

ANALYSIS OF FACTORS RELATED TO RESPIRATORY DISORDERS COMPLAINTS OF SCAVENGERS AT KLOTOK LANDFILL KEDIRI CITY

Anastasya Ferronica¹, Nur Endah Wahyuningsih², Suhartono²

¹Environmental Health Specialization, Faculty of Public Health, Diponegoro University

²Environmental Health Section, Faculty of Public Health, Diponegoro University

Jl. Prof. H. Soedarto, SH, Tembalang, Semarang, Indonesia 50275

E-mail: anastasyaferronica@gmail.com

Article Info

Article history:

Received May 19, 2023

Revised May 20, 2023

Accepted July 01, 2023

Keywords:

Factor Analysis

Respiratory disorders

Complaints

Landfills

Scavengers

ABSTRACT

Analysis of factors related to respiratory disorders complaints of scavengers At Klotok Landfill Kediri City. Klotok landfill is a place where the waste is collected by the community every day. Klotok landfill was also used as a source of livelihood for scavengers. Scavengers working in landfills are prone to respiratory problems due to dust and pollutant gases produced through the waste decomposition process. The purpose of this study was to analyze the factors that have a relationship with scavengers' respiratory complaints at the Klotok landfill. This study used an analytic observational research design with a cross-sectional approach. The research was conducted on 43 scavengers with the total sampling technique used. Data was collected through interviews using questionnaires and observation in the TPA environment. The results showed that 67.4% of scavengers at the Klotok TPA experienced respiratory disorder complaints. The study also revealed a relationship between the use of masks ($p=0.003$), years of service ($p=0.027$) and age ($p=0.002$) with scavengers' complaints of respiratory disorders. And there was no relationship between smoking habits ($p=0.826$), working hours ($p=0.191$), and gender ($p=1.000$) with scavengers' complaints of respiratory disorders.

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



INTRODUCTION

Waste is a significant environmental problem. This problem is directly related to population growth, which leads to an increase in waste production each year. The community's increasing waste production has not alleviated the waste problem in Indonesia, and the lack of effective management persists. According to the Ministry of Environment and Forestry (KEMENLHK), waste generation in Indonesia in 2020 will reach 67.8 million metric tons per year. This implies that Indonesia produces approximately 185,723 tons of waste daily. This waste generation consists of organic waste, plastic waste, paper waste, and other waste ⁽¹⁾.

At a waste collection site known as a final processing place (TPA) or dump station, the community discards and collects the waste it produces daily. This causes waste in the landfill to pile up and become overloaded. The operational system divides the methods used at the final waste processing site into three categories: sanitary landfills, controlled landfills, and open dumping. Final waste processing methods must comply with environmentally sound technical principles in order to cause as little pollution and negative impacts as possible ⁽²⁾.

Apart from serving as a final waste processing site, TPA also provides a source of livelihood for scavengers. At the Klotok TPA, Kediri City, it is estimated that around 50 scavengers sort, search for, and collect waste that can be recycled or reused to be sold to collectors, such as plastic bottles, glass bottles, and electronic equipment. An interview with one of the scavengers reveals that the types of waste entering the Klotok landfill remain mixed. The waste in the Klotok landfill comes from a variety of sources, including household waste, industrial waste, market waste, hotel waste, and other locations.

Every day, scavengers come face to face with rubbish, strong odors, dust, and various air-polluting gases such as H₂S and CH₄, which spread in landfills while carrying out their work. (3). When humans inhale dust, air-polluting gases, and rotting bacteria that land in rubbish, they can cause shortness of breath, coughing, and chest pain, as well as irritation and respiratory tract infections. (4). Scavengers who receive continuous exposure will have respiratory tract problems.

A preliminary study at Klotok TPA on 10 scavengers found that 7 people, or 70%, complained of respiratory issues. Seven individuals reported experiencing shortness of breath, with some also reporting coughing. The observations revealed that 8 out of the 10 scavengers were not wearing masks as personal protective equipment.

This research aims to analyze the factors associated with complaints of respiratory problems among scavengers at the Klotok TPA.

MATERIALS AND RESEARCH METHODS

The final processing site, TPA Klotok, in Kediri City's Mojokerto District, served as the location for this research from September to November 2022.

This study employs an observational-analytical research design with a cross-sectional approach. The subjects in this study were all active scavengers who worked at the Klotok TPA. Sampling used a total sampling technique, namely 43 people. We collected data through interviews using a questionnaire.

The independent variables studied in this research include age, gender, length of service, working hours, smoking habits, and use of masks. In this study, complaints about respiratory problems are the dependent variable. In this study, data analysis was performed using univariate analysis with a frequency distribution table and bivariate analysis using the chi square test with a confidence level of 95% ($\alpha = 0.05$).

RESULTS OF RESEARCH AND DISCUSSION

Results of Univariate Analysis of Respiratory Disorder Complaints, Individual Characteristics, and Mask Use

According to Table 1, the research findings revealed that 14 scavengers (32.6%) did not experience respiratory problems, and 29 scavengers (67.4%) experienced respiratory problems.

Most of the respondents at Klotok TPA were ≥ 40 years old, 32 people (74.4%). The average age of respondents was 46 years, with the youngest respondent being 20 years old and the oldest being 64 years old. There were 26 male respondents (60.5%) and 17 female respondents (39.5%). Most respondents had a work period of ≥ 10 years, totaling 27 people (62.8%) with an average work period of 11 years, with the longest work period being 25 years. The majority of the respondents, specifically 26 individuals (60.5%), worked an average of 8 hours per day, with the longest being 12 hours. Respondents with a smoking habit were 22 people (51.2%), while respondents

who did not have a smoking habit were 21 people (48.8%). There were 9 respondents (20.9%) who wore masks, and 34 respondents (79.1%) did not wear masks when working.

Table 1. Frequency Distribution of Respiratory Disorder Complaints, Individual Characteristics, and Mask Use

Variable	Frequency	Percentage (%)
Complaints of Respiratory Disorders		
Yes	29	67.4
No	14	32.6
Age		
≥ 40 years old	32	74.4
< 40 years	11	25.6
Gender		
Man	26	60.5
Woman	17	39.5
Years of service		
≥ 10 years	27	62.8
< 10 years	16	37.2
Working hours		
> 8 hours/day	17	39.5
≤ 8 hours/day	26	60.5
Smoking habit		
Smoke	22	51.2
Do not smoke	21	48.8
Use of Masks		
No	34	79.1
Yes	9	20.9

Table 2. Descriptive Analysis of Age, Years of Work, and Working Hours

Variable	Mean	Median	Mode	elementar y school	Min	Max
Age	45.98	46	42	10,559	20	64
Years of service	11.28	10	10	6,096	2	25
Working hours	8.16	8	8	2,288	2	12

According to Table 3, the types of complaints experienced by respondents varied: 13 people complained of coughing (30.2%), 4 people complained of coughing with phlegm (9.3%), 5 people complained of wheezing (11.6%), 10 people (23.2%) complained of shortness of breath, 11 people (25.6%) had the flu, and 6 people complained of chest pain (14.0%). We categorized respondents' complaints of respiratory problems into two categories: mild and severe. Respondents in the category of complaints of mild respiratory problems were respondents who only experienced complaints of cough, cough with phlegm, and flu, namely 12 respondents. Meanwhile, respondents in the category of complaints of severe respiratory problems were respondents who experienced complaints other than coughs and flu, namely 17 respondents.

Table 3. Types of Respiratory Disorder Complaints Experienced by Respondents

No.	Type of Complaint	Frequency (Yes)	Percentage (%)	Frequency (No)	Percentage (%)
1	Cough	13	30.2	30	69.8
2	Flu	11	25.6	32	74.4
3	Out of breath	10	23.2	33	77.8
4	Chest pain	6	14.0	37	86.0
5	Wheezing	5	11.6	38	88.4
6	Cough with phlegm	4	9.3	39	90.7

Table 4. Categories of Complaints Experienced by Respondents

Complaint Category	Type of Complaint	Frequency
Minor Complaints	-Cough	2 persons
	-Flu	3 people
	-Cough and flu	3 people
	-Cough, cough with phlegm	1 person
	-Cough with Phlegm and Flu	1 person
	-Cough, cough with phlegm, flu	2 persons
Total		12 people
Severe Complaints	-Hard to breathe	2 persons
	-Wheezing	4 people
	-Chest pain	1 person
	-Cough and Shortness of Breath	4 people
	-Wheezing and shortness of breath	2 persons
	-Flu and Shortness of Breath	1 person
	-Wheezing and Chest Pain	2 persons
	-Wheezing, Shortness of Breath, Chest Pain	1 person
Total		17 people
Total		29 people

Bivariate Analysis

Based on Table 4, the results of the analysis show that there is a relationship between age ($p = 0.002$), length of service ($p = 0.027$), use of masks ($p = 0.003$) and complaints of respiratory problems among scavengers. And there was no relationship between gender ($p = 1,000$), working hours ($p = 0.191$), smoking habits ($p = 0.826$), and complaints of respiratory problems among scavengers.

Table 5. Analysis of the Relationship between Independent Variables and Dependent Variables

Variables and Dependent Variables									
No.	Variable	Complaints of Respiratory Disorders				Total	P value	RP (95%CI)	
		Yes		No					
		f	%	f	%	f			%
1.	Age								
	≥ 40 years old	26	81.3	6	18.8	32	100	0.002	2,979 (1,119-7,932)
	< 40 years	3	27.3	8	72.7	11	100		
3.	Years of service								
	≥ 10 years	22	81.5	5	18.5	27	100	0.027	1,862 (1,039-3,340)
	< 10 years	7	43.8	9	56.3	16	100		
6.	Use of Masks								
	No	27	79.4	7	20.6	34	100	0.003	3,574 (1,040-12,277)
	Yes	2	22.2	7	77.8	9	100		
2.	Gender								
	Man	18	69.2	8	30.8	26	100	1,000	1,070 (0.693-1.652)
	Woman	11	64.7	6	35.3	17	100		
4.	Working hours								
	> 8 hours/day	9	52.9	8	47.1	17	100	0.191	0.688 (0.419-1.129)
	≤ 8 hours/day	20	76.9	6	23.1	26	100		
5.	Smoking habit								
	Smoke	14	63.6	8	36.4	22	100	0.826	0.891 (0.588-1.350)
	Do not smoke	15	71.4	6	28.6	21	100		

Complaints of Respiratory Disorders

The conducted research revealed that 29 respondents (67.4%) reported experiencing respiratory problems, while 14 respondents (32.6%) did not report any respiratory problems. This shows that more scavengers complain of respiratory problems than those who do not complain of respiratory problems.

It's possible that scavengers who don't complain about respiratory issues do so because they've adapted to the landfill's environment. Physiological processes facilitate this adaptation ⁽⁵⁾. Klotok landfill scavengers experienced a variety of respiratory problems, including coughing in 13 people (30.2%), coughing up phlegm in 4 people (9.3%), flu in 11 people (25.6%), and wheezing or wheezing. 5 respondents (11.6%) experienced coughing, 10 people (23.2%) experienced shortness of breath, and 6 people (14.0%) experienced chest pain.

Relationship between Age and Complaints of Respiratory Disorders

The study's results using the chi square statistical test on the age variable obtained a p value of 0.002 p (< 0.05), which means that the zero H was rejected, so it was concluded that there was a significant relationship between the respondent's age and complaints of respiratory problems. The theory states that physiologically, increasing age causes the ability of the body's organs to decrease, which can cause health problems. A decrease in this organ function allows the vital capacity of the lungs to decrease more rapidly at the age of >40 years ⁽⁶⁾. On average, a person's lung quality will decrease, along with respiratory muscle degeneration and tissue elasticity ⁽⁷⁾.

This research is not in line with the findings of Simbolon VA, Nurmaini, and Hasan W (2018), which state that there is no relationship between age and respiratory complaints among scavengers at the Ganet Tanjungpinang TPA with a p value of 0.683 (p > 0.05) ⁽⁸⁾.

Relationship between Work Period and Respiratory Disorder Complaints

At the Final Processing Site (TPA), there are various kinds of pollutants, including dust, rotting microorganisms, and gases produced from the waste decomposition process such as H₂S, CH₄, and NH₄, which, if inhaled by humans continuously, can result in the risk of respiratory problems. ⁽³⁾. H₂S gas is a type of asphyxiant chemical that can cause shortness of breath because its toxicity mechanism inhibits oxygen transport. ⁽⁹⁾ Long-term exposure to these compounds is also associated with potential health risks, such as respiratory irritation, cancer, and even damage to the central nervous system. ⁽¹⁰⁾ The theory from Morgan and Parkes states that it takes approximately 10 years for someone who is exposed to pollutants to develop respiratory system problems. The lonA person's working period lengthens their exposure to pollutants, and the more pollutants they inhale, the higher the likelihood of respiratory tract problems. his thResearch results align with this theory, indicating a higher frequency of respiratory problems among respondents with less than 10 years of work experience. rocessing Sites (TPA) have environmental conditions that are dusty, hot, and contain microbiological and chemical substances in the air that come from waste. This is due to waste's natural decomposition and the production of pollutant substances. With environmental conditions like these, scavengers are at risk of experiencing respiratory problems due to constant exposure to polluting materials, especially scavengers with long working periods.

The results of this study are consistent with research conducted by Ida (2021), which found a relationship between work experience and complaints of respiratory problems among Sanggrahan TPA scavengers with a p value of 0.039 ($p < 0.05$) ⁽¹²⁾.

Relationship between Mask Use and Respiratory Disorder Complaints

Masks serve as respiratory protective equipment, shielding the respiratory system from various dangerous exposures. Masks alone cannot completely protect workers from the possibility of inhaling dust or small particles. However, Suma'mur in Abdul (2018) stated that using a mask will affect the number of particles that enter the body and accumulate in the lungs. Using a mask can reduce the risk of respiratory problems because it prevents the accumulation of polluting particulates in the lung organs (13). The type of mask worn must also be suitable for the risk factors and potential hazards in the workplace, because the type of pollutant and its ability to filter dust will affect the mask's level of effectiveness ⁽¹⁴⁾.

Out of the nine respondents who wore masks, two (22.2%) reported experiencing respiratory problems. According to a study by Putri Alam et al. (2019), the improper use of the mask led to dust particles easily entering the body. If we delve deeper, we discover that the type of mask respondents use, which isn't always perfect, contributes to this issue, leading them to frequently use damaged or dirty masks. ⁽¹⁵⁾. The research is consistent with that conducted by Abdul et al. (2018), who found a significant relationship between the use of personal protective equipment masks and respiratory tract disorders in workers, with a p value of 0.013 ($p < 0.05$). The research findings are also consistent with a study by Felysca (2018), which found a relationship between wearing masks and lung disorders in workers with a p value of 0.015 ($p < 0.05$) ⁽¹⁶⁾.

The Relationship between Gender and Respiratory Disorder Complaints

The statistical tests in this study did not reveal a significant relationship between gender and complaints of respiratory problems among scavengers. This is not in line with the theory, which states that gender will influence lung quality because the anatomy and physiology of men's and women's bodies are different ⁽¹³⁾. Women's lung capacity tends to be smaller than men of the same height and age ⁽¹⁷⁾.

The gender variable has no relationship with the incidence of complaints of respiratory problems among Klotok TPA scavengers, presumably because the activities of male and female scavengers tend to be the same, including searching, collecting, and sorting waste. This can also be due to other factors, such as the length of exposure and the use of respiratory protective equipment.

Research by Riska, Tri, and Hanan (2017), which found no significant relationship between gender and complaints of respiratory problems at the Jatibarang landfill in Semarang with a p value of 0.163 ($p > 0.05$), is consistent with this study ⁽¹⁸⁾. The research is also consistent with the findings of Delita, Taufik, and Nurmaini (2020), who discovered that there was no relationship between gender and complaints of respiratory problems among scavengers at Sei Giling TPA, Tebing Tinggi City. ⁽¹⁹⁾.

Relationship between Working Hours and Respiratory Disorder Complaints

The length of work, also known as working hours, is the amount of time each day spent working. A good working day for someone is generally 8 hours. Working longer

exposes a worker to workplace pollutants and increases the risk of respiratory problems.

According to interviews conducted during the research, scavengers' working hours depend on their will and body strength. Some of the scavengers even work until night. This is what makes it possible that there is no correlation between working hours and complaints of breathing problems among Klotok TPA scavengers, primarily because each individual has varying stamina and immunity.

The study by Ratih Andhika and Tofan Agung (2016), which found no relationship between the length of exposure in a day and complaints of respiratory problems with a p value of 0.699 ($p > 0.05$), is consistent with the research ⁽⁵⁾. The study's results align with Veronika, Nurmaini, and Wirsal's (2018) research, which found no correlation between exposure time and respiratory tract complaints, with a p value of 0.406 ($p > 0.05$). ⁽⁸⁾

The Relationship between Smoking Habits and Respiratory Disorder Complaints

The results of statistical tests show that there is no relationship between the smoking habit variable and complaints of respiratory problems. The research results are not in line with the theory that smoking can cause respiratory problems due to changes in the structure and function of the airways and lung tissue. The theory states that anatomical changes in the respiratory tract in smokers can cause changes in lung function with various clinical symptoms. Tobacco smoke induces pathological changes in the bronchial epithelium that often progress to fatal, invasive lung cancer. Tobacco smoke is a risk factor for COPD, is also a major cause of certain interstitial lung diseases, and exacerbates other diseases ⁽²⁰⁾.

The Klotok TPA scavengers' complaints of respiratory problems did not correlate with the smoking habit variable, likely due to variations in the scavengers' daily cigarette consumption and smoking duration. Therefore, smoking habits do not have a direct relationship with complaints of respiratory problems among scavengers at the Klotok landfill. The results of this study are not in line with the study conducted by Riska (2017), which stated that there was a relationship between smoking habits and complaints of respiratory problems among Jatibarang landfill scavengers with a p value of 0.006 ($p < 0.05$). ⁽¹⁸⁾ However, Ratih's (2016) research, with a p value of 1,000 ($p > 0.05$), indicates that smoking habits do not directly correlate with complaints of respiratory problems. ⁽⁵⁾

CONCLUSIONS AND RECOMMENDATIONS

The research revealed that of the six independent variables studied, three were related to the incidence of respiratory complaints among scavengers at Klotok TPA, Kediri City, namely age, length of service, and use of masks. Meanwhile, working hours, smoking habits, and gender were not significantly associated with complaints of respiratory problems among scavengers. The research results indicate that the use of masks by scavengers at the Klotok landfill remains minimal. We recommend scavengers to always wear personal protective equipment, especially masks, when searching for or sorting waste in the landfill area.

REFERENCES

1. Kementrian Lingkungan Hidup dan Kehutanan. Data Umum Sistem Pengelolaan Sampah [Internet]. [cited 2022 Feb 2]. Available from: <https://sipsn.menlhk.go.id/sipsn/>
2. Rizani MD. Pengelolaan Sanitasi Pemukiman Wilayah Perkotaan dengan Pendekatan Teknokratik dan Partisipatif (Teknoparti). Surabaya: Media Sahabat Cendekia; 2019.
3. Rifa'i B, Darundiati YH, Joko T. Analisis Risiko Kesehatan Lingkungan Paparan Gas Hidrogen Sulfida (H₂S) pada Pemulung Akibat Timbulan Sampah di TPA Jatibarang Kota Semarang. *J Kesehat Masy*. 2016;4(3):692–701.
4. Barni, Saputri AD. Gambaran Pengetahuan Sikap dan Perilaku Personal Hygiene pada Pemulung Sampah di Tempat Pemrosesan Akhir (TPA) Winong. 2021;7(02):22–7.
5. Rahma RAA. Pengaruh Paparan CH₄ dan H₂S Terhadap Keluhan Gangguan Pernapasan Pemulung di TPA Mrican Kabupaten Ponorogo. *J Ind Hyg Occup Heal*. 2016;1(1):1–14.
6. Fentiana N, Putri RR. Kedisiplinan Penggunaan APD (Alat Pelindung Diri) pada Polantas dan Hubungannya dengan Gangguan Pernapasan. *J Kesehat* [Internet]. 2018;11(2):107–14. Available from: <http://journal.uin-alauddin.ac.id/index.php/kesehatan/article/download/6332/5832>
7. Sapta Wardana A, Ma'rufi I, Widi EY R. Kebiasaan Merokok dan Umur Terhadap Kejadian ISPA Pada Petani Di Kecamatan Ijen Bondowoso. *Multidiscip J*. 2020;3(2):87.
8. Simbolon VA, Hasan W. Pengaruh Paparan Gas Hidrogen Sulfida (H₂ S) terhadap Keluhan Saluran Pernafasan pada Pemulung di Tempat Pembuangan Akhir (TPA) Ganet Kota Tanjungpinang Tahun 2018. 2019;18(1):42–9.
9. Dwicahyo HB, Sulistyorini L, Tualeka AR. Risk analysis of h₂s gas exposure at benowo landfill surabaya. *Indian J Forensic Med Toxicol*. 2020;14(2):1282–6.
10. Wu C, Liu J, Liu S, Li W, Yan L, Shu M, et al. Assessment of the health risks and odor concentration of volatile compounds from a municipal solid waste landfill in China. *Chemosphere*. 2018;202:1–8.
11. Saputra R, Hariyono W. Hubungan Masa Kerja dan Penggunaan Alat Pelindung Diri dengan Keluhan Gangguan Saluran Pernafasan Pada Karyawan di PT. Madubaru Kabupaten Bantul. *Semin Nas IENACO*. 2016;58–63.
12. Prasetyawati I, Setiani O. Hubungan Praktik Penggunaan APD dan Karakteristik Individu dengan Keluhan Gangguan Pernapasan pada Pemulung di TPA Sanggrahan Kabupaten Temanggung. *J Ris Kesehat Masy*. 2021;1(2):1–11.
13. Muhith A, Hannan M, Mawaddah N, Aqnata CA. Penggunaan Alat Pelindung Diri (Apd) Masker Dengan Gangguan Saluran Pernapasan Pada Pekerja Di Pt Bokormas Kota Mojokerto. *J Ilmu Kesehat*. 2018;3(1):20–33.
14. Lastri P, Dewata I, Sari M. The relationship between work period and use of personal protective equipment with respiratory disorder complaints in brick craftsman in Sintuk Toboh Gadang District Padang Pariaman Regency 2017. *IOP Conf Ser Earth Environ Sci*. 2019;314(1):6–12.
15. Alam P, Jayadipraja EA, Surya RA. The Relationship between Work Duration and the Use of Personal Protective Equipment with Lung Capacity Disorders

- The Relationship between Work Duration and the Use of Personal Protective Equipment with Lung Capacity Disorders. *East African Sch J Educ Humanit Lit.* 2019;2(8):504–8.
16. Politon FVM, Christine. Faktor Risiko Gangguan Fungsi Paru Pada Pekerja Bengkel Pengecatan Mobil Di Kota Palu. *Poltekita J Ilmu Kesehat.* 2018;12(1):28–33.
 17. Ekström M, Sundh J, Schiöler L, Lindberg E, Rosengren A, Bergström G, et al. Absolute lung size and the sex difference in breathlessness in the general population. *PLoS One.* 2018;13(1):1–12.
 18. Putri RT, Joko T, Dangiran HL. Hubungan Karakteristik Pemulung dan Penggunaan Alat Pelindung Pernapasan dengan Keluhan Gangguan Pernapasan pada Pemulung di TPA Jatibarang, Semarang. *J Kesehat Masy.* 2017;5(5):838–49.
 19. Panjaitan DB, Ashar T, . N. Hubungan Lama Kerja Dengan Keluhan Gangguan Pernapasan Pada Pumulung Di Tpa Sei Giling Kota Tebing Tinggi. *J Kesmas Dan Gizi.* 2020;2(2):151–5.
 20. Murray JF, Buist AS. Respiratory Disorders Related to Smoking Tobacco. *Tob Epidemic.* 2015;42:72–84.

