



Occupational Health and Safety Practices among Workers Involved Wastewater Collection and Treatment in Addis Ababa, Ethiopia

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those hazards using occupational health and safety management system [9]. Thus, the investigation of the origin and underlying causes of work-related injuries, ill health, diseases and incidents should identify any failures in the occupational safety and health management system and should be documented [10]. Therefore, this study aims to assess and document occupational health and safety awareness and wastewater management in Addis Ababa, Ethiopia. Unlike Malakahmad *et al.* [9] who investigated hazards in wastewater treatment plants and Emmatty

26. included in the actual samples used for the study.
27. The first part of the questionnaire covered demographic information
28. of the participants and the second part contained questions for
29. KAP assessment. Demographic variables included age, gender, and
30. religion. The self-designed questionnaire comprised 11 questions
31. regarding knowledge, 4 for attitude, and 8 for practice. Knowledge

The questionnaire was sent to experts to receive their feedback. The validity of the questionnaire was tested in a small pilot study to check clarity and simplicity of the questions. However, the data of the pilot study are not included for the study.

Results and Discussion

Demographic Profile

The majority of the respondents (92%) were male while 8% were female which reflects that the workplace is male dominated. The respondents were in the age range from 26 to 59 years old. Most of the respondents were in the range of 30-49 years old. Nearly eight out of the ten respondents are married indicating that they are shouldering the responsibility of providing food for the family [Table 1]. Only one out of five respondents was living in their own house with most of them (54%) living in a rented or their parents' house (26%). Two-third of the respondents was serving for less than 10 years in the waste management sector. The remaining of them have 10 to 30 years' experience in the sector. All the study participants were literate having attended at least primary school. Around 40% of the participants attended education at college and above college levels. All the decentralized treatment operators had graduated at least with a college level education.

Basic Hand Washing Practice at Workplace

The hand washing practice of the respondents is shown in [Figure 1]. The majority of the respondents state that they always wash their

Response	No. of Respondents	Percentage
Always	12	100%
Sometimes	0	0%
Rarely	0	0%
Never	0	0%

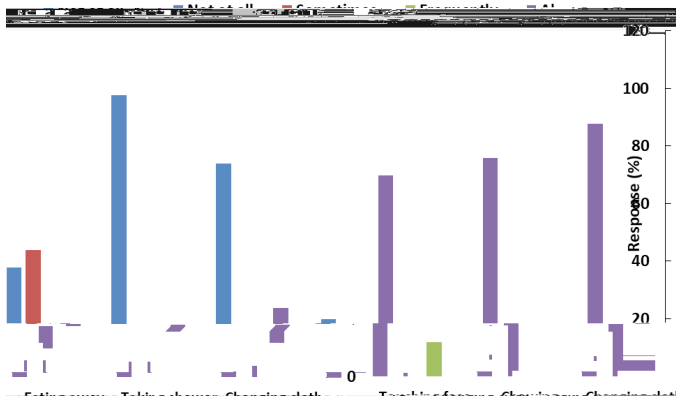
hands with water and soap after handling of waste. However, 6 and 14% of the respondents state they wash hands rarely or sometimes, respectively. The majority of the wastewater collection truck drivers believe that they do not have direct contact with the waste and hence do not need to wash hands frequently. In addition, some waste collection assistants wash their hands only sometimes due to time constraints. AAWSA have assigned a daily quota (minimum amount of sewage to be collected in one day) for workers who are involved in sewage collection and transport. Some respondents said this created shortage of time to practice good hand hygiene and to have time for lunch. The remaining 30% of the respondents which are represented as 'other' in Figure 1 are workers involved on the sludge removal. These workers remove sludge and other coating materials from the waste throughout their working time. Due to the nature of their work, they wash their hands only during lunch time before eating their lunch and after work before leaving the work site.

All the respondents state they wash their hands with soap before eating meals. However, they miss washing hands when eating snacks at work site (for example, when they eat inside the truck). In addition, washing hands after eating are also common practices for majority of the respondents even if some of them wash their hands without soap. However, a few of the respondents state they are washing their hands only sometimes.

Non-availability of water in the customer house during waste collection was raised as a major challenge to practice hand washing after handling waste. Respondents stated two major reasons for this which are (i) due to interruption of water supply during the waste collection time and (ii) some customers do not have positive attitude towards waste collection workers. Similarly, there is also interruption of water supply in the centralized treatment sites. Among the decentralized treatment, water supply has been interrupted in one of the treatment sites for more than two months. We observed that all the decentralized treatment sites do not have a hand washing facility. In addition, soap is not made available to the workers on time because of the slow procurement process.

Workers' Personal Habits at Workplace

Figure 2 shows the respondents' personal habits at the workplace.



Stated personal habits of the respondents at the workplaces.

Almost all the respondents (98%) state they do not chew gums and smoke tobacco at the workplace. More than half (56%) of the respondents said that they sometimes touch their faces while handling waste. On the other hand, 6% respondents said that they always touch their faces at the workplace mainly due to bad habits. This indicates that six out of ten respondents touch their face sometimes or always while handling waste. Operators in the decentralized treatment sites and some truck drivers believe that they do not have direct contact with the sewage (waste).

Their work clothes might be contaminated by the waste which indicates the need to change clothes during lunch time. However, nearly three-fourth of the respondents stated that they do not change their work clothes at all during lunch times. Most of the workers involved in waste collection and driving the trucks do not change their clothes at lunch time. Some drivers and waste collection assistants do not eat lunch at all due to time constraints while the others stated that they are not interested to change their cloths without taking shower. However, those involved in sludge removal and operation of the treatment plant always change their clothes.

Taking a shower is considered as a common practice before leaving workplace to go home. About three-fourth (76%) of the respondents state they always take a shower before leaving their work site to go home. The remaining respondents (treatment operators and workers at sludge removal in the decentralized treatments and two sludge collection truck drivers) take shower sometimes (16%) or do not take shower at all (8%). There is a critical shortage of showers at both Kality and Kotebe treatment sites. The number of the available showers in these treatment sites is not sufficient compared with the number of users/ for the workers involved in waste collection and treatments. All the decentralized treatment sites do not have showering facilities in their compounds. Thus, workers in the decentralized treatment sites either do not take showers before leaving their workplace or they shower in the open space.

In addition, 88% of the respondents always change into clean cloths before leaving the workplace. On the other hand, 8% of the respondents (one operator of decentralized treatment and all the others were drivers) sometimes change their clothes and 4% of the respondents (all were drivers) state they do not change their clothes. The results of the study showed that none of the respondents wash their work clothes with chlorine solution or bleaching agent. Rather they wash their clothes using liquid detergent which is known as "largo" locally.

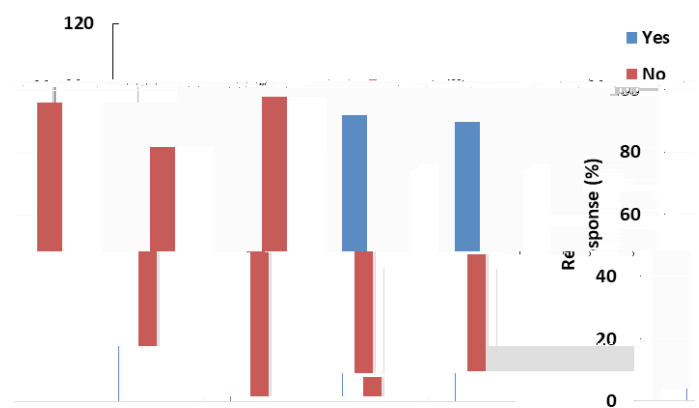
Most of the respondents (70%) state they do not eat around sewage handling areas at all. On the other hand, 20% of the study participants said they eat around waste handling sites. For instance, drivers and assistants of waste collectors eat snacks inside the truck. Workers at the decentralized treatment sites also eat within the small compound of the treatment site.

Figure 3 shows that nearly all respondents (96%) do not wear eye goggles. This is mainly due to either lack of supply of the eye goggle or poor quality of the eye goggle which reduces visibility and creates discomfort. These types of working practice might increase exposure of the eyes of the workers to hydrogen sulphide and methane [8]. These chemical substances may initiate inflammatory reactions on the eyes mucous membranes [4, 8].

Similarly, none of the respondents always wear a waterproof apron before the COVID-19 outbreak. Respondents who are removing sludge in Kality and Kotebe treatment sites have aprons which they use whenever they think it is necessary to wear the apron. However, respondents involved in waste collection and sludge removal in the decentralized treatment sites do not have a waterproof apron. Similarly, 82% of the respondents do not use droplet resistant. Thus, most of the workers are potentially exposed to noxious substances like bacteria, fungi, hydrogen sulphide and methane via inhalation [1, 3]. These substances can lead to the development of respiratory problems and impairment of pulmonary function [12-14], producing chronic bronchitis, cough, throat irritation and wheezing [3].

There is a supply of gloves and plastic boots to the workers. Nearly nine out of ten respondents said they wear gloves and boots at their workplaces. The major concern raised in the study was the poor quality of the gloves. At the decentralized treatment sites, sharp materials are contained in the raw wastewater which can easily damage the gloves and cause injury and infection risks.

The results of the respondents' perception on the level of hazard associated with waste collection and treatments are presented in [Figure 4]. They rated the biological hazard as extremely to very high (36%) or high (40%). Particularly, the workers involved in sludge removal and assistance of wastewater collection are very concerned about their exposure to biological hazard. The wastewater from domestic sources contains potential biohazards such as bacteria, endotoxins, viruses and protozoa [15-17]. Thus, workers in wastewater collection and treatment may be exposed to pathogens and endotoxins through the route of inhalation or hand-to-mouth. The result of this study showed



Stated personal protective equipment usage of the respondents.

that most of the workers have adequate knowledge regarding the bio-hazardous nature of domestic wastewater. However, one fourth of the respondents (mostly treatment plant operators followed by drivers of wastewater collection truck) stated that the level of biological hazard is low.

Similarly, 64% of the respondents rated the chemical hazard at the workplace as high, very high or extremely high. All assistants of wastewater collection, 64% of truck drivers and half of treatment operators and sludge removers rated the level of chemical hazard is at least high. All the remaining 36% of respondents (half of the respondents from treatment plant operator and sludge removal) rated the level of chemical hazards as low or very low.

In contrast to the above two hazards, the level of physical hazard was rated as low and very low by most of the respondents (62%). However, 38% of respondents (assistance of wastewater collection, drivers and sludge removal workers) rated the workplace physical hazard either high or very high level. The high level of noise emanating from the pump during waste collection and high ambient temperature for the Kalitiy wastewater treatment site was also a concern for the workers. Seven out of ten respondents rated safety hazard as either very high (26%) or high (44%). In particular, 85% of sludge removal workers, 64% of the drivers and 55% wastewater collection assistants stated that the safety hazard at the workplace is high or very high. During wastewater collection from toilets, disposal in the treatment plant and operation of the treatment system workers might lose their life due to drowning,

Almost all the respondent agreed that people with cancer, diabetes and chronic respiratory disease are more vulnerable to the disease. Moreover, 92% of the respondents believe that household pets transmit COVID-19. Current research nding shows that infected human with COVID-19 can transmit to other animals including cats, dogs and farmed mink [19]. However, there is no clear evidence on the transmission of SARS-CoV-2 from pet animal to human [20-21].

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Hazards mitigation is an essential process in waste collection, transport and sewage treatment plant towards promoting occupational health and safety. The use of personal protective equipment is found to be low, sanitary facilities are not adequate at the workplace and customers are not fully cooperative due to stigmatization of workers. These factors cause exposure risks to health hazards and safety problems at the workplace. As a result, the workers may be exposed