
Correlation Between Radiographer's Level of Knowledge About COVID-19 with Its Preventive Behavior in Dental Radiography Examination, 2022

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ABSTRACT:

Background: Health Care Associated Infections (HAIs) including COVID-19 are an ongoing challenge to the safety of patients and health workers as well as the quality of health services that require attention and ongoing efforts to prevent the risk of transmission. Radiographers who perform dental radiographic examinations are at high risk of spreading COVID-19 because of the examination requires close contact with patients and the risk of spreading droplets or aerosols. This research was conducted with the aim of studying and analyzing the relationship between the radiographer's level of knowledge about COVID-19 and the preventive behavior of its transmission in dental radiographic examinations.

Methods: The research was conducted by collecting data using an online questionnaire via Google Forms that distributed to 99 radiographers in East Java. Data analysis was carried out using Spearman's Rank Correlation to find out the correlation between radiographers' level of knowledge about COVID-19 and preventive behavior towards its transmission in dental radiographic examinations.

Results: Radiographers' level of knowledge about COVID-19 showed 54% good, 42% moderate, and 4% less. Radiographers' preventive behavior towards the transmission of COVID-19 in dental radiology installations showed 67% good, 30% moderate, and 3% less. Spearman's Rank Correlation showed weak correlation between the level of knowledge and preventive behavior with the value of sig. (2-tailed) was 0,032 and correlation coefficient was 0,215(+).

Conclusions: The level of knowledge of radiographers in East Java about COVID-19 has significant correlation with the preventive behavior of its transmission in dental radiographic examinations with a very weak strength and unidirectional correlation.

KEYWORD: Knowledge, Behavior, Radiographer, COVID-19

1 INTRODUCTION

The COVID-19 pandemic has showed the importance of infection prevention and control measures in healthcare. Health Care Associated Infections (HAIs) including COVID-19 caused by the SARS-CoV-2 virus are an ongoing challenge to the safety of patients and health workers as well as the quality of health services that require attention and continuous efforts to prevent the risk of transmission. SARS-CoV-2 is spread mostly from human to human through droplet transmission in the respiratory system, which occurs when a person is in close proximity to another person who is coughing or sneezing. Transmission can occur when infective droplets come into contact with mucosal surfaces such as the eyes, nose and mouth of the host and also through fomites [6].

Lapor Covid-19 showed that around 2,087 health workers in Indonesia have died while facing the COVID-19 pandemic as of 9 May 2023 [5]. Radiographers as health workers are not free from the risk of contracting the spread of COVID-19 infection. Radiographers in dentistry radiology are at high risk of spreading COVID-19 because of the examination process which requires close contact with the patient and the risk of spreading droplets or aerosols during dental radiographic examinations which require contact with the patient's mouth when placing the film. Prevention of the spread of COVID-19 is urgently needed because of its fast and wide spread and the high risk of transmitting COVID-19 to radiographers with various efforts such as maintaining distance, controlling infection on environmental surfaces in radiology installations, using personal protective equipment (PPE), and others [3].

The preventive behavior that has been described is expected to become a health behavior that is applied to the radiology installation as a whole. Lawrence W. Green explained that there are three determinants of a person's behavior including predisposing factors, supporting factors, and driving factors. Predisposing factors consist of knowledge, attitudes, beliefs, social, cultural, and socio-demographic norms. Enabling factors consist of health facilities and infrastructure. Reinforcing factors consists of family and other supports. Knowledge as a predisposing factor becomes the basis for the formation of existing behavior. Radiographers need to have adequate knowledge about COVID-19 and practice appropriate transmission precautions to carry out radiological examinations during the COVID-19 pandemic effectively [4].

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This study aims to examine and analyze the relationship between radiographers' level of knowledge about COVID-19 and preventive behavior of its transmission in dental radiographic examinations which are expected to encourage prevention practices and reduce the risk of transmission of COVID-19 in dental radiology.

2 METHODS

2.1 Study Design and Sample

The method used in this study is an analytic observational study with a cross sectional approach. This research was conducted on 99 radiographers spread across several hospitals in East Java. The minimum sample size is 95 samples calculated using the Slovin formula which can represent the entire population with predetermined inclusion and exclusion criteria. The inclusion criteria included providing dental radiographic examination services, actively working during a pandemic, and being willing to be research respondents. The exclusion criteria were respondents who resigned during the study for certain reasons (retirement, transfer of work areas outside East Java, or death). Sampling was done by simple random sampling method because members of the population who meet the exclusion and inclusion criteria are considered homogeneous.

2.2 Data Collection

The ethic approval for conducting research was obtained from the Ethical Committee of Medical Research of the Faculty of Dentistry, University of Jember. Permission was submitted to management of East Java PARI prior to conducting research. a questionnaire is used to measure the level of knowledge about COVID-19 and preventive behavior towards its spread. This study used a structured digital questionnaire (Google Forms) because it is effective in reaching large areas, efficient and economical in its use. Part one is a knowledge questionnaire consisting of 12 questions regarding the radiographer's level of knowledge regarding the definition, etiology, transmission, symptoms, and procedures for preventing the spread of COVID-19 by selecting one of the multiple choices with the correct choice getting 1 point and the wrong one getting 0 points. The total score of the respondents' answers will be categorized as follows, good (9-12), sufficient (5-8), and low (<5). Part two is behavior questionnaire consisting of 15 positive statements related to the frequency of infection control procedures, the frequency of using PPE, and the

Table 1. respondents' frequency distribution by region

City/Regency	Frequency
Jember	16
Malang	15
Pasuruan	4
Sidoarjo	16
Lamongan	3
Probolinggo	3
Surabaya	19
Banyuwangi	4
Lumajang	5
Kediri	2
Bangkalan	1
Ngawi	2
Jombang	2
Blitar	1
Tulungagung	1
Madiun	1
Mojokerto	3
Trenggalek	1
Total	99

frequency of using disinfectants in dental radiographic examinations by selecting one of the options: always (3), often (2), rarely (1), and never (0). The total value of the respondents' answers will be categorized as follows, good (35-45), sufficient (25-34), and low (<35).

2.3 Statistical Analysis

Data analysis used non-parametric test, Spearman Rank Correlation to determine the correlation between the radiographer's level of knowledge about COVID-19 and preventive behavior towards its transmission in dental radiographic examinations. Data was entered and analyzed using SPSS version 25.0 with P value set at 0.05.

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3 RESULTS

The results of this study of 99 radiographers in East Java had characteristics based on gender with almost the same distribution, specifically 50 respondents were male (50.5%) and 49 respondents were female (49.5%).

Table 2. The correlation between level of knowledge dan preventive behavior

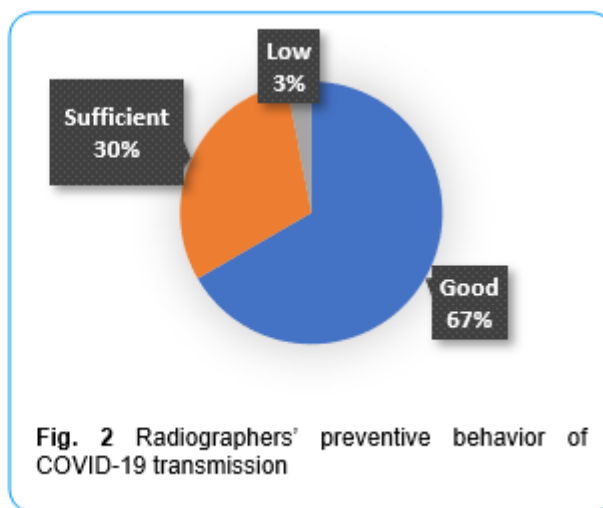
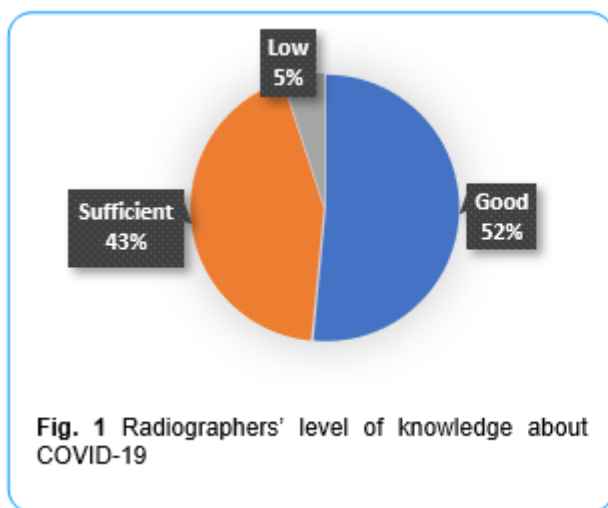
Level of knowledge	Correlation Coefficient	Preventive behavior
		0,215
	Sig. (2-tailed)	0,032

Respondents in this study were active members of the East Java PARI spread across several cities/regencies. The frequency distribution of respondents by region with the highest frequency was Surabaya with 19 respondents and the least frequency was Bangkalan, Blitar, Tulungagung, Madiun and Trenggalek with one respondent (Table 1).

Of the 99 respondents, 53 respondents (54%) had good knowledge of COVID-19, 42 respondents (42%) had sufficient knowledge of COVID-19, and 4 respondents (4%) had low knowledge of COVID-19 (Fig. 1).

Of the 99 respondents, 66 respondents (67%) had good preventive behavior against COVID-19 transmission in dental radiology installations, 30 respondents (30%) had sufficient preventive behavior against COVID-19, and 3 respondents (3%) had low preventive behavior against COVID-19 (Fig. 2).

The correlation between the level of knowledge of radiographers in East Java about COVID-19 and preventive behavior against its transmission in dental radiographic examinations was measured using the Spearman's Rank Correlation. This test is used to measure the level of relationship between two ordinal scale variables. Significance value or Sig. (2-tailed) was 0.032. This value is less than 0.05, so it can be concluded that there is a significant correlation between the level of knowledge of radiographers in East Java about COVID-19 and preventive behavior against its transmission in dental radiographic examinations. The correlation coefficient was 0.215* and has a positive value so that it can be concluded that the correlation strength between the two variables is included in the weak category and is unidirectional, which means that if the respondent's level of knowledge about COVID-19 increases, the respondent's preventive behavior against transmission of COVID-19 at dental radiology installations also increases (Table 2).



4. DISCUSSION

Fig. 1 shows that the level of knowledge of respondents about COVID-19 as much as 54% is good, 42% of respondents have a sufficient level of knowledge and 4% of respondents have a low level of knowledge. The results of this study are in accordance with Arif's research which shows that most health workers know good knowledge, namely 103 health workers (81.1%), 24 health workers (18.9%) have moderate knowledge, and there are no health workers (0%) who have less knowledge [2].

The results of this study are slightly different from the results of Thahir's research and Ridzky's research. Thahir's research showed that the level of knowledge of radiographers regarding infection control during the COVID-19 pandemic found that 5 radiographers (11.12%) had good knowledge, 32 radiographers (71.11%) had sufficient knowledge and 8 radiographers (17.77%) had insufficient knowledge [15]. Ridzky's research shows that the level of knowledge of radiographers is in the good category of 17 respondents (94%) and in the poor category of 1 respondent (6%) [12]. The difference in these results is due to several differences such as sample size, inclusion and exclusion criteria, demographic characteristics of the respondents, and the specific objectives of each study, but

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in general it can be said that the majority of all respondents have a fairly good level of knowledge with a few respondents who have a low level of knowledge.

The level of knowledge is influenced by several factors. Notoatmodjo explains the factors that influence a person's knowledge include the level of education, information, economy, social relations and experience [8]. Respondents who have a good level of knowledge can be based on a good educational background, that is, at least they have taken D-3 (Associate's degree) Radiology education. This level of education will provide a strong foundation of knowledge in the field of radiology and health in general, including how to prevent various risks that can occur while working in radiology installations, one of which is knowledge about the risks of infectious diseases in health facilities.

Radiographers have access to extensive information about COVID-19 through social media, news, and the internet. This is of course reinforced by information about COVID-19 being heavily reported and spread on the internet during the COVID-19 pandemic. Radiographers can access social media managed by WHO and the Ministry of Health as well as accounts that are active in providing updates and information regarding COVID-19.

Radiographers' social relations can be strengthened as members of PARI which is a radiographer professional organization that actively carries out joint social activities. PARI provides access to various sources of information related to COVID-19 that are relevant to the field of radiology by frequently holding social and educational activities, including webinars and seminars on COVID-19. Radiographers can get the latest information on prevention protocols, safe radiographic practices, and the latest developments in radiology related to COVID-19 through PARI.

The experience factor also influences the radiographer's knowledge. Work experience in radiology can provide a deeper understanding of the potential risk of transmission and the precautions that need to be taken. Radiographers who have worked for a long time or have experience dealing with emergency situations or previous outbreaks will have the advantage of knowledge and a better understanding of COVID-19. A person's personal experience can also influence their knowledge and awareness about COVID-19. If the radiographer or a member of their family has experienced or been exposed to COVID-19, this experience can increase their understanding of the risks and precautions that need to be taken.

Fig. 2 shows that the majority of respondents' preventive behavior towards transmission of COVID-19 in dental radiology installations was in the good category with 66 respondents (67%), 30 respondents (30%) in the sufficient category, and 3 respondents (3%) in the low category. The results of this study are in accordance with Arif's research (2021) with 108 health workers (85%) having good behavior, 19 health workers (15%) having moderate behavior, and no health workers (0%) having poor behavior which shows that most respondents have good behavior and very few have poor behavior.

Another study that measured the preventive behavior of radiographers in preventing the transmission of COVID-19 in radiology installations showed slightly different results. The results of Thahir's research show radiographers' behavior regarding infection control during the COVID-19 pandemic at radiology installations in Medan City are 23 radiographers (51.11%) had positive behavior and 22 radiographers had negative behavior (48.89%) [15]. The results of Ridzky's research show that the behavior level of the appropriate category is 15 respondents (83.3%) and the inappropriate category is 3 respondents (16.7%) [12]. The results of these two studies provide a different result from research on radiographer behavior because each study uses different measurements, but it can be seen that both studies show that there is a preventive behavior that tends to be good for the transmission of COVID-19 in radiology installations.

There are two factors that determine a behavior according to Notoatmodjo and Irwan, internal factors and external factors. Internal determinants or factors are the characteristics of the individual concerned, which are innate, for example: intelligence level, emotional level, and so on [4,9]. A better level of intelligence will make it easier for respondents to understand information about COVID-19 and the importance of preventive behavior towards it. A stable emotional level will improve work performance and be able to adopt preventive behavior for COVID-19 in a disciplined and consistent manner. The ability to manage emotions well will have a positive impact on the ability to focus, improve quality in the work environment, good relationships, and adapt to change.

External determinants or factors are influences from the environment or outside the individual concerned, both the physical environment, social, economic, political, and so on [4,9]. Environmental factors including the availability of resources and surrounding support have a significant impact on individual behavior and health [18]. Physical environmental factors that support dentistry radiology installations such as the availability of adequate PPE which will help radiographers protect themselves and patients from transmission of COVID-19. Spatial planning in medical radiology installations is properly regulated to create a safe physical distancing environment between patients and medical personnel and the use of protective screens will help promote preventive behavior against COVID-19. The radiology examination room, which provides distance and separation to prevent radiographers from excessive radiation exposure, will further assist in preventing the transmission of COVID-19. Placement of social distancing reminder signs, adequate air circulation, and a safe medical waste handling system are also important for this preventive behavior.

Social influence from colleagues or family that supports preventive behavior will motivate the radiographer's preventive behavior. This is achieved through adequate training, effective peer-to-peer communication, and social activities implemented by PARI. The

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economic factor influencing preventive behavior is the availability of necessary resources such as budgets for PPE, disinfection materials and other preventive facilities. Political factors also play an important role by providing regulations and regulations that encourage preventive behavior for COVID-19, especially in health facilities.

There are three determinants of health behavior, predisposing factors, enabling factors, and reinforcing factors according to Lawrence W. Green [4]. Predisposing factors are factors that facilitate the occurrence of a person's behavior. The factors included are knowledge, information, attitudes, and perceptions. Good knowledge about COVID-19 will encourage radiographers to carry out good preventive behavior. A good understanding of the risks and benefits of certain behaviors can influence intentions and decisions to adopt a behavior [13]. This knowledge will determine the attitudes and beliefs of radiographers towards COVID-19 which will then be manifested in their preventive behavior in dental radiology examination services. High perceptions of the threat level of COVID-19 which can affect the quality of service and the health of radiographers and patients will be the basis for good preventive behavior.

Enabling factors are factors that facilitate a behavior. Factors included in the supporting factors are the availability of health services, accessibility and ease of health services both in terms of distance and cost and social, the existence of regulations and community commitment in supporting certain behaviors. This is in accordance with the external factors that have been described previously. The availability of budgets for the procurement of PPE and disinfection materials, operational standards that apply in health facilities in dealing with COVID-19, as well as policies issued by the government will encourage radiographers to apply appropriate preventive behavior.

Reinforcing factors are factors that encourage or strengthen the occurrence of a behavior. These factors manifest in the attitude and behavior of health workers or other officers who are a reference group for community behavior. The group of driving factors includes opinion, social support, peer influence, criticism from colleagues or the environment and even suggestions and feedback from health workers. Social influence plays an important role in shaping individual behavior, because people are often influenced by the actions and opinions of others in their social environment [14]. Moral support and support from people around them will motivate radiographers to carry out preventive behavior for COVID-19 consistently. Training and education carried out by health facilities and related organizations also encourage existing behaviors. PARI has held seminars related to COVID-19 such as the Webinar on Prevention of Infection Control and Mitigation of Covid Variant Delta for Health Workers as well as several other supporting activities including activities carried out regionally that encourage preventive behavior of COVID-19 [11].

Table 2 shows the significance value or Sig. (2-tailed) (p value) of 0.032. The significance value (p value) is less than 0.05 so it can be concluded that there is a significant relationship between the knowledge level of radiographers in East Java regarding COVID-19 and preventive behavior against transmission in dental radiographic examinations. The level of correlation strength is measured by the value of the correlation coefficient that has been obtained. The correlation coefficient obtained is 0.215*. This value can be interpreted that the level of correlation strength between the two variables is included in the very weak category because it is included in the value category 0.0-0.25. The correlation coefficient that has been obtained is also positive (+) which can be interpreted that the direction of the correlation is unidirectional, meaning that if the respondent's level of knowledge about COVID-19 increases, the respondent's preventive behavior towards the transmission of COVID-19 in dental radiology installations also increases.

The results of this study are in accordance with Arif's research which shows that there is a significant relationship between the knowledge of health workers and the behavior of using personal protective equipment during the COVID-19 pandemic at Balung Hospital based on statistical tests using the Spearman Rho method with a significance value of 0.03 (Sig. <0.05) and a correlation coefficient of 0.192 [2]. The results of this study contradict Ridzky's research which shows that based on the results of the tests conducted it shows that there is no significant relationship between knowledge of infection control behavior as evidenced by the results of statistical tests, namely a significance value of 1.000 (Sig. > 0.05) [12]. This difference is based on the fact that behavior is not only influenced by knowledge and there are other factors that can determine this behavior. Other differences also affect research results such as differences in questionnaires, measuring methods, sample sizes, and others.

Notoatmodjo's opinion supports the results of this study which explains that knowledge possessed can be followed by appropriate behavior. Knowledge is one of the predisposing factors that can form a behavior that provides an overview and awareness of something that affects a person to behave in accordance with the knowledge they have [10]. Irwan also added that in the theory of health behavior a health behavior consists of three domains; knowledge, attitudes, and actions. Health behavior is formed from the three domains that have been mentioned with knowledge as a basis for someone to make a decision and react to it and determine action on the problem at hand [4].

There are factors that also influence the radiographer's preventive behavior besides knowledge that cause a very weak correlation between knowledge and behavior in this study such as beliefs, social norms, or other personal factors that can play a role in shaping a person's behavior. Factors in the work environment or institutional policies can also influence the level of adherence to preventive behavior. Psychological factors, such as an individual's level of anxiety or level of motivation, can also influence the consistency of preventive behavior. Albano et al. explained that factors such as trust in information, perceived risk, social support, and accessibility of health resources can influence individual preventive behavior [1]. Yıldırım and Güler also explained that knowledge alone is not

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enough to change behavior, but strong motivation, self-confidence and social support are needed to encourage consistent preventive behavior [17].

Other factors that influence behavior were not examined due to limitations in this study. This research was conducted online so that it cannot be ensured that the respondent has given the best and most appropriate answer. Factors that influence respondent filling include perception, motivation, emotion, and level of focus during filling. This study has tried to adjust and distribute questionnaires according to the scope of the existing inclusion and exclusion categories.

The condition of COVID-19 underwent changes that entered an endemic period during the writing of this thesis. This change was marked by the revocation of COVID-19 from Public Health Emergency of International Concern (PHEIC) status by WHO on Friday, 5 May 2023, which means that COVID-19 is no longer considered an extraordinary event internationally [16]. The results of this study can be used despite the transition from the pandemic to the endemic period of COVID-19. Prevention and control of COVID-19 must still be carried out to prevent transmission from getting out of control to encourage transmission from pandemic to endemic. The results of this research can also be used to deal with future outbreaks that are always likely to occur by helping to plan better responses, prepare health systems, and increase public awareness in dealing with new health threats. The focus of this research is limited to COVID-19 and radiographers in dental radiology installations, but the data from this study can be applied more broadly in the context of other infectious diseases. Other infectious diseases have different characteristics and mechanisms of transmission, but the general principles of prevention of transmission remain the same. This research can provide insight into the importance of good knowledge and appropriate preventive behavior to prevent transmission of infectious diseases in general. One example of another infectious disease is the risk of hepatitis B infection for dentists during dental treatment which can arise through exposure to the patient's blood and body fluids [7]. All viruses, including SARS-CoV-2, have the ability to mutate over time. These mutations have little impact on the properties of the virus, but can affect the properties of the virus, such as its transmission ability, severity, vaccine performance against it, therapeutic drugs, diagnostic tools, or other public health and social measures so that continued attention is needed to prevent transmission of COVID-19002E

5 CONCLUSION

The level of knowledge of radiographers in East Java about COVID-19 has a significant correlation with the preventive behavior of its transmission in dental radiographic examinations with very weak strength. the correlation between the two is directly proportional, which means that if the radiographer's level of knowledge about COVID-19 is getting better, the radiographer's preventive behavior towards the transmission of COVID-19 in dental radiology installations is also getting better.

List of abbreviations

PARI: Perhimpunan Radiografer Indonesia (Indonesian Society of Radiographers)

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AUTHORS' CONTRIBUTIONS

FAB, SP, and S conceived of the study and participated in its design, coordination, and statistical analysis. FAB wrote the final draft. SP and S revised the manuscript. FAB performed the data collection and data entry and participated in statistical analysis. All authors read and approved of the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

Data and questionnaire are available from the corresponding author upon request.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the the Ethical Committee of Medical Research of the Faculty of Dentistry, University of Jember in September 29, 2022 with reference number 1699/UN25.8/KEPK/DL/2022. informed consent was obtained from all participants using google forms and their anonymity and confidentiality were guaranteed.

COMPETING INTERESTS

The authors report no conflicts of interest in this work.

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