Development of an occupational safety and health online database of MSMEs in Pasir Mukti Village, Citeureup District, Bogor Regency, in the era of the industry 4.0

Varla N Affah¹, Mila Tejamaya¹*, Amelia A Putri¹, William Wijaya¹, Akbar Maulana¹, Rizka A Firdausi¹, Desvia D Aryani¹ and Nobella A Firdausi¹

¹Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok, 16424, Indonesia

*tejamaya@ui.ac.id

Abstract. In Citeureup Sub-district, Bogor, Indonesia, many MSMEs have developed their business around the metal sector. Despite many MSMEs operating in the area, there still a lack of OHS implementation. This study aimed to create an online database regarding business profile, OHS implementation, and health symptoms among workers at surveyed MSMEs. The survey was conducted to the 56 MSMEs located in Pasir Mukti Village, Citeureup District, Bogor Regency, Indonesia. The majority of MSMEs are micro-sized enterprises with 1-4 workers and produce metal products. Only 2% of MSMEs have an OHS commitment that is formally signed by the employer. The most prevalent hazards found in MSMEs were noise (71%), dust exposure (57%), and vibration (45%). Awkward postures and manual handlings are also commonly found in MSMEs. The most prevalent health symptom commonly experienced by workers is the soreness of the musculoskeletal system. There are six primary healthcare facilities located around MSMEs, yet only one facility operates for 24 hours and only 2 out of 6 facilities have an ambulance for emergencies.

1. Introduction
MSMEs contribute 60% to the national GDP, and absorbs 97% of Indonesian’s workforce [1], [2]. Despite their significance for the economic growth, there are challenges such as the Occupational Health and Safety (OHS) standard that has yet to be adapted [3] [4] [5], the lack of resources to ensure OHS compliance [5] [6][7], and the lack of a comprehensive OHS data [8].

There are similar problems related to OHS in Indonesia, such as unavailability of specific regulation for OHS in MSMEs, lack of commitment, and lack of data about OHS in MSMEs [9]. Based on the Occupational Health and Safety Management System (OHSMS) regulation in Indonesia [10] the obligation to implement OHSMS only applies to a company with at least 100 employees. Therefore, the regulation of OHSMS automatically excludes MSMEs because according to MSMEs law in Indonesia, MSMEs only has 1-99 employees[11]

Even though the MSMEs are excluded from the obligation to develop OHSMS, the implementation of OHS in MSMEs is monitored by the Ministry of Health (MoH). MoH promotes OHS education, and creates a reporting system for informal sectors to collect OHS data, through Occupational Health Unit (Pos UKK) established by Primary Healthcare Center or Puskesmas in each sub-district [12] [13]. Despite the existing effort to gather the data, there is no disaggregated data on occupational accidents and diseases in MSMEs [9].
Data availability is essential in OHS, statistics on occupational accidents and disease becomes the foundation to formulate OHS policy [14] [15]. WHO proposed four categories of OHS indicators to illustrate OHS's condition in a country such as health policy, social and economic, health care delivery, and health status [15].

The idea of creating an online system for MSMEs has been introduced since 2018 with aims to collect MSMEs data and simplify the business registration process[16]. Another database about MSMEs profile has been created by the Indonesian Bank (BI), but it does not include any information about OHS [17]. Realizing the limitation of OHS data of MSMEs in Indonesia, this study was performed to develop an online database that contains information about OSH related aspects of MSMEs in Indonesia.

There are more than 500 MSMEs scattered around Citeureup Sub-district, Bogor District, West Java Province, Indonesia, and mostly are metal-based industries [18]. Nevertheless, data on OSH awareness and implementation are still lacking [9]. Therefore, this study aimed to create an online database as a community engagement program to help the local government and MSMEs owners and workers acquire information about MSMEs business profile OHS related data, including health care facilities.

2. Method
This study aimed to develop an online database regarding OSH implementation in MSMEs at Pasir Mukti Village, Bogor Regency, Indonesia. Observations and interviews were carried out between September 25th to October 24th, 2019 to collect data as follows:
1) General information on MSMEs business such as MSMEs profile, work schedules, wage systems, number of workers and workers’ insurance.
2) OHS's information-related data such as OSH commitment, hazard exposure to the workers, control measures, and health complaints.
3) General information on healthcare facilities that are available in Pasir Mukti Village.

All data obtained from the survey were analyzed and inputted into an online database for MSMEs in Pasir Mukti Village.

3. Results and discussion
3.1. Characteristics of MSMEs
The data were obtained from 56 MSMEs in Pasir Mukti Village, Bogor Regency, West Java Province, Indonesia. More than 84% of surveyed MSMEs are metal industries that produce gas oven, cake pans, cormorants, and others. The remaining are building materials, footwear and service sectors. After collecting the data, MSMEs' characteristics were categorized according to their capital, number of workers, possession of a business license, operational hours per day, and owner’s demography (Table 1).

According to the MSMEs classification based on the capital, 80% of MSMEs fell into micro-sized enterprises that have less than 50 million Rupiah capital. In comparison, only 20% were small enterprises with capital around 50 up to 500 million Rupiah. However, there are slightly different results from the MSMEs classification based on the number of workers. Based on the number of workers, 64% of workers fell into micro-sized enterprises with 1-4 workers, 16% different from the classification based on the capital. Meanwhile, around 34% of MSMEs fell into small categories with 5-19 workers, and only 2% of MSMEs was a medium-sized enterprise with 20-99 employees. Despite many MSMEs found in the area, most MSMEs did not have a license, only 14% of MSMEs had a business license.

Based on the operational hour, around 64% MSMEs operated in regular working hours, 8 hours a day. Interestingly, 19% of MSMEs were found operated more than 8 hours a day and 5% MSMEs operated less than 8 hours a day.

Table 1. Characteristics of MSMEs in Pasir Mukti Village.

| Characteristics of MSMEs | % MSMEs (n=56) |
|-------------------------|----------------|
| Capital                 |                |
| Micro (<50 million Rupiah) | 80% (45)      |
MSMEs were also analyzed based on the owner's and workers' demography, such as gender, age, and educational background. Most MSMEs owners fell into the adult category; 33% of owners were around 26-35 years old which was in the first adult category and 35% were around 36-45 which was in the late adult category. Out of all 57 MSMEs, only 2% were owned by females, while males owned the rest. Based on the owner’s educational background analysis, 56% MSMEs owners only had an elementary school background and 19% of MSMEs had junior high school graduated. As for the workers, workers from all 56 MSMEs that were observed were all male.

Table 2. Characteristics of MSMEs’ Owners & Workers in Pasir Mukti Village.

| Characteristics of Owners & Workers of MSMEs | %MSMEs (n=56) |
|---------------------------------------------|---------------|
| **Owner’s Age**                             |               |
| 17-25                                       | 4% (2)        |
| 26-35                                       | 34% (19)      |
| 36-45                                       | 36% (20)      |
| 46-55                                       | 20% (11)      |
| 56-55                                       | 4% (2)        |
| >65                                         | 2% (1)        |
| **Owner’s Gender**                          |               |
| Female                                      | 2% (1)        |
| Male                                        | 98% (55)      |
| **Owner’s Educational Background**          |               |
| Uneducated                                  | 14% (8)       |
| Elementary School                          | 57% (32)      |
| Junior High School                         | 20% (11)      |
| Senior High School                         | 11% (6)       |
| Higher Education                            | 0% (0)        |
| **Workers’ Gender**                         |               |
| Female                                      | 0% (0)        |
| Male                                        | 100% (56)     |

According to interviews with business owners and workers at MSMEs in Pasir Mukti, most of MSMEs are not covered by any insurance (38, 68%). 25% of MSMEs (n=25%) are covered by health insurance or BPJS Kesehatan, and not more than 5% of MSMEs are covered by labor insurance or BPJS Ketenagakerjaan; and other types of insurance.

3.2. OHS commitment
The survey also explored the commitment of MSMEs owners towards OHS. Only 1 out of 56 MSMEs provides signed OHS commitment in their premises, while 2 out of MSMEs claimed that they allocate...
OHS implementation funding. It shows that most MSMEs owners have low awareness of OSH. Even though Act no 36 the Year 2009 regarding Occupational Health states that protecting workers’ health at both formal and informal sectors are compulsory, promotion and enforcement of OSH for MSMEs in Indonesia need to be strengthened. A study in Ghana shows that inadequate OSH regulation contributes toward poor attitudes on OSH [19].

3.3. OHS implementation
This study observed occupational health and safety implementation, based on several indicators such as general safety, industrial hygiene related hazards, ergonomics, and emergency preparedness.

3.3.1. General safety. General safety aspects investigated in MSMEs cover administrative control through the availability of work procedures, safety promotion through media, and engineering control through the installation of machine guarding. Only 2 out of 56 MSMEs provide printed work procedures, safety posters/media communication, and machine’s guard.

3.3.2. Hazards related to industrial hygiene aspect. Based on survey results and field observation at MSMEs in Pasir Mukti Village, which are predominantly metal SMEs, the hazards can be identified as lighting hazards, noise, vibration, humidity, non-ionizing radiation, dust exposure, chemical exposure, and animals (Table 3).

| Hazards                          | %MSMEs (n) | Yes  | No   | N/A |
|---------------------------------|------------|------|------|-----|
| Lighting                        |            | 39%  | 57%  | 4%  |
| Noise                           |            | 71%  | 29%  | 0%  |
| Vibration                       |            | 45%  | 52%  | 4%  |
| Heat                            |            | 13%  | 82%  | 5%  |
| Humidity                        |            | 7%   | 89%  | 4%  |
| Non-ionizing radiation          |            | 20%  | 80%  | 0%  |
| Dust Exposure                   |            | 57%  | 43%  | 0%  |
| Chemical Exposure               |            | 34%  | 66%  | 0%  |
| Animal                          |            | 20%  | 80%  | 0%  |

The data shows that noise, which was found in 71% of the MSMEs, was the most prevalent physical hazard. Meanwhile, dust exposure and vibration were the second and third common hazards in MSMEs, found in 57% and 45% of MSMEs. This result is similar to a study on MSMEs in Thailand by Kongtip (2008), whose majority of the study population also MSMEs produce metal products such as iron and machinery. A study from Kongtip showed that excessive noise was found in most MSMEs studied [20]. A study among Indian iron and steel SMEs workers also showed that noise is the primary exposure among workers in the iron and steel industry. Over 90% of workers engaged in the casting and forging industry showed hearing loss in the noise-sensitive medium and higher frequencies [21].

As for the chemical hazards, approximately half of the total MSMEs visited (56%) were exposed to dust exposure, while only 34% of MSMEs was exposed to chemical exposure. Dust exposure was mostly found among MSMEs in this research because most MSMEs in this study produce metal products. A study from Malaysia in 2016 at 1675 metal and steel factory workers showed that dust exposure mostly exposed workers. There was an exposure-response relationship of cumulative metal dust exposure with lung function [22].

3.3.3. Ergonomics. The survey also observed the implementation of OHS in the ergonomic aspect (Table 4). The observation was conducted based on some criteria such as a day off, workstation design, manual handling activities, manual handling tools, and observation on awkward posture.
Table 4. Ergonomic Aspects in MSMEs.

| Ergonomic Aspects                      | %MSMEs (n) |
|----------------------------------------|------------|
|                                        | Yes  | No  | N/A |
| Day off for workers                    | 89%  | 9%  | 2%  |
| Well-designed workstation              | 5%   | 89% | 5%  |
| Manual handling activities             | 54%  | 46% | 0%  |
| Tools for manual handling              | 68%  | 30% | 2%  |
| Awkward posture while working          | 68%  | 32% | 0%  |

Most MSMEs in Pasir Muki Village provide weekend days off for their workers. However, if the workload is high, the owner will ask for extra work from the workers. An essential ergonomic hazard that was found in this study was the improper workstation. Based on our observations, most MSMEs perform their work at their own house or the house yard. Manual handling, manual tools usage, and awkward posture (e.g. squatting, bending down, and back twisting), were also dominant. In line with the previous study, most Indonesia’s workers were exposed to ergonomic hazards such as bending and twisting [23]. Therefore, it is imperative to encourage ergonomic work design implementation since it provides relief for employees from fatigue, stress and fear, and ensures health, safety, and healthy mental participation in work [24].

3.3.4. Emergency preparedness. The effort on emergency preparedness was also investigated since it helps minimize the consequences in case of any incidents. 11% of MSMEs (n=6) provide an escape route; 5% (n=3) provide health care telephone number, and 2% (n=1) has a first aid kit and provide first aid training to the workers.

3.3.5. Personal protective equipment. The provision of PPE and workers’ behavior in wearing PPE were explored. It was found that 43% of MSMEs (n=24) provide PPE to the workers such as mask (12%), gloves (18%), welding shield (2%) and earplug (2%). However, only 18% (n=10) of them use the provided PPE. Interestingly, only 13% (n=7) of MSMEs wear the appropriate attire, potentially due to warm climate and heat stress. The attitude toward protecting workers’ health needs to be improved, not only to the owner but also to the workers.

3.4. Housekeeping
Housekeeping of surveyed MSMEs was evaluated. The majority of MSMEs in Pasir Muki Village have dirty floors due to the haphazard placement of tools and work materials (96%). Only 25% of MSMEs has a dry and tidy floor. 54% involve water in their working process, but only 2% provides a drainage system. Puddles and piles of garbage were seen at 68% of MSMEs. Consequently, vectors of diseases were found in 60% MSMEs. Part of these vectors was due to working in the outside area.

Table 5. Housekeeping Aspect in MSMEs.

| Housekeeping Condition                              | %MSMEs (n=55) |
|-----------------------------------------------------|---------------|
|                                                     | Yes | No  | N/A |
| Dry and tidy floor                                  | 25% | 75% | 0%  |
| Availability of water drainage                      | 2%  | 98% | 0%  |
| Floors that are free from puddles and piles of garbage | 32% | 68% | 0%  |
| Neatly stored working equipment and materials        | 4%  | 96% | 0%  |
| Vectors of disease at work (Mosquito, flies cockroaches, rats, cat, and dog) | 60% | 40% | 0%  |

3.5. Available facilities
The study observed facilities in the workplace provided by the employer for the worker to support the well-being of the workers. It was found that the majority of MSMEs have a toilet (70%), handwashing
facilities (52%), drinking water (75%), ventilation (75%), and a separate dining room (55%). However, only less than 50% of the total MSMEs provided separate accommodation for workers (33%).

3.6. Health Effects
The survey also observed the health effect of hazards exposure among workers in MSMEs in some body parts such as skin, eye, respiratory system, arm, and musculoskeletal system (Table 12).

Table 6. Health symptoms experienced by workers (%MSMEs).

| Symptom                  | Skin | Eye   | Respiratory system | Hand and Arm | Musculoskeletal system |
|--------------------------|------|-------|--------------------|--------------|------------------------|
| Itchiness                | 47%  | Redness 44% | Cough 46% | Numb arm 28% | Soreness 89%          |
| Prickly Heat             | 7%   | Itchiness 18% | Sniffles 45% | Sore arm 51% | Low Back Pain 66%     |
| Furuncle                 | 4%   | Eye Discharge 5% | Phlegm 13% | Paralyzed arm 11% | Carpal Tunnel Syndrome 43% |
| Stye                     | 2%   | Shortness of breath 38% | Tingling sensation 58% | (21) | (33) |
| Visual Disturbance       | 14%  | Asthma 9% | Unable to clench 12% | (5) | (7) |
| Blinking Eye             | 4%   | (2) | (2) | (1) | (8) |

3.7. Health facilities
This study also evaluated the healthcare facilities that are located near Pasir Mukti Village. There are six health facilities close to Pasir Mukti Village, comprise of both public (health care center) and private clinic. Only “Klinik Annisa 2” is categorized as an advanced-level healthcare facility (ALHF) and operated 24 hours a day. The rest are only first level healthcare facilities (FLHF). Facilities provided by those healthcare facilities can be seen in Table 7.

Table 7. List of public health facility in Pasir Mukti Village.

| Name                                 | Type                        | Service Unit                  | Supporting facility | Transport      | Medical worker/s |
|--------------------------------------|-----------------------------|-------------------------------|---------------------|----------------|-----------------|
| Auxiliary Puskesmas at Tarikolot Village | First-Level Health Facility (FLHF) | Ambulance                     | -                   | Ambulance      | MD(1) Nurse (1) Admin (1) |
| Klinik Permata Medika 2               | First-Level Health Facility (FLHF) | Public Clinic                 | Laboratory         | -              | MD (3) Dentist (1) Midwives (1) Admin (2) |
| Klinik Annisa 2                       | First-Level Health Facility (FLHF) | Emergency Room                | Laboratory         |                 | MD(2) Dentist (1) Nurse (4) Pharmacist (1) Nutritionist (1) Midwife (8) |
|                                      | Advanced-Level Health Facility (ALHF) | Public Clinic Dental Clinic Maternal and Child Clinic |                   |                 |                 |
|                                      |                             | Laboratory Audiometric Others |                     |                 |                 |
3.8 Online database SIUMKM

An online database named SIUMKM.ID was created (Figure 1). All data from our survey of the 56 MSMEs in Pasir Mukti Village, Citeureup, West Java, was inputted into the system. The database can be accessed through the [http://siumkm.id/](http://siumkm.id/). Information regarding MSMEs business profile, OSH-related information, and healthcare facilities is accessible through the SIUMKM website. This database will benefit the government and all stakeholders to assist MSMEs in improving their safety, health, and productivity.

![Online database for MSMEs: SIUMKM.ID](Source: SIUMKM.ID)
4. Conclusion
This study collected data regarding business characteristics of MSMEs, OSH performance, health complaints from the workers, and healthcare facilities available at Pasir Mukti Village, Bogor Regency, West Java Province. The main findings from this study convince that OSH awareness at MSMEs needs to be enhanced. Muscle soreness, tingling sensation of the hand-arm, and itchy skin; are the most complained symptoms by the workers. Consistently, ergonomic hazards, operating hand-tools, noise, and dust were significant occupational health hazards in the workplace. Housekeeping is another safety hazard that may lead to an unsafe condition. All that information available in SIUMKM.ID. We hope that this study will be replicated by relevant governments to draw a picture of OSH implementation in Indonesias MSMEs.

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