

## Conference Paper

# Working Environmental Hazard at Home-based Workers in the Charcoal Industrial Sector in Semarang

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## Abstract

Home-based workers are workers who work at home for a certain wage without health and safety protection. For them, house is their workplace, so the hazards of the workplace and work activities are health risk for the workers and their family members. This research was conducted to identify the dangers of working environment to the home-based workers in charcoal industrial sector in Semarang City. It also described the relationship of the working environment hazard to the experienced health problems. This observational research was done using cross-sectional design with samples of 146 home-based workers collected using purposive sampling. The working environment conditions include the housing environment and work activities. The housing conditions of home-based workers who were not eligible include ceiling 91.1 percent; floor 57.5 percent; ventilation 42.5 percent and waste disposal facilities 97.3 percent. The working environment conditions were exposed with chemical hazard (dust) 39.7 percent and ergonomic hazard (non-ergonomic position) 59.6 percent. The types of experienced injury were 80 percent joint pain and 13.7 percent out of breath, whereas the more often work complaints were 41.1 percent muscle pain; 19.2 percent stiffness; 13 percent cough and 11.6 percent tingling. The dangers of working environment to the home-based workers in the charcoal industrial sector including the condition of the floor which was a risk factor for the occurrence of dizziness and headache (increased risk for 1.84 times greater), as well as twisting and repetitive movements risking to a dizziness and headache (increased risk for 1.48 times greater) and tingling (increased risk for 1.36 times greater).

**Keywords:** charcoal industrial sector, home-based workers, working environment hazard

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## 1. Introduction

Home-based workers are a well-researched phenomenon in all rich, developing and poor countries, but it is mainly found in developing countries. Today, many home-based workers produce goods under a contractor order for the global value chain [1]. It aims to cut the production costs and to maximize the profits of companies outsourcing production to home-based workers [2].

Home-based workers represent the vast majority of workers in some countries, especially in Asia. Most of the existing home-based workers are women. A study in 1999 estimated the contribution of female domestic workers in some sectors in South Asia: [4] In Nepal, more than 100,000 people, and most of these are women who collect and process herbal medicines, all of which are completed at home. In addition, the study result in India from 600 home-based workers in 3 industrial sectors showed their average contribution to the household income was 35 percent for rural and 35.6 percent in urban areas [5].

According to ILO Convention No. 177 in 1996 on Home-based work [3], Home-based work is the work done by a person in his or her house or elsewhere which he chooses, outside the workplace of the employer to obtain wages, and the outcome is a product or service determined by the employer regardless of whom provides the raw materials, equipment, and other inputs used. In Indonesia, home-based workers are often also known as wholesale workers who work from their houses and are paid based on the job targets, such as the number of products they can afford.

The existence of home-based workers is still invisible; thus, it is making the working conditions still under the standard working conditions of formal workers. There are many problems that are often faced by home-based workers, such as the absence of written employment agreements, wages under MSE (minimum wage of cities/districts), long working hours, no social security, income security, health insurance and work safety, and no maternal protection and no mechanism for dispute resolution. The condition is still experienced and faced by home-based workers in Indonesia. So that home-based workers are in a vulnerable position and close to the poverty line, and the basic rights of workers are not protected, secured and fulfilled.

A great challenge for home-based workers is where the house has become multiple functions both as a work place and as a residence. The taking of wholesale work is not possible if there is no place for self-storage, so often it competes with other household

activities. Many home-based workers do the chores during the day and work as home-based workers for hours at night, which can lead to fatigue and eye strain. Some home-based workers produce dust or use hazardous chemicals, for example the charcoal workers. However, sometimes the work space and family room are not separated. This may endanger both home-based workers and other family members, including the children.

Occupational health and safety are important issues for home-based workers, including ergonomic risk factors associated with poor posture from sitting on the floor or on low tables, repetitive movements, and long hours with limited rest periods; as well as the risk of exposure to toxic substances (dust, metal and chemicals) [6]. This risk is increased if the condition of houses and workplaces have poor water, sanitation, lighting or ventilation [7].

## 2. Methods

The type of this research was observational research using cross sectional design. This research was conducted in Semarang City with 2 stages, the first stage was conducting a survey to find out the number and distribution of home workers in 6 sub-districts in Semarang City and the second phase aimed to identify the working environmental hazard to the home-based workers especially who work in the charcoal industrial sector. The population in this research was all home-based workers in the charcoal industrial sector which recorded in the phase I survey and the research samples were 146 home-based workers taken by purposive sampling (female workers). The data analysis using descriptive analysis and analytical bivariate was applied to find out the relation of working environmental hazard to health problem experienced by home-based worker in the charcoal industrial sector.

## 3. Results

### 3.1. Work environmental conditions

Home environmental conditions observed include the house environment and work activities. The house condition of home-based workers, where it has a double function both as a residence and workplace of home-based workers was mainly found in the place of home workers for the charcoal industrial sector. There is no special place

made in the houses of home-based workers to be used as their workplace. Home-based workers of the charcoal industrial sector do all the activities of packing charcoal in one part of the room in the house. A total of 65.1 percent of home-based workers have an ineligible ceiling condition. The condition of the ceiling in the houses of home-based workers of the charcoal industrial sector was 34.9 percent without any ceilings, 37 percent with ceilings but not in clean condition and 19.2 percent with ceilings but in dark condition, thus it affects the lighting level in the house. The floor condition of home-based workers on the charcoal industrial sector in Semarang was 71.9 percent with floor that does not meet health requirements of the house, with the detail of 21.1 percent not plastered floor, 6.8 percent not made of strong material, 11 percent not clean, 11 percent not waterproof and 0.7 percent was uneven. The house environmental besides the condition of the ceiling and floor, is the ventilation conditions and the waste disposal facilities. These results showed that 57.5 percent of the houses ventilation did not meet the healthy ventilation requirements ( $\geq 10$  percent of floor area), while 87.7 percent of the charcoal industrial workers did not have good waste disposal facilities (Table 1).

### 3.2. Working environmental hazards

Working environmental hazards are potential hazards to home workers as the effect of physical, biological, chemical working environmental (residence) conditions and work activities undertaken by home workers. The results showed that the potential hazards presented in the charcoal industrial sector workers were 39.7 percent of potential hazards from dust and chemicals used for production, 100 percent of potential ergonomic hazards (Table 2) which includes the activities that rotate and repeat at work (40.4%) and non-ergonomic working positions (59.6%) (Table 3).

TABLE 1: Work environmental condition.

Work Environmental Condition	Good		Bad	
	f	%	f	%
The ceiling	51	34.9	95	65.1
House floor	41	28.1	105	71.9
Ventilation	84	57.5	62	42.5
Waste disposal facilities	18	12.3	128	87.7

TABLE 2: Working environmental hazard.

Working environmental hazard	Yes		No	
	f	%	f	%
Dust and chemicals	58	39.7	88	60.3
Ergonomic	146	100	0	0

TABLE 3: Ergonomic risk factor.

Ergonomic risk factor	f	%
Repetitive motion	59	40.4
Working position is not ergonomic	87	59.6

### 3.3. Types of injuries and work complaints

Home-based workers in the charcoal industrial sector are inseparable from injuries due to their works. The most common types of injuries to home workers are joint pain occurring in 80.8 percent of the charcoal industrial workers who became the research subject, followed by 13.7 percent shortness of breath, while 4.1 percent of the charcoal industrial workers claim that they never had an injury. Complaints in the home-based workers in the charcoal industrial sector in majority stated that muscle pain occurred in 41.1 percent of home-based workers, 19.2 percent of stiffness, 13 percent cough, 11.6 percent tingling, the rest was 7.5 percent stated experiencing other complaints (blurred eyes, moody, shortness of breath and dizziness) and 7.5 percent also stated never having a complaint due to his work (Table 4).

### 3.4. Health problems

In addition to injuries and complaints of employment, home-based workers of the charcoal industrial sector also experienced some health problems that occur due to the work environment or work activities. Home-based workers are experiencing health problems such as dizziness and headaches for 54.8 percent from 146 home-based workers of charcoal industrial sector who were the subject of the study, 31.5 percent had a cough and shortness of breath and 68.5 percent experienced tingling (Table 5).

### 3.5. The result of bivariate analysis

Analytical test results were for the variables in the study. Not all variables in the descriptive test were analytically tested. Analytical tests were only performed for the

TABLE 4: Types of work injuries and complaints that are often experienced by home workers of the charcoal industrial sector.

Types of Work Injuries and Complaints	f	%
Type of injury		
Joint pain	118	80.8
Shortness of breath	20	13.7
others	2	1.4
never injured	6	4.1
Work complaints		
Muscle pain	60	41.1
Stiffness	28	19.2
Cough	19	13
Tingling	17	11.6
Others	11	7.5
No complaints	11	7.5

TABLE 5: Health problems experienced by home-based workers in the charcoal industrial sector.

Health problems	Yes		No	
	f	%	f	%
Dizziness and headaches	80	54.8	60	45.2
Cough and Shortness of breath	46	31.5	100	68.5
Tingling	100	68.5	46	31.5

variables of floor type and ergonomic hazards (circular and repetitive motion) with health problems such as headache and stiffness, cough and shortness of breath and tingling. The result of chi-square test showed that there is a significant correlation between floor condition with dizziness and headache with  $p$ -value = 0.003 and tingling ( $p$ -value = < 0.0001). Significant results were also obtained on the test results of the relation between ergonomic hazards (circular and repetitive motion) with dizziness and headache ( $p$ -value = 0.015) and tingling ( $p$ -value = 0.01).

The risk level emerged by the condition of the floor to the health problems such as dizziness and headache was 1.841 times greater, while the condition of tingling was 2.399 times greater for the group of home based workers in charcoal industrial sector with the floor condition that do not meet the health requirement.

The ergonomical hazards risk (circular and repetitive motion) to the attack of dizziness and headaches at home-based workers in the charcoal industrial sector was 1,475

times greater in workers who perform work activities such as circular and repetitive movements, while the risk of the tingling was 1,361 times greater.

TABLE 6: The result of bivariate analysis.

Research variable			p-value	PR (CI 95%)	Information
Condition of floor	x	Dizziness and headache	0.003	1.841 (1.174-2.886)	Significant and is a risk factor
		Narrowing cough	0.07	1.687 (0.988-2.882)	Not significant
		Tingling	< 0.0001	2.399 (1.553-3.704)	Significant and is a risk factor
Ergonomic Dangers (circular and repetitive motion)	x	Dizziness and headache	0.015	1.475 (1.106-1.966)	Significant and is a risk factor
		Tingling	0.01	1.361 (1.10-1.681)	Significant and is a risk factor

#### 4. Discussion

The house conditions of home-based workers in the charcoal industrial sector that mostly do not meet the health requirements was influenced by the work system as putting out system. Putting out system is a double form of the housewives' work and part time work where the majority of the housewife is middle to lower society. Workers who work with this system are paid based on the amount of goods produced by the workers rather than the work hours. Furthermore, the employers only provide material support with no protection in the form of PPE or social insurance provided to the workers. The condition is further worsened by the involvement of families including children. Thus, it can be assumed that the health and work accident risk for the workers with this system is big enough, especially with the additional condition of the house is getting unhealthy either because of the raw material of production and also the work activities done by the home-based workers.

Environmental hazards of home-based workers in charcoal industrial sector is more dominant in the ergonomic hazards rather than the dust hazard, it occurred because if they see their activities while performing their job with a lot of repetitive tasks with no ergonomic working position. The work positions here is the home-based workers in the charcoal industrial sector working only by sitting on a floor that is sometimes grounded in a mat or plastic or sometimes with no base, and then on the floor they sit and run the production process of packing the charcoal they have taken from their employer. Repetitive work appears as they pack the charcoal in the plastic and then

put it into the packing plastic before they put it into the packaging box and close the box.

Studies in seven countries reported the work health and safety hazards to home workers. In Bangladesh, almost all respondents reported respiratory problems and other chronic or acute health problems. In Thailand, many home workers, especially elderly workers, report eye strain, sore eyes and blurred vision. Their workplaces have poor lighting and, especially in rural areas, are often congested, hot and stuffy. Exposure to dust and other irritants, such as stinging kerosene fumes, causes allergies and respiratory diseases. Those who were involved in food processing suffered from skin rashes due to hot oil sprinkles while cooking. In Kanpur, India, those who work with leather in highly polluted working conditions must face a very sharp smell. In Nepal, home workers are forced to work in candle light due to frequent power outages: dim light affects the eyes and smoke from wax disrupts the nose and throat [9].

That working positions led to some complaints such as muscle pain and tingling. MSDs (musculoskeletal disorders) complaints are described as stiffness, pain, inflexibility, heat, tingling, numbness, swelling and stiffness. This complaint is a complaint on the skeletal muscle that is felt by someone ranging from mild complaints to complaints that feel very sick [10].

According to OSHA in 2000, ergonomic risk factors that contribute to the occurrence of MSDs are [11] physical factors, such as awkward posture (posture or position of body parts that are unsupported for stretching to the physical limit or deviating from a neutral position, can suppress nerve and tendon irritation), static posture (a position where a worker must hold for long periods of time, can interfere with blood flow and muscle damage), power/force (exerting excessive force), repetition or repetitive motion (an excessive of repetitive movement can cause irritation of the tendon and increase the pressure on the nerves), fast movement, pressure or contact stress, vibration and cold temperature, while the risk factor arising from the work includes physical work posture in various positions (static, prolonged standing, prolonged sitting, squatting or kneeling). (Workcover, 1999).

MSDs complaints are accumulative and may be temporary or permanent, depending on the duration of muscle loading. Muscle and bone pain, dizziness and tingling in home-based workers of the charcoal industrial sector are generated by the ergonomic risk factor that occurs in them. In this study the ergonomic risk factor that occurred is the awkward posture where the home-based workers in the charcoal industrial sector do their work by sitting on the floor, so they have to bend at the time of packing the charcoal so that the nerves are suppressed and there is irritation of the

tendon, the continuous nervous pressure resulting in dizziness and headaches are also experienced by them, in addition to the main complaints of MSDs. In addition to the awkward position as the cause of MSDs complaints experienced by home-based workers of the charcoal industrial sector, repetition or repetitive movements performed by the workers also affected the effects of occurring MSDs, the intended repetitive movement is to do the packing of charcoal in large quantities with the stages of preparing the charcoal in the packaging plastic, packing plastic, then inserting plastic into cardboard packaging and finally smoothing cardboard packing with glue. This increases the pressure on the nerves and the tendency of the tendon is getting stronger, so it is natural that home-based workers of the charcoal industrial sector experience MSDs.

It is supported by the results of other studies that were a research conducted by Andres and Djunaidi in 2014, that MSDs complaints occurred in sandals craftsmen in the form of stiffness, pain, stiffness and tingling and cramps/seizures, where the complaint occurred because of the ergonomics risk, working risks and individual characteristics. The workers should not make sudden, jerky or violent movements to control movement or do anything that causes discomfort, pain or awkward positions. Back pain will be closely related to daily work (Workcover, 1999). Posture either standing or sitting can cause mechanical stress on the bones and muscles resulting in lower back pain.

The results of research on home-based workers in three cities was there were four main types of occupational health and safety hazards identified, such as body aches and pains; blisters, cuts and burns; eye irritation and tension; and respiratory problems. The main causes of this problem are lack of proper seating/work, lack of adequate ventilation, and toxic substances used in production [13].

The arising of the muscle and bone pain, dizziness and headaches and tingling effects in the home-based workers of the charcoal industrial sector is the effect of their work as home workers reinforced by the bivariate test results showing the relationship between working environmental hazard conditions such as physical risk factors (floor condition) and ergonomic risk factors (ergonomic work positions and repetitions of movement in work), suggesting that floor conditions increases the risk of home workers for dizziness and headaches, and ergonomic risk factors increases the risk of dizziness and headache for 1,475 times and 1,361 times for the occasions of tingling.

The floor conditions which do not meet the health requirements, such as not plastered, not made of strong materials, not clean, not waterproof and uneven increases

the risk of dizziness and headache. Based on the information from home-based workers who experience dizziness and headaches, this happens because the condition of such flooring causes an increase in stress on charcoal packing workers. The increasing stress on workers resulted in an increasing risk of experiencing primary headaches, such as tension type headache, migraines and cluster headache. This type of headache is a headache that is closely related to stress.

While an increasing risk of dizziness and headaches associated with ergonomic risk factors was due to ergonomic risk factors such as non-ergonomic working position increasing the pressure that occurs to the nerves and muscles so the potential for increased irritation of the tendon will be greater. Pressure on nerves and muscles and tendon irritation usually occurs in the back and neck due to a non-ergonomic working position. Pressure on the neck is what triggers the headache and dizziness. Other than due to non-ergonomic working position, dizziness and headache are also happened due to the worker's repetitive movements, this causes pressure on the nerve of the eye so that the effect caused is eyestrain so that dizziness and headache caused by repetitive motion. Fatigue has a direct effect on security at work and on productivity and product quality [14].

In addition to dizziness and headaches, ergonomic risk factors also increase the likelihood of tingling in home workers. This tingling arises because of excessive pressure on the nerves in certain body parts, thus causing blood flow from the legs to the upper body not smooth so the tingling happens. This tingling arises because the sitting position during work that is not ergonomic and resulting in pain, workers sit on the floor and do the work with odd positions such as bending, squatting or deviate from the normal position.

## 5. Conclusion

The working environmental hazards at home-based workers in the charcoal industrial sector covers the physical factor of working environment (floor condition) which is a risk factor for the occurrence of dizziness and headache (risk increases 1.84 times greater in workers with the condition of floor do not meet health requirements), as well as ergonomic risk factors such as ergonomic working position and workers perform repetitive movements increase the risk of dizziness and headache 1.48 times greater in workers with ergonomic risk factors and workers with ergonomic risk factors have 1,361 times greater chance for experiencing a tingling compared to them with no ergonomic risk in work.

## Competing Interest

The authors declare that they have no significant competing financial, professional or personal interests that might have influenced the performance or presentation of the work described in this article.

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