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Analysis of Behavior and Treatment of Mask Waste Impact of the Covid-19 Pandemic and Its Impact on the Environment

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Abstract - *The pandemic caused by Covid-19 has had various impacts on people's lives. One of these impacts is the use of masks when carrying out outdoor activities. Most people use disposable masks, so the amount of disposable mask waste has increased during the pandemic and post-pandemic. This research aims to find out whether people process disposable mask waste during the pandemic until post-pandemic. The research method was carried out using a non-probability sampling method using Google Form. Data analysis was carried out using Likert calculations and elasticity calculations. The results of the research show a decrease in people's behavior towards processing disposable mask waste during the pandemic to post-pandemic with E = 0.535, which means that people's behavior is inelastic.*

Keywords *– Covid-19, Pandemic, Disposable Mask Waste, Waste Processing*
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1. Introduction

The Covid-19 pandemic has changed the lifestyle of most people. One of these changes is the use of masks whenever carrying out outdoor activities. People are required to wear masks, so as not to be infected by Covid-19. This is because the Corona virus can spread through droplets that come from someone's cough or sneeze (Meri, et al., 2020). Various types of masks are worn by the public to prevent the transmission of Covid-19. One type of mask worn by the majority of people is a disposable mask.

The large number of disposable masks worn by the public has increased the amount of disposable mask waste. Disposable mask waste is a type of infectious waste, which is included in the B3 waste classification. Therefore, special treatment is required before throwing it in the trash. According to the Ministry of Environment and Forestry Circular no. SE.2/MENLHK/PSLB3/PLB.3/3/2020 concerning Management of Infectious Waste (B3 Waste) and Household Waste from Handling Corona Virus Disease (Covid-19), some methods can be implemented by the public before throwing away mask waste once used, namely by destroying the mask waste and then wrapping the waste tightly and covering it to prevent airborne transmission.

For 2 years, people continued to wear masks until the government announced that the situation had improved enough and Indonesia was considered to have reached the post-pandemic era. During this time, people can carry out activities outside the home while still complying with health protocols that have been regulated by the government, namely wearing masks when doing activities outside the home, washing hands with soap, maintaining distance, and avoiding crowds of people to prevent transmission of COVID-19 (Sitorus, 2020). Because post-pandemic it was implemented as an appeal, the response given by the public was quite varied. One response that can be seen is the use of masks, and this also influences the processing of mask waste carried out by the community, especially disposable mask waste.

Researchers want to use this opportunity to find out people's behavioral patterns in wearing disposable masks and processing their waste during the pandemic to post-pandemic. In this research, the author will focus on the processing of disposable mask waste carried out during the pandemic to post-pandemic as well as factors related to this behavioral pattern. This research aims to find out how the community processes waste masks, as well as how to process disposable mask waste properly.

2. Research Methods

The research was conducted in Surakarta City, with a research sample covering five sub-districts. These sub-districts are Jebres District, Laweyan District, Pasar Kliwon

District, Bajarsari District, and Serengan District. The data collection technique was carried out using a non-probability sampling method carried out via Google Form with a predetermined sample size using the Slovin calculation method. Then, data analysis will be carried out using several formulas in stages. First, the data that has been collected will be determined by the index using the Likert calculation method in the form of:

$$\text{Index} = \text{Pn x T} \quad (1)$$

Notes: Pn = Number/scale selected in the Likert score; T = Total respondents who chose that number.

Then, the index obtained will be analyzed by calculating the elasticity of people's behavior, namely:

$$E = \frac{\Delta Q}{\Delta P} \text{ x } \frac{P1}{Q1} \quad (2)$$

Notes: E = Elasticity of community behavior (respondents); Q1 = Respondent's index of processing disposable mask waste; ΔQ = Difference in processing index for disposable masks during the pandemic and after the pandemic; P1 = Respondent's index of use of disposable masks; ΔP = Difference in index for the use of disposable masks during the pandemic and after the pandemic.

The index for use (P) and processing (Q) of disposable mask waste is obtained from the average index of statements with the same criteria. The results of these calculations are in the form of one of the elasticity graphs which can be called perfectly inelastic graphs (E = 0), perfectly elastic graphs (E = ∼), unitary elastic graphs (E = 1), inelastic graphs (E < 1), or elastic graph (E > 1). It is necessary to have an index in the form of a percentage so that respondents' interpretations can be analyzed and evaluated. The equation formulas (3) and (4) will determine the % index of the data obtained, while the equation formula (5) will determine the interval of the % index.

$$\text{Index\%} = \frac{Total\ Indeks}{Y} \text{ x } 100 \quad (3)$$

Notes: Total Indeks = The index number of all responses in one statement/question; Y = Constant.

$$Y = Total\ Respondent \text{ x } Highest\ Scale \quad (4)$$

Notes: Highest Scale = The highest number on the Likert scale.

$$I = \frac{100}{L} \quad (5)$$

Note: I = Percent interval; L = Number of Likert scales.

3. Result and Discussion

3.1. Likert Scale

Table 1 shows the results of calculating respondent data using the Likert method. These results are in the form of numbers that indicate certain indices from the respondents, and interpretation of the indices obtained is required. The interpretation of the index in Table 1 can be seen in Table 2.

3.2. The Elasticity of Community Behavior

Elasticity is a method for measuring the sensitivity of one variable to other variables (Heriswanto & Membaka, 2022). In writing this thesis, the variable in question is the use of disposable masks with the processing of disposable mask waste. The use of disposable masks includes wearing disposable masks during activities outside the home during a pandemic and post-pandemic, and the duration of wearing a disposable mask is 4 hours. Meanwhile, the processing of disposable mask waste includes disposable mask waste which is damaged and disposed of in a separate place, and disposable mask waste which is burned. Then, a graph will be formed based on the average index obtained from each variable which has been grouped according to its indicators. The results of the average can be seen in Table 3.

From the table above, it can be seen that the average index for the indicator for the use of disposable masks during the pandemic is 5554. Then, the average index for the indicator for waste management for disposable masks during the pandemic is 4735.667. In the post-pandemic period, the average index for the indicator for the use of disposable masks was 5020, while the average index for the indicator for waste management for disposable masks was 4492. Then, all of these indices were converted into graphs in Figure 1. Based on Figure 1, it can be said that the elasticity results from the graph are inelastic or unitary elastic. To find more precise results, calculations are needed using the equation formula (2) and the result is E = 0.535. The elasticity results show that E < 1 so the Figure 1 is an inelastic graph.

Table 1. Likert Scale Calculation Results

Statement	Index	Index%
During the pandemic, you use a disposable mask.	6984	88%
Masks are worn for approximately 4 hours during the pandemic.	4124	52%
During the pandemic, mask waste is damaged first (cut or torn) before being thrown away.	5648	71%
During the pandemic, disposable mask waste is thrown away in special trash cans provided at home.	4956	62%
Mask waste is processed by burning it during the pandemic.	3603	45%
During the post-pandemic period, you use a disposable mask.	6320	79%

Statement	Index	Index%
Masks are worn for approximately 4 hours during the post-pandemic period.	3720	47%
During the post-pandemic period, mask waste is first damaged (cut or torn) before being thrown away.	5390	68%
During the post-pandemic period, disposable mask waste is disposed of in special trash bins provided at home.	4707	59%
Mask waste is processed by burning it during the post-pandemic period.	3379	42%
You understand how to manage disposable mask waste as determined by the Ministry of the Environment.	5699	71%
You have the desire to manage disposable mask waste under recommendations from the Ministry of the Environment.	6679	84%
There are perceived obstacles that prevent the management of disposable mask waste under the recommendations of the Ministry of the Environment.	4644	58%

Table 2. Interpretation of Respondents Based on Index%

Index%	Respondent's Interpretation			
	Use and processing	Understanding of processing	The desire to process well and correctly	Barriers to processing
0% – 24.99%	Never	Do not understand	Unwilling	There are many burdensome obstacles
25% - 49.99%	Seldom	Hardly understand	Not want to	A few obstacles are aggravating
50% - 74.99%	Often	Fairly understood	Just want to	A few mild obstacles
75% - 100%	Always	Very understanding	Very willing	No obstacles

Table 3. Average Index

Indicator	Average Index
Using disposable masks during a pandemic	5554
Processing disposable mask waste during the pandemic	4735.667
Use of disposable masks post-pandemic	5020
Processing disposable mask waste post-pandemic	4492

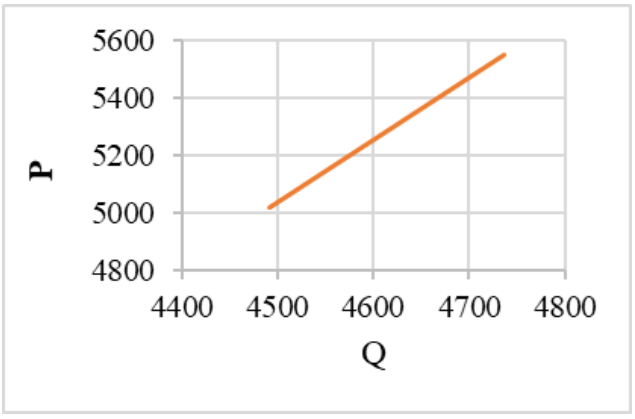

Figure 1. The Elasticity of Community Behavior

3.3. Community Understanding of Disposable Mask Waste Processing

Since the COVID-19 pandemic hit Indonesia, the government has given various appeals to the public, one of which is an appeal to wear masks when carrying out activities outside the home (Kriswibowo, et al., 2021). Some people prefer to wear disposable masks because they are more practical, increasing the amount of disposable mask waste. It is necessary to process all disposable mask waste, by all parties from the household to the larger scope. In the results of this research, an interpretation was obtained regarding the understanding of processing disposable mask waste by the people of Surakarta City which can be seen in Table 4.

Based on the Table 4, the interpretation of the public's understanding of processing disposable mask waste is in the form of "Fairly understood" with an index% of 71%. Then the second statement has an index% of 84%, so the interpretation of this statement is "Very willing". Finally, the index% in the third statement is 58% so the interpretation of this statement is "A few mild obstacles".

3.4. Community Behavior in Facing the Pandemic

The pandemic can be called a critical point in changing human behavior because the nature, character, and habits formed during the pandemic can persist to become a new culture for society or return to the way they were before the pandemic. Changes in people's behavior can be permanent or non-permanent. Permanent behavior changes are characterized by new habits that persist until a new culture is formed, while non-permanent behavior is characterized by habits that slowly disappear. Changes in people's behavior can be seen through the interpretation results in Table 5.

Based on the Table 5, changes in behavior during the pandemic and post-pandemic are only shown in wearing masks for 4 hours. The results of this interpretation show that people often wore disposable masks for 4 hours during the pandemic, whereas during the post-pandemic people rarely wore disposable masks for 4 hours regularly. This shows that changing the mask every 4 hours is a behavior that is not permanent. According to the interpretation results in Table 5, permanent behavior includes wearing disposable masks, destroying disposable mask waste, disposing of disposable mask waste in a separate container, and burning disposable mask waste. People's behavior of frequently changing disposable masks every 4 hours stems from feelings of worry and anxiety during the pandemic, so people are more regular in changing disposable masks every 4 hours.

Feelings of worry, anxiety and stress are examples of changes in behavior influenced by the pandemic (Agung, 2020). If this continues, people's social behavior can change significantly both physically and psychologically (Aslamiyah & Nurhayati, 2021). According to Hotima (2020), the impact of this behavior change could be that many people were already wearing masks while carrying out activities outside the home even before the government made an official statement regarding Covid-19 in Indonesia. Apart from that, excessive panic has caused some people to store medical masks and other disposable masks excessively. With the use of disposable masks increasing during the pandemic, the amount of mask waste being thrown away has also increased.

Another impact occurred after the government gave an official statement that Covid-19 had entered Indonesia, namely that people had to get used to various activities being shifted to activities at home. This is done to prevent further transmission of Covid-19. People must get used to carrying out various activities such as school, work, sports, and shopping at home until the post-pandemic period. In the post-pandemic era, the government has allowed people to return to activities outside the home as before. Some people prefer to continue carrying out various activities at home. This is because there is still anxiety and fear remaining from the pandemic period, so some people prefer to continue their activities at home.

3.5. Evaluation of Community Behavior Regarding Disposable Mask Waste Processing

The processing of disposable mask waste by the people of Surakarta City is inelastic. The inelastic nature shows that for every 1% increase, there will be an increase below 1% (Heriswanto & Membaka, 2022). In this study, for every 1% increase in the use of disposable masks, there was an increase of 0.535% in the processing of disposable mask waste. Then, in the community's interpretation of processing mask waste, it can be seen that people tend to frequently process disposable mask waste, especially at the stage of destroying and disposing of disposable mask waste in a separate trash bin. Unfortunately, at the stage of burning waste, people tend to rarely do this as can be seen in the Table 6.

Based on the Table 6, the interpretation of people's behavior during the pandemic and post-pandemic looks the same even though there is a decrease in the percentage in the table. This can be caused by several factors (Handayani, et al., 2022), namely:

a. Not all people comply

Not all levels of society comply with the government's appeal regarding the use of disposable masks, as well as the processing of disposable mask waste. Most people comply with the appeal to use disposable masks, rather than processing disposable mask waste. As a result, a lot of disposable mask waste is thrown away mixed with other waste (Albuquerque et al., 2021). Public non-compliance also increased post-pandemic because of their sense of security, so they ignored calls to wear masks, and even processed disposable mask waste.

b. Influence from the surrounding environment

Indonesian society has high communal relations. Communal relations are high social ties between people, giving rise to a sense of similarity towards each other in their respective environments (Gultom, 2014; Izzudin, 2019).

Table 4. Interpretation of Community Understanding of Disposable Mask Waste Processing

Statement	Index%	Interpretation
You understand how to manage disposable mask waste as determined by the Ministry of the Environment	71%	Fairly understood
You have the desire to manage disposable mask waste under recommendations from the Ministry of the Environment	84%	Very willing
There are perceived obstacles that prevent the management of disposable mask waste under the recommendations of the Ministry of the Environment	58%	A few mild obstacles

Table 5. Interpretation of Respondents Regarding the Use of Disposable Masks, and Processing of Disposable Mask Waste at Each Stage

Statement	Pandemic		Post Pandemic	
	Index%	Interpretation	Index%	Interpretation
You wear a disposable mask when doing activities outside the home	88%	Always	79%	Always
The mask is worn for approximately 4 hours	52%	Often	47%	Seldom
Disposable mask waste is destroyed first before you throw it	71%	Often	68%	Often
Disposable mask waste is disposed of in special trash bins provided at home	62%	Often	59%	Often
Disposable mask waste is processed by burning it	45%	Often	42%	Seldom

Table 6. Community Interpretation of Disposable Mask Waste Processing

Statement	Pandemic		Post Pandemic	
	Percentage	Interpretation	Percentage	Interpretation
Mask waste is destroyed first (cut or torn) before being thrown away	71%	Often	68%	Often
Disposable mask waste is disposed of in a special trash bin provided at home	62%	Often	59%	Often
Disposable mask waste is processed by burning	45%	Seldom	42%	Seldom

Therefore, the surrounding environment can have a direct or indirect influence on people's behavior (Ardanu & Riganti, 2023).

One form of influence is a person's tendency to follow behavior that is more dominant in the surrounding environment. So, it can be said that behavior that is more dominant in the surrounding environment is one of the factors for someone to process their mask waste. If the behavior of processing disposable mask waste is more dominant in the local environment, there will be a tendency for people to follow this behavior. On the other hand, if the dominant behavior is not processing disposable mask waste, then the tendency not to process disposable mask waste will be higher.

c. The influence of gender, education, and income

Community compliance with processing disposable mask waste is also influenced by gender, education level and income of each individual in the community. Women tend to comply more with advice regarding waste processing for disposable masks compared to men (Handayani et al., 2022). Likewise, highly educated people are more obedient compared to people with low education.

Communities with higher incomes also have higher levels of compliance compared to communities with lower incomes (Handayani et al, 2022). This is because people with higher income levels have wider access to everything needed to comply with government directives to wear masks and process disposable mask waste. Apart from that, access to learning how to process mask waste properly and correctly also has a higher possibility in communities with higher income levels.

d. Government outreach

Socialization from the government is needed so that the public can better understand how to process disposable mask waste properly. The form of socialization needs to be adapted to the environment where the socialization is held, so that the information being socialized can be conveyed and well received by the community (Akbar et al, 2021). Several ways that can be done as a form of outreach to the community are by holding outreach, training, and providing facilities that can support the processing of disposable mask waste (Munfiah et al, 2023).

3.6. How to Process Disposable Mask Waste

The large number of disposable masks used by the public means that the amount of disposable mask waste has increased. Therefore, it is more necessary for the public to know how to process disposable mask waste than how to reduce mask use, especially during this pandemic (Bagja et al, 2023). In general, processing of disposable mask waste is carried out in two stages, namely basic level processing and advanced level processing (Amalia et al, 2020). Basic level processing refers to processing carried out on a small scale such as households, while advanced processing refers to processing on a large scale such as that carried out by the government. Processing disposable mask waste on a household scale is carried out in several stages as follows:

1. Disposable mask waste is sorted so that it is not mixed with other household waste. Sorting is carried out at the same time as destroying the disposable mask waste to reduce the potential for irresponsible individuals to re-sell the disposable mask waste.
2. The next stage is containerization and sterilization which can be carried out as follows (Scheinberg et al, 2020):
   a. Waste is collected in rubbish bags which are then closed tightly but still leaving a little air.
   b. Sterilization is carried out by spraying a 0.5% chlorine solution (1% household bleach solution) on the trash bag and the pile of disposable masks before the trash bag is closed. Don't forget to wash your hands after sterilization.
3. The final stage is to label the trash bags so they don't get mixed up when throwing away disposable masks. After that, the trash bag containing disposable mask waste can be handed over to the waste carrier, or burned within a radius that does not disturb the surrounding environment.

4. Conclusion

The processing of disposable mask waste carried out by the people of Surakarta City is by destroying the disposable mask waste before throwing it into a separate trash bin, then burning the waste to reduce the potential for Covid-19 transmission. During the pandemic and post-pandemic, mask waste tends to be processed more often by simply destroying it and throwing it away in a separate place by the community, while processing disposable mask waste by burning it is rarely done. The way to process disposable mask waste is divided into two stages, namely the household stage and the advanced stage in the form of a waste processing institution. In a household environment, processing mask waste is by destroying the mask waste first before throwing it in a separate trash bin from other household waste. Then the waste is handed over to the waste processing party so that it can carry out further processing stages. The public can also burn disposable mask waste if there is no waste processing party to pick up the waste. The next stage of processing is carried out by waste processing parties from both government agencies and the local waste bank community. Processing is carried out by transporting and sorting household waste from disposable mask waste. Disposable mask waste will be separated and burned together with other waste that has the potential for infection. Other types of processing are by autoclave, Mechanical Biological Treatment (MBT), or the incinerator method with temperatures above 800˚C.

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