SRIWIJAYA JOURNAL OF MEDICINE

The Relationship of Knowledge About Radiation Hazard Risk with The Level of Compliance with PPE Use in Workers in The Radiology Department of Hospitals

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Abstract

The use of nuclear technology is increasingly high in various aspects, one of which is medicine, especially in the radiology section. X-rays have a very high penetrating power against the material they pass. So that X-rays can be used as a diagnostic and therapeutic tool in medicine. However, the risk of possible harm to radiation workers is that it can cause hematopoietic damage (blood disorders), such as anemia, leukemia, and leukopenia. Therefore, radiation protection and safety measures are indispensable. Knowledge of the risk of radiation hazards is one of the things that can prevent the impact of radiation. Objective: This study aims to determine the relationship between Radiation Hazard Risk Knowledge and the Level of Compliance with the Use of PPE for Radiation Workers in the Radiology Section of Hospitals in Palembang. Method: This study is an observational analytical, quantitative research design using *a cross-sectional approach* on 25 respondents' radiation workers in the radiology department of RSUP Rivai Abdullah, and RSUD Palembang Bari were taken using *total sampling.* The instrument uses questionnaires on the level of knowledge of radiation hazards and the level of compliance. Results: *Fisher's analysis* obtained a value of p = 1000, meaning there is no relationship between knowledge and compliance. Conclusion: The results of this study show no relationship between radiation hazard risk knowledge and the level of compliance with the use of PPE for radiation workers in the radiology department of hospitals in Palembang.

Keywords: level of knowledge, level of compliance, radiation hazard, radiology

1. Introduction

Hospitals are crucial institutions in the health sector. The hospital consists of a number of sections that address several problems related to health problems, such as medication, diagnosis, and treatment. Hospitals have a number of tools to perform such functions. These tools are in the radiology department, such as MRI, CT-Scan, general X-ray, and others.[1]

Preliminary data obtained at Bhayangkara Kendari Hospital shows that the number of patients who carried out irradiation activities in 2019 was 2,767. The average per day of irradiation activities amounts to approximately 20 irradiations. The dose value received by radiation workers in October 2019 averaged 0.5 mSv. The number of medical workers in the radiology room is 6 workers, namely doctors, totaling 2 people, and radiographers, totaling 4 people. The results of an initial survey conducted by Juliyanti (2021) workers who serve patients every day with approximately 20 irradiation and minimal personal protective equipment are very risky to health.[2]

The use of nuclear technology at this time is increasingly high in various aspects, including industry, medicine, agriculture, and research. In medicine, especially in the radiology department, the use of nuclear technology has developed rapidly since the discovery of X-rays by Wilhelm Conrad Roentgen in 1895. The many facilities of radiology tools mark changes in nuclear technology in the radiology section in the

form of X-ray tools ranging from conventional to digital systems. Diagnostic radiology in hospitals is the entire part of medical services that utilize X-ray radiation in order to help establish the diagnosis of a disease.[3]

Occupational Health and Safety (K3) is related to efforts to prevent accidents and diseases caused by work and has a reach in the form of creating a safe, healthy, prosperous, efficient, and productive community and work environment. Based on technical Occupational Health and Safety (K3), it is a way of protection provided so that workers and other people in the workplace/company are always in safe and healthy conditions. The purpose of Occupational Safety and Health (K3) is to prevent and reduce the number of accidents and occupational diseases and ensure that every workforce is healthy and safe.[4]

The research conducted by Hidayat (2020) was to observe the effects of radiation through the formation of γH2AX foci on three radiographer blood samples at the Radiology Installation of dr. Reksodiwiryo Hospital Padang and three non-radiographers as comparison controls. The study was conducted through the observation of the formation of γH2AX foci in lymphocyte cells as a biomarker of *Double Strand Break (*DSB) damage to *Deoxyribose Nucleic Acid* (DNA). The results showed the formation of γH2AX foci as much as 0.04 in radiographers and 0.02 in controls. From these results, it can be concluded that radiographers are twice as likely to experience DSB damage as the initial stage of cancer formation.[5]

Research conducted by Ernawidiarti (2017) explained that in 10 samples of radiation worker lymphocyte cells, three of them had chromosomal aberrations. According to them, it is likely that radiation workers are exposed to radiation while working without using body protective equipment and not wearing radiation safety equipment while working.[6]

The impact of radiation can cause cancer and genetic effects in the form of defects in offspring. It can cause damage to the blood, such as anemia, leukemia, and leukopenia (decreased number of leukocytes). Leukocytes or white blood cells comprise about 7,000 cells per microliter of blood in an adult human. Research conducted by Suwarda (1997) also proved that there was a decrease in lymphocytes by 17% in radiation workers who used radiation sources.[7]

Radiation protection and safety programs are systematic and planned actions to protect workers, members of the public and the environment from radiation hazards. This program is made in accordance with the mandate of Government Regulation No.29 of 2008 concerning licensing of the use of ionizing radiation sources and nuclear materials, taking into account government regulation No.33 of 2007 concerning ionizing radiation safety and radioactive source safety, Head of BAPETEN Regulation No.8 of 2011 concerning radiation safety in the use of diagnostic and interventional radiology x-ray aircraft.[8]

Given the potential for significant radiation hazards in the use of X-rays, safety factors are essential so as to minimize the risk of work in radiology installations and the impact of radiation on radiation workers. How to prevent this can be done by implementing aspects of radiation management where radiation safety is an action taken to protect patients, workers, and members of the public from radiation hazards.[9]

Based on the background above, the author wants to conduct further research whether with the Standard Operating Procedures (SOP) that must be applied, there is a relationship between knowledge of the risk of potential radiation hazards with the level of compliance with the use of PPE on

radiation workers in the radiology department of hospitals in Palembang.

2. Methods

This type of research is an observational analytical quantitative research design using a cross sectional approach. This research was conducted at the radiology department of Rivai Abdullah Hospital and Palembang Bari Hospital from December 2021 to January 2022. The sampling technique used in this study was *total sampling*. The inclusion criteria in this study are radiation workers who have worked at least 1 year in the radiology department. The exclusion criteria in this study are radiation workers who do not use badges to determine the radiation exposure received.

Table 1 Characteristics of Respondents

Characteristics of Respondents	Responds	
	N=25	%
Age		
18-40 Years	18	72.0
41-60 Years	7	28.0
Gender		
Law – Law	6	24.0
Woman	54	76.0
Recent Education		
DIII	24	96.0
S1	0	0.0
S2	1	4.0
Length of Work		
0-5 Years	11	44.0
6-10 Years	3	12.0
11-15 Years	6	24.0
>15 Years	5	20.0
Knowledge Level		
Good	21	84
Bad	4	16
Compliance Rate		
Obedient	24	96
Disobedient	1	4
Total	**25**	**100%**

Table 2. Relationship of Level of Knowledge of Radiation Hazards with Level of Compliance with PPE Use of Radiation Workers

Knowledge	Compliance		Sum	P *Value*
	Obedient n(%)	Disobedient n(%)	n(%)	
Good	20 (95.2)	1 (4.8)	21 (100)	
Bad	4 (100)	0 (0)	4 (100)	1,000
Total	**24 (88)**	**1 (12)**	**25 (100)**	

3. Results

Characteristics of Respondents are shown in table 1. Relationship of Level of Knowledge of Radiation Hazards with Level of Compliance with PPE Use of Radiation Workers are shown in table 2. The test conducted in this study was the Fisher test, obtained a p value of 1,000 ($p < 0.05$), meaning that there was no relationship between the level of knowledge of radiation hazards and the level of compliance with the use of PPE.

4. Discussion

Based on the results of the study, it can be seen that the characteristics of respondents according to age were obtained as many as 18 respondents (72.0%) aged 18-40 years who were included in early adulthood. According to the psychological theory of work development Hurlock (1986) in Rachman's research (2020), states that age can be classified into early adulthood, namely the age of 18-40 years and elderly adults aged 41-60 years. The age of early adult workers is believed to be a productive age for work and can build their health by preventing a disease or overcoming a disease.[10]

The characteristics of respondents according to gender were obtained at most female at 19 respondents (76.0%). This is in accordance with research. According to Balbeid (2018), the health sector is still more dominated by the female sex; health workers must have the ability to carry out care and must have *a mother instinct* that is more owned by women.[11]

The characteristics of respondents according to the last education were obtained as many as 24 respondents (96.0%) had the last education D III. This is in accordance with Alhayati's research (2014), the number of officers with Diploma III education is more because since 1996 one of the requirements for the acceptance of health workers is that prospective employees have at least DIII education to work.[12]

The characteristics of respondents according to the length of working as radiation workers were obtained by 11 respondents (44.0%) 0-5 years. This is likely related to the age of many officers in the range of 21-40 years, so the length of service is more in the new category. In this study, the most respondents had a working period of 1 year, which was 7 respondents. According to Faniah (2016), workers or employees who have a working period of less than 5 years include new workers. New workers usually do not know and know the work environment where they work.[13] The possibility to wear or use PPE still requires adjustment time, training, and experience. Years of employment can allow a person to understand better the risk factors for his work and prevention efforts, but it does not affect behavior in the use of PPE. This is in accordance with Wekoyla's (2012) research in Alhayati research (2014) where the most working period in the new category is 40 people (88.9%) and the old category is 5 people (11.1%).[12]

Based on the results of the study there were 3 questions (regarding the definition of risk, definition of x-rays, the Law that regulates the maximum dose received by radiation workers) which were answered incorrectly by more than 60% of respondents. According to Mantiri research (2020), poor knowledge of the implementation of hospital K3 management has a risk of 8 times compared to sound knowledge. If every worker has good knowledge of the application of hospital K3, then the risk of being exposed to occupational diseases and occupational accidents will be avoided or reduced.[14]

In the results of the bivariate test, the relationship between the level of knowledge and the level of compliance with the use of PPE was obtained by 1 respondent who was

well knowledgeable but needed to be more compliant in using PPE. According to Hendra (2011) Based on the results of interviews and observations, it can be seen that radiographers' non-compliance to wear PPE is because so far the results of *the film badge are always at the standard threshold (10 mrem), so radiographers consider whether or not to use the* film badge, *they feel safe at work.*[15]

Based on the results of the Fisher test*,* it shows that the significant value of knowledge is 1,000. It can be interpreted that the knowledge of radiation workers has no relationship with compliance with the use of Personal Protective Equipment (PPE) at Palembang Bari Hospital and Abdullah Rivai Hospital in 2022 with a sample of 25 people. This result is in line with Hendra's research (2011) on radiographers in the city of Semarang. The result obtained is that there is no significant relationship between education and compliance with the use of PPE by radiographers at Radiology Installation 4 Hospital in the city of Semarang.[15]

The results of this study are also in accordance with research conducted by Lubis (2020), where the study stated that there was no relationship with compliance with the use of personal protective equipment (PPE). High awareness of personal safety also motivates officers to equip themselves with PPE before doing work as a radiographer.[16]

This research is also in accordance with research conducted by Alhayati (2014), where there is no meaningful relationship between knowledge and the use of personal protective equipment in the PK laboratory of Arifin Achmad Hospital. This study revealed that knowledge is lacking, but using PPE when working may be due to the officer's high awareness of using PPE, there are complete PPE facilities and another cause is the influence of friends who always use PPE when working. Personal Protective Equipment (PPE) is equipment designed to protect workers from accidents or diseases in the workplace.[12]

The results of this study are in accordance with research conducted by Akbar (2016), the results state there is no relationship between knowledge and the level of compliance, in this study most respondents have a positive attitude towards the use of gloves, so fear and anxiety of contracting diseases can be one of their reasons for being positive, besides the habit of always using gloves can cause this, The availability of gloves as well as regulations on personal protective equipment applied in the ER of Tanjungpura University Hospital thus creating behavior that is compliant mainly in the use of gloves.[17]

According to Notoadmodjo (2012) knowledge is the result of "knowing" and this occurs after people have sensed a specific object. Sensing of objects occurs through the five human senses, namely sight, hearing, smell, taste and touch by itself. At the time of sensing to produce knowledge is greatly influenced by the intensity of attention perception of objects. Most human knowledge is acquired through the eyes and ears. A person's knowledge affects the way he thinks in dealing with his work, including how to avoid accidents while working and there is an influence on the availability of the amount of PPE provided on compliance with PPE use.[18] Both well-informed and under-skilled workers have almost the same percentage of compliant PPE. Good or lack of knowledge only sometimes causes discipline to obey using PPE while working.[19]

5. Conclusions

Good knowledge level results were obtained by 21 respondents (84%) and not good 4 respondents (16%). Moreover, the results of the compliance rate of PPE use by radiation workers were compliance with as many as 24 respondents (96%) and non-compliance with 1 respondent (4%). The

results of this study show that there is no relationship between the Knowledge of Radiation Hazard Risk and the Level of Compliance with the Use of PPE for Radiation Workers in the Radiology Section of Hospitals in Palembang.

In future studies in order to continue this research by using other variables such as what factors can affect the level of compliance with the use of PPE in radiation workers. For related agencies, it is expected to increase knowledge by providing training to radiation workers

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