The staffing pattern at the center and the regional level is relatively better than what is available at the periphery. Zonal Offices are staffed by 1-2 persons who are also doing social services in addition to OSH services. The inconsistent organization of OSH records makes using computerized databases difficult to monitor and evaluate the progress of health outcomes and the status of exposures.

In summary, the present review found the following gaps that require interventions.

1. **Research gaps:** Uncoordinated effort and lack of strategic research action plan have made the research institutions including the academia, unproductive in influencing national policies and needs. The volume of research in OSH is not yet adequate and remains unlinked to the industrial services.
2. **Training gaps:** Limited formal structure available in the training profile of OSH inspectors has crippled the efficiency of inspection in workplaces.
3. **Capacity gaps:** This is primarily linked to the availability of limited access to equipment for hazard measurements. The absence of effective OSH laboratory that could make a significant difference on decision making based on evidence continues to be a challenge.
4. **Policy and regulation gaps:** While the progress in regulation is adequate, the means to implement the provisions still needs attention. The introduction of cleaner production through an establishment of local policy, the presence of guidelines that meet the implementation of hazard measurement are priorities that still need to be met.
5. **Organizational gaps:** The failure to provide relevant units of OSH with adequately trained manpower and other resources is yet another obstacle faced in the operation of OSH as a system.
6. **Monitoring and evaluation gaps**
Scientific evidence on exposures of workers, the periodic survey of hazards using measurements, and the evaluation of the evidence following national or international standards are found to be areas that need yet further attention.
7. **Establishing databases:** Relevant variables (exposures and health outcomes) at the central

level have been found to be very important (but unavailable) to enable the evaluation of progress of OSH related activities.

In this review, an attempt has been made to describe the existing OSH status in the Ethiopian context, largely based on local reports.

Conclusions and Recommendations:

There is a need to introduce a complete transformation in the existing OSH situation in order to meet the maintenance of workers' health. This means that workplace environment can be improved through the reduction of exposures to OSH hazards. Research outputs that enhance the implementation of policies towards improving the workplace environment are, thus, encouraged. It is strongly suggested that appropriate measures be taken, with the involvement of broad based stakeholders including National Universities, in the generation and use of OSH evidence to improve the working environment.

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References

1. International Labour Organization. Prevention of occupational diseases: world day for safety and health at work. 2013.
2. Stephen SL, Theo V, Abraham DF, Goodarz D, Kenji S, Heather A-R, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*. 2012;380:2224-60.
3. Ministry of Labour and Social Affairs. Occupational Safety and Health profile for Ethiopia. October. Addis Ababa October 2006.
4. Federal Democratic Republic of Ethiopia. Proclamation No. 377/2003: Labour Proclamation. 10th Year No 12, Federal Negarit Gazeta. Addis Ababa, Ethiopia. 2004.
5. Federal Republic of Ethiopia. The Federal Civil Servants Proclamation No 515/2006. 13th year No. 15, Federal Negarit Gazeta. Addis Ababa, Ethiopia. 2007.
6. Federal Democratic Republic of Ethiopia. Ministry of Finance and Economic Development. Growth and Transformation Plan-2010/11-2014/15. 2010.
7. Confederation of Ethiopian Trade Unions (CETU). Country (Ethiopia) Situational Report. <https://www.google.com.et/#q=Confederation+of+Ethiopian+Trade+Unions+of+2012+annual+report+> 2012.
8. Ministry of Finance and Economic Development, Federal Democratic Republic of Ethiopia. Growth and Transformation Plan, Annual Progress Report for FY 2012/2013. February 2014.
9. World Health Organization. Occupational health program of WHO Headquarters, Geneva, Switzerland. The Global Occupational Health Network. 2003.
10. Central Statistical Agency of Ethiopia. Report on the 2005 National Labour Force Survey Addis Ababa. Addis Ababa 2006 Contract No. 365.
11. Central Statistical Agency of Ethiopia. Report on small scale manufacturing industries survey. Addis Ababa. 2010.
12. Central Statistical Agency of Ethiopia. Report on Large and Medium Scale Manufacturing and Electricity Industries Survey. Addis Ababa. 2012.
13. Central Statistical Agency of Ethiopia. The 2010 urban employment and unemployment survey report Addis Ababa. 2010.
14. Central Statistical Agency of Ethiopia. Summary and statistical report of the 2007 population and housing census. Addis Ababa. 2008.
15. Woldeyohannes M, Bergevin Y, Mgeni AY, Theriault G. Respiratory problems among cotton textile mill workers in Ethiopia. *British journal of industrial medicine*. 1991;48(2):110-5.
16. Alemu K, Kumie A, Davey G. Byssinosis and other respiratory symptoms among factory workers in Akaki textile factory, Addis Ababa Ethiopian J Health Dev. 2010;14(2):133-9.
17. International Labour Organization. Safety in Numbers: Pointers for a global safety culture at work. Geneva. 2003.
18. Zeleke ZK, Moen BE, Bratveit M. Excessive exposure to dust among cleaners in the Ethiopian cement industry. *Journal of occupational and environmental hygiene*. 2011;8(9):544-50.
19. Faris K. Survey of Occupational safety and sanitary conditions in small scale enterprises in Jimma Town, SW Ethiopia. *Ethiop J Health Develop*. 1998;12(3):182-90.
20. Ministry of Labour and Social Affairs of the Federal Democratic Republic of Ethiopia. A report on Occupational safety and health condition in small and microenterprise found in Addis Ababa (2012, operational study). Addis Ababa. 2012.
21. Gululat T. Assessment of occupational exposure of noise Pilot study in some selected metallurgical and textile factories in Addis Ababa: Addis Ababa University. 2010.
22. Ayele B, Yemane B. Noise-induced hearing loss among textile workers. *Ethiop J Health Dev*. 1999;13(2):69-75.
23. Abebe Y, Fantahun M. Shift work and sleep disorder among textile mill workers in Bahir Dar, northwest Ethiopia. *East African medical journal*. 1999;76(7):407-10.
24. Achenef M. Assessment of knowledge and practice on safety Information among factory workers. [Masters in Public Health]: Addis Ababa University. 2007.

25. Hardeep RS, Susila A, Mamo W, Takele T. Occupational exposures and related health effects among construction workers. *Ethiop J Health Biomed Sci.* 2008;1(1):41-6.
26. Shine S, Kumie A. Determinants of Occupational Injury: A case control study among the condominium house construction workers of Addis Ababa city, Ethiopia. Addis Ababa: School of Public Health, Addis Ababa University. 2013.
27. Global Development Solution. Towards a globally competitive Ethiopia: the role of service and urbanization case studies-Rose and polo shirt value chain 18 February. Addis Ababa. 2011.
28. Lakew K, Mekonnen Y. The health status of northern Omo State Farm workers exposed to chlorpyrifos and profenofos. *Ethiopian medical journal.* 1998;36(3):175-84.
29. World Health Organization. Workers' Health: Global of Plan of Action [Available from: http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/presentation/wcms_169568.pdf.
30. United Nations. world health assembly resolution 60.26 2007 [Available from: <http://grantome.com/grant/NIH/E11-OH010676-01>.
31. International Labour Office, Ministry of Labour Kenya. National Profile on Occupational Safety and Health-Kenya. 2013. http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/policy/wcms_187632.pdf.
32. Negatu B, Kromhout H, Mekonnen Y, Vermeulen R. Use of Chemical Pesticides in Ethiopia: A Cross-Sectional Comparative Study on Knowledge Attitude and Practice of Farmers and Farm Workers in Three Farming Systems. *The Annals of occupational hygiene.* 2016.
33. Hanssen VM, Nigatu AW, Zeleke ZK, Moen BE, Bratveit M. High Prevalence of Respiratory and Dermal Symptoms Among Ethiopian Flower Farm Workers. *Archives of environmental & occupational health.* 2015;70(4):204-13.
34. Atkure D. Assessment of occupational induced problems in floriculture workers in West Shewa Oromia, Ethiopia. A MPH thesis work, School of Public Health, Addis Ababa University 2011. [MPH]. Addis Ababa: Addis Ababa University. 2011.
35. Meaza G. A comparative cross sectional study on occupational health problems among workers in floriculture industry, Holeta, Ethiopia. [MPH]: Addis Ababa University. 2012.
36. Osman Y, Abera K. Assessment of occupational injuries in Tendaho Agricultural Development S.C, Afar Regional State. *Ethiop J Health Dev.* 2010;24(3):167-74.
37. Reda AA, Fisseha S, Mengistie B, Vandeweerd JM. Standard precautions: occupational exposure and behavior of health care workers in Ethiopia. *PLoS One.* 2010;5(12):e14420.
38. Gebresilassie A, AKumie A, Yemane D. Standard Precautions Practice among Health Care Workers in Public Health Facilities of Mekelle Special Zone, Northern Ethiopia. *J Community Med Health Educ.* 2014;4(3):286.
39. Getahun K, Mesafint M, Hardeep RS. Needle stick and sharps injuries among health care workers in Gondar city, Ethiopia. *Safety Science.* 2011;50(2012):193-1097.
40. Anagaw B, Shiferaw Y, Belyhun Y, Erku W, Biadagegn F, Moges B, et al. Seroprevalence of hepatitis B and C viruses among medical waste handlers at Gondar town Health institutions, Northwest Ethiopia. *BMC Res Notes* 2012. 2012;5(55).
41. The Federa Democratic Republic of Ethiopia. Labour Proclamation No. 377/2003. 10th Year No. 12, Addis Ababa. February 2004.
42. Abera F. Injuries in urban factories of Ketena one, Addis Ababa. Masters. Thesis, Addis Ababa University 1988. Addis Ababa: Addis Ababa University. 1988.
43. Ministry of Health. Occupational health and safety assessment in selected factories in Ethiopia. 1996.
44. Elias S. The incidence of injuries and their determinants in Akaki textile factory. Addis Ababa: Addis Ababa University. 1991.
45. Zewdie A, Dagneu E, Takele T. Determinants of Occupational Injury: A Case Control Study among Textile Factory Workers in Amhara Regional State, Ethiopia. *Journal of Tropical Medicine.* doi:10.1155/2011/657275. 2011;2011.
46. Takele T, Abera K. Prevalence and factors affecting work-related injury among workers engaged in Small and Medium-Scale Industries in Gondar wereda, North Gondar zone, Amhara Regional State, Ethiopia. *EthiopJHealth Dev.* 2007;21(1):25-34.
47. Manaye K. Work related injuries and associated risk factors among iron and steel industries workers in Addis Ababa: University of Gondar. 2010.
48. Demamu S, Ayele F, Tilahun L, Fekadu S, T/hymanot W, Dawit Y. Epidemiologic survey of respiratory symptoms among workers of small grain mills and others. 1998;12(3):213-5.
49. The Federal Government of Ethiopia. The Constitution of the Federal Democratic Republic of Ethiopia. 1994.
50. Ministry of Labour and Social Affairs of the Federal Republic of Ethiopia. Occupational Safety and Health Directive. May 2008. Addis Ababa.
51. World Health Organization. Universal health coverage of workers [Available from: http://www.who.int/occupational_health/activities/universal_health_coverage/en/.
52. International Labour Organization. Occupational safety and health and working environment Convention No 155/1981. 1981.
53. Ministry of finance and economic development, Federal democratic republic of Ethiopia. Growth and transformation plan, Annual progress report for FY 2011/12. March 2013.
54. Internationa Labour Organization. National Profile on Occupational Safety and Health-Tanzania. 2004. http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/policy/wcms_187634.pdf.