p–ISSN: 2723 - 6609 e-ISSN: 2745-5254
Vol. 5, No. 5 Mei 2024 http://jist.publikasiindonesia.id/

Health Workers' Attitude Mediates the Relation of Knowledge and Interest in Medical Waste Management Practice

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Keywords: Attitude; Knowledge; Interest; Medical Waste; Waste Management.

ABSTRACT

Medical waste management is essential to the hospital's operational activities. Health workers are needed to manage medical waste in hospitals because they are in direct contact with it. Therefore, the behaviour of health workers plays a vital role in medical waste management. This study determined the relation of knowledge, awareness, interest, and attitude of health workers on medical waste management practices at Sinar Kasih Purwokerto Hospital, Indonesia. In addition, this study also aims to determine the attitude of health workers in mediating the relation of knowledge, awareness, and interest in medical waste management practices at Sinar Kasih Purwokerto Hospital, Indonesia. The sampling method was cluster random sampling with 68 health workers: general practitioners, dentists, specialists, nurses, sanitisers, and public workers (PW). The data collection tool uses a questionnaire tested for reliability and validity to determine the level of knowledge, awareness, interest, attitude, and practice of medical waste management. Data analysis in this study used Partial Least Square (PLS) testing. This study showed that knowledge and interest had no significant positive effect on medical waste management practices. In contrast, awareness and attitude significantly positively impacted medical waste management practices. In addition, the attitude of health workers mediates the effect of knowledge and interest on medical waste management practices. However, attitude does not mediate the impact of awareness on medical waste management practices. The attitude of health workers is a mediator of knowledge and interest toward medical waste management practices.

Introduction

Medical waste management is a matter that has the potential to affect public health and the environment. Waste management efforts are included in environmental protection and management efforts. Based on Article 1 paragraph (2) of Government Regulation of the Republic of Indonesia Number 22 of 2021 concerning Implementation of Environmental Protection and Management, environmental protection and management are a systematic and integrated effort carried out to preserve environmental functions and prevent environmental pollution and damage which includes planning, utilisation, control, maintenance, supervision, and law enforcement (Peraturan et al. 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup, 2021). Waste management aims to reduce or eliminate the risks posed by waste (Kurniawan & Nawawi, 2020). Therefore, managing medical waste to preserve environmental functions is very important.

Sinar Kasih Purwokerto Hospital, Indonesia, generates medical waste in operational activities. Medical waste generated daily will be transported and stored in temporary shelters before being transported and processed by a third party collaborating with Sinar Kasih Purwokerto Hospital. The average medical waste generated at Sinar Kasih Purwokerto Hospital in 2021 is 740 kg/month or about 25 kg/day. However, in July and August 2021, there was a surge in waste of 1 ton/month due to an increase in COVID-19 patients at this hospital. This surge in medical waste makes the Class D Hospital, which only has 54 beds, close to the average medical waste production at the Class B Hospital, namely Haji Medan Hospital, which has 250 beds and produces 1,165 kg/month of waste (Huda, 2019).

The medical waste produced at Sinar Kasih Purwokerto Hospital requires good waste management so as not to endanger public and environmental health. Waste management officers cannot be separated from health workers such as doctors, nurses, sanitarians, and public workers (PW). Therefore, health workers' behaviour in waste management is the key to implementing medical waste management.

Behaviour is formed through a process and occurs in interaction with the environment. Internal factors influencing behaviour can be knowledge, awareness, interests, and so on (Syakir, 2018). These internal factors can be a stimulus that affects a person's reaction. Reactions can be closed reactions (attitudes) and open reactions (practices) (Hidana, Shaputra, & Maryati, 2018). Attitude is an intervening variable between the observed stimulus and the observed response. If someone already knows the stimulus and assesses what is known, that person can practice what he or she knows and responds to (Hussein, 2015). If the acceptance of behaviour is based on knowledge, interest, and awareness of a positive attitude, then the behaviour will last long (Rangkuti, Tarigan, & Amelia, 2023).

Previous research stated that health workers' knowledge of waste management is significantly related to infectious waste disposal practices (Pitaksanurat, Junggoth, & Setiyadi, 2020). Another study stated that knowledge did not have a significant relationship with waste management; only attitude and practice variables had a

significant relationship (Merdeka, Tosepu, & Salma, 2021). Then, another study stated that health workers' awareness at the National Referral Hospital in Bhutan affected medical waste management (Letho et al., 2021). However, other studies have stated the opposite: awareness does not affect the practice of reuse and waste disposal. Awareness only affects waste separation, reduction, and recycling practices (Bautista, 2019). Previous research on interest states that interest has an essential relationship with waste recycling programs (Xu, Zhou, Cao, & Luo, 2016). Furthermore, research on attitudes as mediators states that attitudes to sustainable development mediate the total relationship between knowledge about sustainable development and behaviour towards sustainable development. Meanwhile, specific research on attitude as a mediator in medical waste management behaviour has not been carried out, so it is a novelty in this research.

Based on the above, it is necessary to conduct research related to the effect of knowledge, awareness, and interest on medical waste management practices. Therefore, this study aims to determine the impact of knowledge, awareness, and interest of health workers on medical waste management practices. In addition, this study also aims to determine the impact of the attitude of health workers in mediating knowledge, awareness, and interest in medical waste management practices.

This study uses a survey method with a cross-sectional approach, in which data concerning the independent variable and the dependent variable are collected at the same time. The independent variables were health workers' knowledge, awareness, and interest. The intervening variable in this study is health workers' attitudes. The dependent variable is medical waste management practices.

This research was conducted at Sinar Kasih Purwokerto Hospital, Banyumas Regency, Central Java, Indonesia, from the end of August 2021 until the end of March 2022. Respondents in this research are health workers who play a role in medical waste management, namely general practitioners, dentists, specialists, nurses (one), and sanitation workers. The determination of the number of respondents based on the Slovinthe formula is as follows: equalsfoll$= \frac{\mathrm{N}}{1+\mathrm{N}()^2} = \frac{82}{+82(0{,}05)^2} = 68{,}05 = 68$

Inform.:
n = number of samples
N = number of population
e = fault-tolerance limit
Based on the above calculation, the total number of respondents is 68. Sampling was done using the cluster random sampling technique.

Table 1
Questionnaire indicator

Knowledge	
Code	Indicator
K1	Medical waste management concept
K2	Knowledge of medical waste segregation
K3	Knowledge of medical waste transport
K4	Knowledge of medical waste storage
K5	Medical waste treatment
Awareness	
Code	Indicator
Aw1	Awareness of role in medical waste management
Aw2	Awareness of medical waste segregation
Aw3	Awareness of handling medical waste
Aw4	Awareness of the impact of medical waste
Interest	
Code	Indicator
I1	Interest in the concept of medical waste management
I2	Interest in participating in medical waste management
I3	Interest in medical waste segregation
I4	Interest in disposing of medical waste
Attitude	
Code	Indicator
At1	The role of health workers in medical waste management
At2	Medical waste segregation
At3	Handling of medical waste
Practice	
Code	Indicator
P1	Handling practice of medical waste
P2	Medical waste segregation

They are collecting data using survey techniques with questionnaire instruments given to respondents and observation sheets to determine the actions of health workers in managing medical waste and scoring variables using a Likert scale of 1-5. Furthermore, the assessment of variables is divided into three categories as follows: good (76-100), adequate (56-75), and poor (≤ 56). The indicators of the research questionnaire can be seen in Table 1.

Data analysis uses Partial Least Square (PLS) testing through the analysis stages of the outer model, inner model, and hypothesis testing (Tabelessy & Pattiruhu, 2022). PLS data analysis using WarpPLS software version 8.0. The outer model analysis consists of reliability and validity testing. The variable is declared good reliability if the composite reliability and Cronbach's alpha values are> 0.7 (Alfa et al., 2017). A good validity value is the loading indicator value > 0.7.

The inner model analysis ensures that the structural model built is robust and accurate. The inner model analysis determines the coefficient of determination (R-squared), predictive relevance (Q-squared), and effect sizes. If the coefficient of determination is higher, the higher the independent variable affects changes in the dependent variable. Furthermore, the value of Q-squared > 0 means the model has a predictive relevance value, while the Q-squared value < 0 means the model lacks predictive relevance. Then, to measure the effect of mediation using the effect size f-squared. The f-squared value can be interpreted as follows: 0.02 (weak), 0.15 (medium), and 0.35 (large).

Hypothesis testing uses path analysis on the model being tested. Correlation between constructs is measured through path coefficients obtained from the coefficient's value and the level of significance seen through the p-value. Path coefficients indicate the direction of positive or negative influence in the independent variable on the dependent. At the same time, the significance value shows whether or not the probability value of the influence of the independent variable is significant on the dependent (Rahayu, Bawono, & Sudibyo, 2020).

The hypothesis in this study is as follows:

1. Health workers' knowledge, awareness, interests, and attitudes significantly positively affect medical waste management practices at Sinar Kasih Purwokerto Hospital.
2. Health workers' attitudes mediate the effect of knowledge, awareness, and interest in medical waste management practices at Sinar Kasih Purwokerto Hospital.

Research Methods

This research method employs a cross-sectional survey design with a cross-sectoral approach to collect data on independent variables (knowledge, awareness, interest, attitude) and the dependent variable (medical waste management practices) simultaneously. The study uses cluster random sampling to select participants from various Sinar Kasih Purwokerto Hospital departments. Data are gathered through structured questionnaires and observation sheets and then analysed using Partial Least Square (PLS) analysis for Structural Equation Modeling (SEM). The analysis includes testing the reliability and validity of the questionnaire and hypothesis testing using path analysis to examine direct and indirect effects and the mediation effect of attitude on the relationship between knowledge, awareness, interest, and medical waste management practices.

Results and Discussion

Findings

Medical waste production at Sinar Kasih Purwokerto Hospital from April 2021 to March 2022 was 7,290.34 kg. The adequate monthly waste production is 607.53 kg or 20.25 kg per day. In Figure 1, the highest production of medical waste was in July 2021. This was due to a large amount of COVID-19 waste due to a surge in COVID-19 cases

in Indonesia in mid-2021. This large amount of medical waste requires special handling from health workers so that medical waste does not endanger the environment or public health.

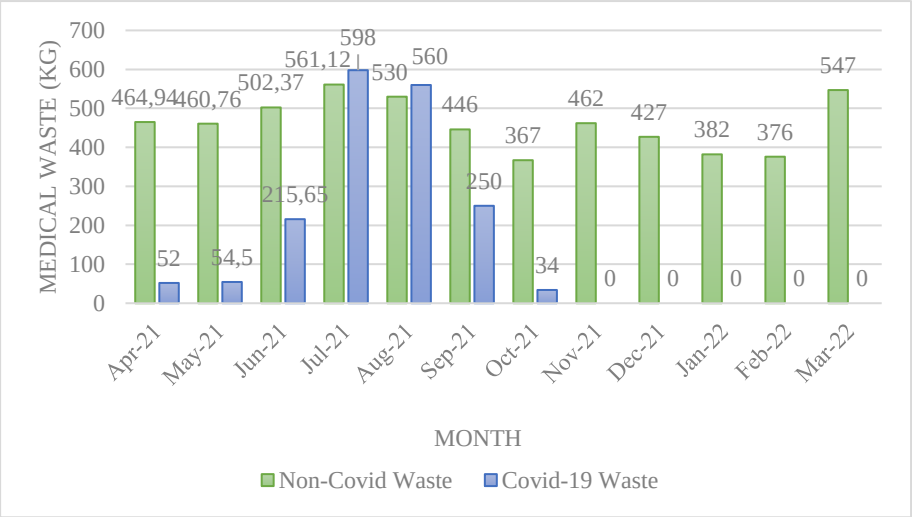

Figure 1 Production of Medical Waste at Sinar Kasih Purwokerto Hospital

In this study, 68 health workers acted as respondents. The distribution of respondents can be seen in Table 2. Based on the questionnaires distributed to respondents and the results of observations of respondents, the level of knowledge, awareness, interests, attitudes, and practices of respondents towards medical waste management is shown in Table 3. Table 3 shows that the level of knowledge, awareness, interest, attitude, and practice in managing medical waste in general practitioners, dentists, and sanitarians are included in the excellent category. Then, the specialist doctors have good knowledge, awareness, attitude, and medical management practices but have an adequate level of interest in managing medical waste. Meanwhile, nurses and PW have adequate knowledge, awareness, interests, attitudes, and practices to manage medical waste.

Table 2
Distribution of Respondents

Profession	Number of Respondents	Percentage (%)
General Practitioner	5	7.35
Dentist	2	2.94
Specialist	4	5.88
Nurse	53	77.94
Sanitarian	1	1.47
Public Worker (PW)	3	4.41
Total	68	100

Table 3
Level of Knowledge, Awareness, Interests, Attitudes, and Medical Waste Management Practices

Profession	Knowledge	Awareness	Interest	Attitude	Practice
General Practitioner	86.4 (Good)	86 (Good)	78 (Good)	80 (Good)	86 (Good)
Dentist	98 (Good)	87.5 (Good)	85 (Good)	90 (Good)	80 (Good)
Specialist	83 (Good)	80 (Good)	75 (Good)	80 (Good)	80 (Good)
Nurse	68.38 (Adequate)	68.96 (Adequate)	68.11 (Adequate)	71.32 (Adequate)	71.32 (Adequate)
Sanitarian	80 (Good)	80 (Good)	80 (Good)	93.33 (Good)	90 (Good)
Public Workers (PW)	65 (Adequate)	63.33 (Adequate)	63.33 (Adequate)	66.67 (Adequate)	70 (Adequate)

In the analysis using Partial Least Square (PLS), the value of composite reliability and Cronbach's alpha was more significant than 0.7 for all variables, so all variables were declared reliable (Table 4).

Table 4
Reliability Test Results

Variable	Composite Reliability	Cronbach's Alpha	Inform.
Knowledge	0.962	0.951	Reliable
Awareness	0.943	0.919	Reliable
Interest	0.934	0.905	Reliable
Attitude	0.937	0.899	Reliable
Practice	0.947	0.888	Reliable

Furthermore, the validity test shows in Table 5 that the loading indicator value is more significant than 0.7, so it has good convergent validity. Then, in the cross-loading indicator approach, Table 6 shows that the value of the cross-loading indicator in the intended construct is more significant than that in other constructs, so it is declared to have good discriminant validity.

Table 5
Loading Indicator Results

Indicator	Knowledge	Awareness	Interest	Attitude	Practice
K1	(0.864)	-0.388	-0.132	-0.308	0.515
K2	(0.923)	0.304	-0.341	0.120	-0.003
K3	(0.938)	0.642	-0.327	0.478	-0.483

K4	(0.924)	-0.604	0.548	-0.161	0.206
K5	(0.921)	0.011	0.249	-0.156	-0.194
Aw1	0.205	(0.891)	-0.431	-0.349	1.028
Aw2	0.221	(0.922)	-0.044	0.144	-0.191
Aw3	-0.104	(0.912)	-0.185	0.716	-0.893
Aw4	-0.339	(0.861)	0.689	-0.551	0.086
I1	0.345	-0.394	(0.867)	-0.407	0.781
I2	0.384	-0.690	(0.900)	-0.284	0.183
I3	-0.231	0.245	(0.899)	0.748	-0.551
I4	-0.506	0.859	(0.864)	-0.075	-0.400
At1	-0.011	0.041	0.013	(0.899)	0.260
At2	-0.034	0.207	0.067	(0.911)	-0.326
At3	0.045	-0.243	-0.078	(0.927)	0.068
P1	-0.100	-0.110	-0.049	-0.100	(0.948)
P2	0.100	0.110	0.049	0.100	(0.948)

Table 6
Cross-Loading Indicator Results

Indicator	Knowledge	Awareness	Interest	Attitude	Practice
K1	(0.864)	0.748	0.687	0.747	0.733
K2	(0.923)	0.836	0.757	0.821	0.813
K3	(0.938)	0.876	0.793	0.856	0.817
K4	(0.924)	0.828	0.829	0.832	0.816
K5	(0.921)	0.826	0.780	0.800	0.774
Aw1	0.820	(0.891)	0.785	0.809	0.867
Aw2	0.867	(0.922)	0.848	0.841	0.852
Aw3	0.836	(0.912)	0.833	0.829	0.807
Aw4	0.702	(0.861)	0.836	0.712	0.776
I1	0.783	0.825	(0.867)	0.791	0.823
I2	0.752	0.799	(0.900)	0.768	0.768
I3	0.770	0.824	(0.899)	0.831	0.807
I4	0.667	0.802	(0.864)	0.704	0.736
At1	0.804	0.828	0.818	(0.899)	0.848
At2	0.817	0.817	0.807	(0.911)	0.831
At3	0.809	0.794	0.776	(0.927)	0.839
P1	0.791	0.852	0.819	0.858	(0.948)
P2	0.850	0.894	0.865	0.886	(0.948)

Furthermore, the analysis of the inner model can be seen from the value of the coefficient of determination (R-squared) and the predictive relevance value (Q-squared). The R-squared value for the attitude variable is 0.858, which means that the knowledge, awareness, and interest variables can explain the attitude variable by 85.8%. Then, the value of the R-squared for the practice variable is 0.992, which means that the knowledge, awareness, interest, and attitude variables can explain the action variable by

99.2%. The R-squared value obtained is more than 0.75, so it has an extreme interpretation. The Q-squared value of the attitude variable is 0.856, and the practice variable is 0.899. The two Q-squared values obtained are more significant than 0, so the model has predictive relevance. Then, in testing the mediation effect, the results obtained successively on the variables of knowledge, awareness, and interest in medical waste management practices of 0.142, 0.115, and 0.142. The effect size is more than 0.02 and less than 0.15, which is still included in the weak category.

In testing the hypothesis, the results of testing the direct effect and indirect effect are shown in Figure 2.

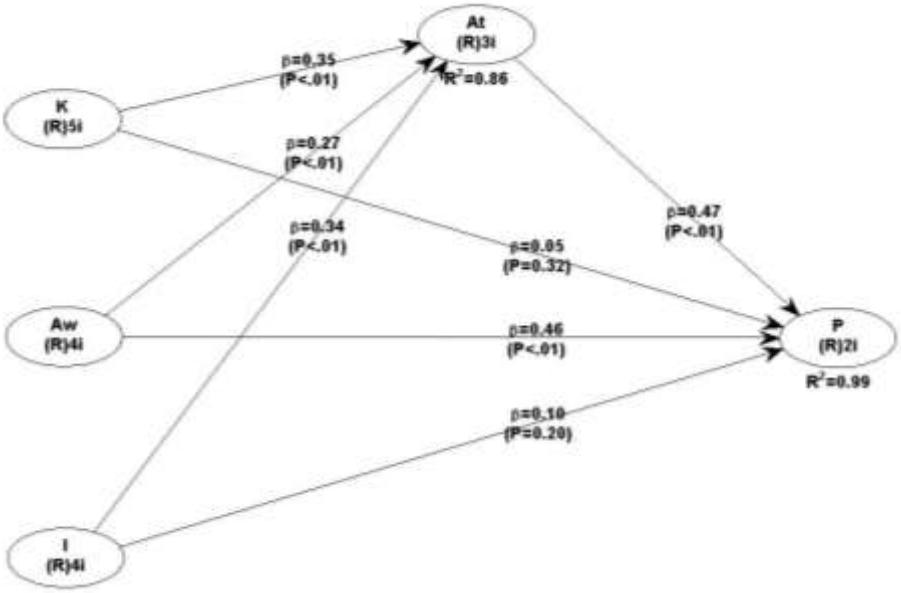

Figure 2 Research Model using WarpPLS 8.0

From Figure 2, the following results are obtained:

1. The knowledge and interest variables have a positive but insignificant direct effect on the medical waste management practices variable.
2. Knowledge and interest variables have a positive and not significant indirect effect on medical waste management practices through attitude variables.
3. Knowledge and interest variables have a positive and not significant indirect effect on medical waste management practices through attitude variables.
4. The awareness variable positively and indirectly affects medical waste management practices through attitude variables.

Based on the above results, the attitude variable mediates the effect of knowledge and interest on medical waste management practices. However, it does not mediate the effect of awareness on medical waste management practices.

Medical waste at Sinar Kasih Purwokerto Hospital consists of infectious and non-infectious waste. Infectious waste includes syringes, infusion sets, unused human tissue,

surgical masks, and others. Meanwhile, non-infectious waste includes injection wrappers, plaster wrappers, and others. Infectious waste is in a yellow trash bin, while non-infectious waste is in a green trash bin. Sharp objects such as syringes are put into the safety box. All types of trash bins are always provided in each treatment room.

Medical waste produced by medical personnel from clinical activities is transported by PW twice a day from the treatment room and operating room to a temporary storage area using a wheeled bin or closed and wheeled garbage transportation according to the provisions of Minister of Health Regulation No. 18 of 2020 concerning Management of Medical Waste for Health Service Facilities [21]. Furthermore, the waste will be transported by transporter to a medical waste treatment facility that has a permit and has collaborated with the hospital.

In carrying out this medical waste management, the knowledge, awareness, interests, attitudes, and practices of good health workers are needed to carry out waste management correctly. Based on the research results, nurses and PW were included in the adequate category for each research variable. Therefore, proper medical waste management training for health workers, especially nurses and PW, is essential.

In testing the direct effect using PLS, the results obtained are similar to the research by (Merdeka et al., 2021), which states that knowledge does not have a significant relationship with medical waste management practices. Awareness has a significant positive effect, according to research by Lalamonan Comighud (2020), which states that the level of awareness can affect the extent to which waste management practices are implemented. Good awareness can result in good medical waste management practices as well. Furthermore, from this study, interest is directly proportional to practice, but interest is not strong enough to significantly influence practice. Then, the attitude variable obtained a significant positive effect, indicating that attitude is a supporting factor for implementing medical waste management practices.

After testing the direct effect, the next step is testing the indirect effect. The indirect effect test determines whether other variables can affect the relationship between the stimulus and the response. In this study, the mediation effect was used. Mediation effects can be divided into full, partial, and no-mediation. Complete mediation is shown through cases where the direct effect is insignificant, but when it is through a mediator in the indirect effect test, significant results are obtained. Then partial mediation is stated when the direct or indirect effects show significant results. Meanwhile, no mediation means that no mediating effect occurs. The no-mediation model is a model that only has a direct effect.

Based on the indirect effect analysis, it is found that attitude is a mediator for the variables of knowledge and interest in medical waste management practices. The mediating effect produced through the attitude variable is a complete mediation, which means that knowledge and interest variables cannot affect the action variable positively and significantly without the attitude. While on the variable of awareness of action, attitude does not act as a mediator. This is indicated by the p-value that exceeds the

significance level (> 0.05) so that the awareness variable can only affect the action variable directly (no mediation).

This study shows results by Wawan & Dewi's (2014) statement that attitude is an intervening variable between the observed stimulus and the observed response. In this case, the observed stimulus is knowledge and interest, while the observed response is medical waste management practices. Meanwhile, awareness does not require intervening variables to influence medical waste management practices.

Conclusion

Based on this research, it can be concluded that the attitude of health workers mediates the effect of knowledge and interest on medical waste management practices. Meanwhile, attitude does not mediate the effect of awareness of health workers on medical waste management practices. Seeing the importance of attitude as a mediator in medical waste management behaviour, it is necessary to improve the attitude toward medical waste management to health workers through training organised by hospitals and other health service facilities to practice excellent and correct medical waste management.

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