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Factors Related to Respiratory Disorders Among Scrap Collectors at the Final Disposal Site in Sumompo, Manado City

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ABSTRACT
Waste management issues, especially in landfills that still apply the open dumping system, can pose serious health risks. At Sumompo Landfill in Manado City, the decomposition of waste generates hazardous gases that may cause respiratory disorders. Scavengers as informal workers who are directly exposed to the landfill environment without adequate protection, become a vulnerable group, commonly experiencing complaints such as coughing, chest pain, and shortness of breath. This study aimed to identify factors associated with complaints of respiratory disorders among scavengers at the Sumompo Landfill. This study used an analytic observational design with a cross-sectional approach, conducted from May to July 2025, with a population of 100 peoples selected through accidental sampling. Data were collected through interviews with a structured questionnaire. The data were analyzed univariately and bivariately using the chi-square test with a 5% significance level of $p<0.05$. The results showed that most scavengers had worked for less than 10 years (42%). The majority worked more than 8 hours per day (58%), and a large proportion did not use masks (78%). All respondents reported respiratory disorders complaints, ranging from moderate (54%) to severe (46%) categories. The study concluded that length of service (p = 0,000), working duration (p = 0,017), and the use of personal protective equipment (masks) (p = 0,015) had significant relationship with complaints of respiratory disorders. As preventive measures, scavengers should improve their use of personal protective equipment, especially masks, while relevant institutions need to provide safer waste management systems and better access to protective equipment

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INTRODUCTION

The issue of waste is a crucial global issue because every individual produces waste from various daily activities (Prasetiyawati et al, 2021). Waste is something that is discarded, no longer needed, unused, unutilized, and unusable, originating from human activities or actions and does not occur naturally, whether in organic or non-organic form. Improper waste management can cause problems for human health (Wijayanti, 2021).

A landfill is a place for storing waste from various human activities. Accumulated waste can have direct effects such as unpleasant odors, and waste also has a negative impact on the air quality of the surrounding environment (Abdillah et al, 2019). In Indonesia, around 24% of waste is unmanaged, 7% is recycled, and around 69% ends up in landfills. In general, the highest composition of waste in landfills is organic waste. Organic waste undergoes decomposition or decay, producing various types of gases that can cause health problems, such as hydrogen sulfide (H2S), carbon monoxide (CO), ammonia (NH3), phosphorus (PO4), sulfur oxide (SO4), and methane (CH4) (Fahmi et al, 2023).

Data from the International Labor Organization (ILO) shows that every year, around 2.3 million workers worldwide die from work-related accidents and illnesses. In addition, there are 340 million cases of work accidents and 160 million cases of work-related illnesses each year. Of these, deaths due to exposure to hazardous substances are estimated at around 651,279 per year (ILO, 2021). The ILO reveals that the causes of death from work-related illnesses consist of 34% from cancer, 25% from work accidents, 21% from respiratory tract disorders, 15% from cardiovascular disease, and 5% from other factors. Worker deaths due to respiratory diseases rank third after work accidents (ILO, 2018).

Landfills play a strategic role in the waste management system, which serves to prevent the accumulation of waste in the surrounding environment. The Sumompo landfill is the main final disposal site for waste provided for the residents of Manado City, located in the Tuminting District. The waste management method applied at this landfill is the open dumping system, which involves the open accumulation of waste without further processing or treatment (Prasetiyawati et al, 2021). This system can pose a risk of air pollution due to the accumulation of methane gas and leachate produced from exposure to rainwater on waste piles (Warokka et al, 2021).

LITERATURE RIVIEW

The Sumompo landfill is also a source of livelihood for the surrounding community who work as scavengers. Scavengers are informal workers who play an important role in sorting waste for recycling or resale as a source of income to meet their daily needs. However, this activity is prone to various health risks and is generally carried out without adequate personal protective equipment, exposing scavengers directly to various hazardous occupational exposures such as dust, smoke, toxic gases, and pathogenic microorganisms from waste. Continuous exposure to these factors can cause health problems, particularly in the respiratory system (Prasetiyawati et al, 2021). The decomposition process of organic and inorganic waste contributes to respiratory complaints such as

coughing, chest pain, shortness of breath, and dry throat. This is in line with research by Prasetiyawati et al (2021) at the Sanggrahan landfill in Temanggung Regency, which found that some scavengers experienced respiratory complaints such as coughing, flu, fever, headache, shortness of breath, sore throat, chest pain, and nasal pain.

Factors that can influence respiratory complaints among scavengers include length of service or duration of employment as a scavenger, duration of work or hours worked per day, and use of personal protective equipment (PPE) such as masks. Long working periods indicate accumulated exposure over many years, which can affect the condition of the respiratory tract, while working hours that exceed normal hours can increase the level of exposure to hazardous substances. In addition, inconsistent use of respiratory PPE such as masks, or not using them at all, can increase vulnerability to harmful substances inhaled during work (Prasetiyawati et al, 2021).

Initial observations at the Sumompo landfill in Manado City found that scavengers worked more than 8 hours per day, with varying lengths of service, ranging from ≤5 years to >20 years. Some waste pickers have experienced respiratory problems such as coughing, flu, and shortness of breath. In addition, eating and resting activities are often carried out around the landfill, and on average, workers do not use adequate PPE, especially masks to cover their nose and mouth as a means of protecting themselves from air pollutants at the landfill.

Based on the background description above, the author is interested in researching the factors related to respiratory complaints among scavengers at the Sumompo landfill in Manado City. This study aims to identify the factors related to respiratory complaints among scavengers at the Sumompo landfill in Manado City.

METHODOLOGY

The type of research used was analytical observational research with a cross-sectional study design. This study was conducted at the Sumompo Village Landfill, Tuminting District, Manado City, from May to July 2025. The population in this study consisted of 100 scavengers at the Sumompo Landfill in Manado City. The sample in this study consisted of 50 people. The sampling technique used was accidental sampling, taking into account the inclusion and exclusion criteria. The variables in this study were independent variables, including length of service, duration of work, and use of personal protective equipment (masks), and dependent variables, including complaints of respiratory disorders. Primary data was obtained through questionnaires filled out by scavengers at the Sumompo landfill in Manado City, while secondary data was obtained from previous studies. Data was collected and processed using the SPSS program with a chi-square test. The analyses used included univariate analysis to describe the frequency distribution and percentage of the variables of length of service, duration of work, use of personal protective equipment (masks), and complaints of respiratory disorders, as well as bivariate analysis to

analyze the relationship between length of service, duration of work, use of personal protective equipment (masks), and complaints of respiratory disorders.

RESULT

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Table 1. Distribution of Respondent Characteristics

Respondent Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	26	52
Female	24	48
Total	**Total**	**100**
Years		
<35 Years	18	36
35-50 Years	15	30
>50 Yeasr	17	34
Total	**Total**	**100**

Based on Table 1, there were 26 male respondents (52%), while there were 24 female respondents (48%). The age characteristics of the respondents varied, including 18 respondents (<35 years old) (36%), 15 respondents (35-50 years old) (30%), and 17 respondents (>50 years old) (34%).

Table 2. Distribution of Respondents Based on Length of Service

Years of Service	Frequency (n)	Percentage ((%)
<10 Years	21	42
10-20 Years	18	36
>20yeass	11	22
Total	**50**	**100**

Based on Table 2, there were 21 respondents (42%) who had worked for less than 10 years, 18 respondents (36%) who had worked for 10-20 years, and 11 respondents (22%) who had worked for more than 20 years.

Table 3. Distribution of Respondents Based on Length of Employment

Working Hours (Hours/Day)	Frequency (n)	Percentage (%)
≤8 Hours/Day	21	42
>8 Hours/Day	29	58
Total	**50**	**100**

Based on Table 3, most respondents, namely 29 people (58%), worked for more than 8 hours per day, while 21 people (42%) worked for 8 hours or less per day.

Table 4. Distribution of Respondents Based on Use of Personal Protective Equipment (Masks)

Use of Personal Protective Equipment (Masks)	**Frequency (n)**	**percentage(%)**
Menggunakan	11	22
Tidak menggunakan	39	78
Total	**50**	**100**

Based on Table 4, 11 respondents (22%) stated that they wore masks while working, while the majority of respondents, namely 39 people (78%), stated that they did not wear masks while working.

Table 5. Distribution of Respondents Based on Reasons for Not Wearing Masks at Work

Reasons for Not Wearing a Mask at Work	**Frequency (n)**	**percentage (%)**
Uncomfortable	23	59
Indifferent	1	2,6
Already accustomed to it	15	38,5
Total	**39**	**100**

Based on Table 5, of the 39 respondents who stated that they did not wear masks while working, most respondents, namely 23 people (59%), stated that the reason was that it was uncomfortable to wear masks while working, followed by respondents who stated that they were accustomed to the smell of the landfill environment, namely 15 people (38.5%), and respondents who answered that they did not care, namely 1 person (2.6%).

Table 6. Distribution of Respondents Based on the Type of Mask Commonly Used When Working

Types of Masks Commonly Used at Work	**Frequency (n)**	**Percentage (%)**
Medical mask (disposable)	1	9,1
Cloth mask	2	18,2
T-shirt	8	72,7
Total	**11**	**100**

Based on Table 6, of the 11 respondents who stated that they wore masks while working, most respondents, namely 8 people (72.7%), wore T-shirts to cover their nose and mouth while working, followed by 2 people (18.2%) who wore cloth masks and 1 person (9.1%) who wore medical masks.

Table 7. Distribution of Respondents Based on Type of Respiratory Complaint

Types of Respiratory Complaints	Frequency (n)	Percentage (%)
Cough without shortness of breath		
Yes	29	58
No	21	42
Cough with phlegm		
yes	39	78
No	11	22
Cough accompanied by flu		
Yes	36	72
No	14	28
Runny nose (clear fluid discharge from the nasal cavity)		
Yes	32	64
No	18	36
Hoarse voice without fever		
Yes	32	64
No	18	36
Chest pain (burning or pressure)		
Yes	27	54
No	23	46
Sore throat (feels itchy/sore)		
yes	36	72
No	14	28
Shortness of breath or difficulty breathing		
yes	24	48
no	26	52

Based on Table 7, it is known that the most common respiratory complaint experienced by respondents was coughing accompanied by phlegm, which was experienced by 39 people, followed by coughing accompanied by flu and sore throat (feeling itchy/sore) by 36 people, runny nose (clear discharge from the nasal cavity) and hoarseness without fever by 32 people, and coughing without shortness of breath by 29 people. Complaints such as chest pain (burning or pressure) were experienced by 27 people and shortness of breath or difficulty breathing by 24 people.

Table 8. Distribution of Respondents Based on Respiratory Complaint Classification

Classification of Complaints Respiratory Disorders	Frequency (n)	Percentage (%)
Moderate	27	54
Severe	23	46
Total	**50**	**100**

Based on Table 8, the majority of respondents had moderate respiratory complaints, namely 27 people (54%), while 23 respondents (46%) had severe respiratory complaints.

Bivariate Analysis

Table 9. Relationship between Length of Service and Respiratory Complaints

Length of Service (years)	Respiratory Complaints				Amount		*ρ value*
	Moderate		severe				
	n	%	N	%	n	%	
<10 **years**	19	90,5	2	9,5	21	100	
10-20 **years**	8	44,4	10	55,6	18	100	0,000
>20 **years**	0	0	11	100	11	100	

Based on Table 9, most respondents with <10 years of service, namely 19 people (90.5%), experienced moderate respiratory problems. Furthermore, respondents with 10-20 years of service, mostly 10 people (55.6%), experienced severe respiratory problems. Meanwhile, all respondents with >20 years of work experience, totaling 11 people (100%), experienced severe respiratory problems. Based on the results of the chi-square test, a p-value of 0.000 ($p < 0.05$) was obtained, indicating that there is a relationship between work experience and respiratory problems among scavengers at the Sumompo landfill in Manado City.

Table 10. Relationship between Work Duration and Respiratory Complaints

Working Hours (hours/day)	Complaints of Respiratory Disorders				amount		*ρ value*
	Medium		Heavy				
	N	%	N	%	n	%	
≤8 (hours/day)	16	76,2	5	23,8	21	100	0,017
>8 (hours/day)	11	37,9	18	62,1	29	100	

Based on Table 11, of the 21 respondents who worked ≤8 hours/day, 16 respondents (76.2%) experienced moderate respiratory complaints and 5 respondents (23.8%) experienced severe respiratory complaints. Meanwhile, of the 29 respondents who worked >8 hours/day, 11 respondents (37.9%) experienced moderate respiratory complaints and the majority, namely 18 respondents (62.1%), experienced severe respiratory complaints. Based on the

results of the chi-square test analysis, a p-value of 0.017 (p < 0.05) was obtained, indicating that there is a relationship between work duration and respiratory complaints among waste pickers at the Sumompo Landfill in Manado City.

Table 11. Relationship Between the Use of Personal Protective Equipment (Masks) and Complaints of Respiratory Disorders

Use of Personal Protective Equipment (Masks)	Complaints of Respiratory Disorders				Amount		*ρ value*
	Currently		Weight				
	n	%	n	%	n	%	
Use	10	90,9	1	9,1	11	100	0,015
Do not use	17	43,6	22	56,4	39	100	

Based on Table 12, of the 11 respondents who wore masks while working, most of them, namely 10 respondents (90.9%), experienced moderate respiratory problems, and 1 respondent (9.1%) experienced severe respiratory problems. Meanwhile, of the 39 respondents who did not wear masks while working, 17 respondents (43.6%) experienced moderate respiratory problems, and the majority, namely 22 respondents (56.4%), experienced severe respiratory problems. Based on the results of the chi-square test analysis, a p-value of 0.015 (p < 0.05) was obtained, indicating a significant association between the use of personal protective equipment (masks) and respiratory complaints among waste pickers at the Sumompo Landfill in Manado City.

DISCUSSION

Work History Overview

The results of the univariate analysis of work history show that 21 respondents had a work history of <10 years, 18 respondents had a work history of 10-20 years, and 11 respondents had a work history of >20 years. Work history is an important indicator for assessing an individual's level of exposure to a work environment that is hazardous to the respiratory system. The longer a person works in a landfill environment, the higher the likelihood of exposure to pollutants such as hazardous gases, dust, and smoke from waste, which can cause respiratory complaints. This theory is supported by Ramadhona (2014), who found that the longer the length of service, the greater the exposure and the greater the health risks.

Overview of Working Hours

The results of the univariate analysis of working hours show that most respondents, namely 29 people, worked more than 8 hours per day, while 21 respondents worked 8 hours per day or less. These findings indicate that the majority of respondents work beyond the standard working hours. Prolonged exposure in the landfill environment has the potential to increase health risks, particularly respiratory disorders due to exposure to pollutants in the landfill environment. This is in line with Utami's (2023) research, which states that prolonged exposure will cause effects in the human body.

Overview of Personal Protective Equipment (Mask) Use

The univariate analysis of personal protective equipment (mask) use shows that the majority of respondents, namely 39 people, did not wear masks while working. Meanwhile, only 11 respondents wore masks while working, and none of the respondents always wore masks while working. These findings indicate that the level of compliance in the use of personal protective equipment, especially masks, is still very low among scavengers at the Sumompo landfill in Manado City. This could be due to various factors, one of which is low awareness of the importance of using PPE. This is in line with Utami's (2023) research, which found that PPE usage behavior can affect respiratory disorders.

Based on the findings in the field, the reasons why scavengers do not wear masks while working are that most respondents stated that it is uncomfortable to wear masks while working, followed by respondents who stated that they are already accustomed to or have adapted to the environment at the landfill, and there were respondents who stated that they do not care. The types of masks commonly used by respondents while working are T-shirts, cloth masks, and medical masks.

Overview of Respiratory Complaint

The results of the univariate analysis of respiratory complaints show that 23 respondents experienced severe respiratory complaints. Meanwhile, 27 other respondents experienced moderate respiratory complaints, and there were no respondents who fell into the mild complaint category. These findings indicate that all scavengers who were respondents in this study experienced moderate to severe respiratory complaints, indicating a serious health risk exposure during their work activities at the Sumompo landfill in Manado City. The absence of respondents in the mild complaint category may indicate that the level of air pollution caused by exposure to pollutants generated from the landfill has a direct impact on the respiratory system of workers. This is supported by Rahma's (2016) study, which found that exposure to gases such as methane (CH4) and hydrogen sulfide (H2S) affects respiratory complaints in scavengers.

Scavengers at the Sumompo landfill experience various respiratory complaints, including coughing without shortness of breath, coughing with phlegm, coughing with flu, runny nose (clear discharge from the nasal cavity), hoarseness without fever, chest pain (burning or pressure), sore throat (itchy/stinging), and shortness of breath or difficulty breathing.

The Relationship between Length of Service and Respiratory Complaints

Length of service refers to the length of time a person has worked in a particular place or work environment. The longer a person works, the better their experience and performance. However, a long length of service can also increase the risk of exposure to hazards in the work environment, which can affect workers' health (Deviyanti, 2022).

The results of the study show that there is a relationship between length of employment and respiratory complaints among scavengers at the Sumompo landfill in Manado City. These results indicate that the longer a person works at the landfill, the higher the risk of accumulated exposure to pollutants, such as

dust, toxic gases, and pathogenic microorganisms from accumulated waste. Long-term exposure can increase the risk of more severe complaints.

The results of this study are in line with the research conducted by Prasetiyawati et al (2021) on waste pickers at the Sanggrahan landfill in Temanggung Regency, which found a relationship between length of service and complaints of respiratory disorders (p = 0.025). Putri et al (2017) presented findings consistent with this study, namely that there is a relationship between length of service and respiratory complaints among scavengers (p = 0.039). The results of this study are also supported by the theory that the longer a person's length of service, the longer the worker is exposed to chemical, biological, or physical factors in the work environment. Frequent exposure to chemical factors over a long period of time can cause abnormalities or disorders in the respiratory system (Insani, 2023).

Morgan and Parkes' theory states that a person exposed to pollutants needs about 10 years to experience respiratory system disorders. The longer a person's working period, the longer their exposure to pollutants, and the more pollutants inhaled, the higher the possibility of respiratory tract disorders (Wu et al, 2018). The results of this study are in line with the theory that the frequency of severe respiratory complaints among respondents with 10-20 years and >20 years of work experience is higher than among respondents with <10 years of work experience.

The Relationship between Working Hours and Respiratory Complaints

Working hours are the amount of time spent by a person performing work activities in a day, measured in hours. In this case, working hours represent the length of time a person is exposed to various pollutants in the work environment, including dust particles, inhalable hazardous substances, and bioaerosols originating from various types of waste (Tahar, 2024).

The results of the study show that there is a relationship between working hours and respiratory complaints among scavengers at the Sumompo landfill in Manado City. Scavengers who work ≤8 hours/day mostly experience moderate respiratory complaints, while those who work >8 hours/day mostly experience severe complaints.

Landfills fall under the category of informal work sectors, where workers do not have official working hours or limits. Based on observations and interviews, it was found that scavengers begin working as soon as the landfill gate opens in the morning until the afternoon, and some even work until nighttime. This is because the duration of work depends on the willingness and physical ability of each scavenger. The shortest duration of work is 4 hours per day, while the longest is 12 hours per day.

The results of this study are in line with the research conducted by Prasetiyawati et al (2021) on scavengers at the Sanggrahan Landfill in Temanggung Regency, which showed statistical test results with a p-value of 0.039 (p < 0.05), meaning that there is a relationship between working hours and complaints of respiratory disorders among scavengers. Furthermore, these results are also in line with the research conducted by Raihanah (2024) on scavengers at the Tamangapa Final Waste Disposal Site in Makassar City, which

stated that there is a significant relationship between working hours and respiratory complaints (0.001).

Theoretically, working hours are one of the risk factors for respiratory system disorders such as lung disorders, which are greatly influenced by working conditions and the situation around the workplace. The longer a person's working hours, the higher the chance of exposure to hazardous pollutants in the work environment (Insani, 2023). This theory is also supported by research by Pahrir (2021), which states that workers who work more than 8 hours a day have a 1.9 times greater risk than workers who work less than 8 hours a day.

The Relationship Between the Use of Personal Protective Equipment (Masks) and Respiratory Complaints

Personal protective equipment, namely masks, are devices used to protect the respiratory system from the risk of hazards or diseases that may arise from exposure to hazardous substances, whether chemical, biological, physical, or other factors (Putri et al, 2017).

The results of the study show that there is a relationship between the use of personal protective equipment (masks) and complaints of respiratory disorders among scavengers at the Sumompo landfill in Manado City. The results of the study show that most respondents who did not wear masks while working experienced severe respiratory problems. This illustrates that the use of masks protects the respiratory system from exposure to dust, smoke, toxic gases, and microorganisms found in landfills.

Based on findings in the field, most scavengers do not wear masks while working, both when searching for waste in active zones and when sorting waste. This is due to various reasons, including discomfort, especially in the hot sun, being accustomed to working without masks, and the perception that masks are not important. In addition, external factors also play a role, such as the limited availability of masks from landfill managers and the government. The limited economic conditions of scavengers make it difficult for them to purchase masks independently. This shows the need for support from the government and landfill managers in providing masks or PPE facilities for scavengers, given that their work involves daily exposure to a high level of risk.

The results of this study are in line with the research by Putri et al (2017), which shows that there is a relationship between the use of respiratory protection equipment among waste pickers and ($p = 0.001$). In addition, the results of this study are also supported by the research of Prasetiyawati et al (2021), which states that there is a relationship between the use of respiratory PPE/masks and complaints of respiratory disorders with ($p = 0.021$)

.The open working environment of scavengers and the lack of respiratory protection equipment can increase the risk of contaminated air and other contaminants entering the respiratory tract, which in turn can potentially cause respiratory problems. The use of masks by workers in environments with hazardous pollutants is an effort to reduce the entry of particles into the respiratory tract (Putri et al, 2017). This theory is also supported by Prasetiyawati

et al (2021), who state that respiratory protection/masks are important tools, because 90% of poisoning cases are caused by inhalation of toxic chemicals, so the use of masks can provide protection against the dangers of air pollution. The more compliant a person is in wearing a mask while working, the lower the risk of respiratory complaints.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion of this study is that there is a relationship between length of service, duration of work, and use of personal protective equipment (masks) with complaints of respiratory disorders among scavengers at the Sumompo landfill in Manado City.

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