Homes Journal
Hospital Management Studies Journal

RADIATION SAFETY MANAGEMENT SYSTEM FOR EMPLOYEES IN RADIOLOGY INSTALLATIONS dr. TADJUDDIN CHALID HOSPITAL

Lilis Widiastuty[1*], Dian Rezki Wijaya[2], Ranti Ekasari[3], Zilfadhillah Arranuri[4], Habibi[5], Muhammad Azwar[6], Hasriani[7]

[1,2,3,4,5] Public Health, Faculty of Medicine and Health Science, UIN Alauddin Makassar, Indonesia
[6] Faculty of Public Health, Universitas Pejuang Republik Indonesia, Indonesia
[7] Program Study Hiperkes dan Keselamatan Kerja, Sekolah Tinggi Ilmu Kesehatan Makassar, Indonesia

ARTICLE INFORMATION

Received : August 21th, 2022
Revised : October 30th, 2022
Available online : October 31st, 2022

CORRESPONDENCE

Phone: -
Email: liliswidiastuty86@gmail.com

KEYWORDS

Management, Safety, Radiation, Radiology Installation

https://doi.org/10.24252/hmsj.v3i3.32444

ABSTRACT

Background: Radiographers have duties and responsibilities related to radiation, so one must receive protection for occupational health and safety before starting work, while working or after finishing work, considering that a radiation worker's job is related to X-rays that have characteristics can cause deterministic effects (tissue damage) and genetics.
Objective: This study aims to find out in-depth information about the radiation safety management system for employees at the radiology installation at dr. Tadjuddin Chalid Hospital.
Method: This study uses a *qualitative method.* The informants of this study were the head of the room and 2 radiation protection officers, a total of 3 people. Data was collected through in-depth interviews, observation, and documentation.
Results: The results showed that radiation protection staff at the radiology installation of dr. Tadjuddin Chalid Hospital has attended radiation protection training organized by BAPETEN (Nuclear Energy Supervisory Agency), has a certificate and SIB (Work Permit), Initial and periodic health checks have been carried out, Radiation protection equipment owned in radiology installations is still inadequate and 5 the apron has a leak.
Conclusion: It is hoped that the hospital management needs to ensure the implementation of a radiation safety management system at the radiology installation of dr. Tadjuddin Chalid Hospital, so that radiology employees have a sense of security and can work professionally.

INTRODUCTION

Utilization of nuclear technology for human welfare has penetrated into various fields of life such as health, industry, earth research, food energy and agriculture. safety of users and other user communities (Lusiyanti and Syaifudin, 2004).

With the duties and responsibilities that have been set, a radiographer must receive protection for occupational health and safety both before starting work, while working and after finishing work, considering that a radiation worker's job is related to X-rays which have characteristics that can cause deterministic effects (tissue damage) and genetics (Akhadi, 2002).

In the Law of the Republic of Indonesia Number 10 of 1970 concerning nuclear energy, the use of nuclear energy must receive careful supervision so that it always follows all provisions in the field of nuclear energy safety so that the use of nuclear energy does not pose a radiation hazard to radiation workers, the public and the environment.

Civil servants who work as radiation workers in nuclear installations or ionizing radiation installations are required to receive Radiation Hazard Allowance (TBR) because the potential risk of radiation hazard they receive is very high and is estimated to receive an annual dose exceeding the dose for the public, which is regulated by Presidential Decree No. 138. 2014 concerning Radiation Hazard Allowance for Radiation workers.

According to Akhadi (2002) several adverse effects that appear on the human body due to exposure to X-rays were immediately observed not long after and the discovery of X-rays. The adverse effects were in the form of hair loss and skin damage. Based on data in 1897 in the United States reported 69 cases of skin damage mentioned by X-rays, in 1902 the number reported increased to 170 cases. In 1911 in Germany also reported 94 cases of tumors caused by X-rays. Although some effects of X-rays have been observed, but efforts to protect against the dangers of X-ray radiation have not been thought of.

Based on the radiation worker dose monitoring report, in 2013 the highest dose value received by radiology staff in Indonesia was 21.85 mSv. In 2011-2012 it was 25.03 mSv and 23.64 mSv. This value is above the required NBD (Dose Limit Value) which is 20 mSv (BAPETEN, 2013).

Dr. Tadjuddin Chalid Hospital, has 1 Radiology Doctor, 3 Radiographers, 3 Protection Officers, 2 Medical Physicists. Data on the number of patients served in a day is 6 people, in a month it can reach 200 people and the frequency of radiation exposure to employees depends on the disease experienced by the patient. Employees already understand the use of radiation protection equipment and have attended radiation protection training. However, the requirements for completeness of radiation protection equipment are still inadequate for radiation safety. Health

monitoring is only carried out once a year. Referring to this, the author conducted a study on "Radiation Safety Management System for Employees at the Radiology Installation of Dr. Tadjuddin Chalid Hospital Makassar

METHODS

This type of research is qualitative in nature which is used to investigate, find, describe, and explain in-depth information about the Radiation Safety Management System. The Radiology Installation Staff at the Tadjuddin Chalid Hospital Makassar. The informants were 2 PPR (Radiation Protection Officers) at the radiology installation of the Tadjuddin Chalid Hospital Makassar, while the key informant was the Head of the Radiology Installation Room (PPR) because they knew completely and thoroughly all the procedures in the installation. radiology Tadjuddin Chalid Hospital Makassar

RESULT

The results of this study describe the overall information obtained during the research process, the results of the research can be arranged based on the research objectives plus the information that is in the research findings during the research. The results of the analysis of the data obtained during the study are as follows:

Table 1 Characteristics of Informants Based on Position, Age, Gender and Last Education

Informan	Position	Gender	Age	Education Last
JD	Kep. Room/PPR	L	51	S1
AR	PPR	L	41	S1
ONR	PPR	L	25	D3

Source: Primary Data

Table 2 Completeness of Radiation Protection Equipment at the Radiology Installation

Type of Equipment Equipment	Condition		Total
	Good	Not Good	
Apron	5	5	10
Radiation Shield	1	-	1
Pb Glasses	2	-	2
Pb Gloves	1	-	1
TLD	9	-	9

Source: Primary data

Based on table 2 explains that the completeness of radiation protection equipment in the installation hospital radiology dr. Tadjuddin Chalid Hospital, 5 pieces of apron available in good condition and 5 pieces available in bad condition, radiation screen available 1 piece in good condition, PB goggles available 2 pieces in good condition, 1 pair of PB gloves available in good condition, and TLD 9 available in good condition.And there is radiation protection equipment which is not provided such as thyroid shield and gonadal shield.

a. Radiation protection training

Based on the results of interviews, about radiation protection training. With, having attended training, who organized it, protection officers have a certificate

having attended and passed radiation protection training, how many years the certificate is valid for, the results of the interview are as follows:

> *"Yes, in the form of training organized by BAPETEN, I participated in the last training in 2014 and it has a validity period of 4 years, so there is a term after the expiration date, there is a term for refreshment. Yes, here is the certificate that was issued, it has a validity period of 4 years."*
> *(JD, male, 51 years old, August 2021)*

> *"Once, I wanted to participate again and it was over, which was held by BAPETEN (Nuclear Energy Supervisory Agency), I joined the last time in 2013 it's finished now. If the validity period expires, you have to take part in a name refresh, radiation protection refresh every 4 years, so if you take part in training you can get a certificate, you can get an SIB, the name is a Work Permit as a radiation protection officer."*
> *(AR, male, 41 years old, August 2021)*

> *"If the training is certain because I am a protection officer, there used to be training for approximately 1 week which later when it is available, the SIB (Work Permit) is specifically for protection officers Radiation validity period is 4 years, 5 years, if I'm not mistaken, it's 4 years. (Nuclear Energy Regulatory Agency)."*
> *(ONR, male, 25 years old, August 2021)*

Basically, radiation protection officers (PPR) have attended training and refreshment organized by BAPETEN (Board for Nuclear Energy Supervisory Agency), and have certificates and SIB (Work Permits) which have a validity period 4 years. The answers of key informants and informants related to having attended radiation protection training, who organized it, protection officers who have a certificate of having attended and passed radiation protection training, how many years the certificate is valid for and SIB (Work Permit).

b. Health monitoring

Based on the interview results, key informants and informants explain about health monitoring. With, whether the initial examination is carried out on everyone who will work as a radiology employee, periodic health checks during work and medical examinations for radiology employees who will terminate the employment relationship, the results of the interview are as follows:

> *"That is if for our hospital there is a standard procedure operationally so if there are new employees who want to work in the radiology department, there is a term orientation, there are several scopes there, including the medical test for the new employee who will work in radiology itself, one of which besides providing an understanding of the new employee means how work in radiology itself. Periodic checks if we are here once a year."*
> *(JD, male, 51 years old, August 2021)*

> *"Until now there has been no meaning, it's very rare, it's not rare, in fact, this isn't it. Right, the medical test by the examiner, we accept that he has been tested and is general in nature, only for the radiology itself you don't do a medical test unless you later work in radiology. Yes, once a year you have to. Because there is no work relationship terminated here, I guess not."*
> *(AR, male, 41 years old, August 2021)*

> *"Mandatory, the standard is that we must have a medical check-up even though in reality many don't do that, scientifically it must be related to whether we are really ready in the radiation field or not because Directly or indirectly, the effects of radiation are actually felt, especially for workers, even though the dose is exposure, but we are there every day, the effects are felt. If those who are already working,*

usually once a year, we combine them with individual monitoring devices, we use the TLD, so if the dose we get is still below the threshold, our health is still good, it's okay, we can continue to work"
(ONR, male 25 years old, August 2021)

Basically the radiation protection officer (PPR) explained that he had to conduct an initial examination when hiring employees because it was in accordance with standard hospital operating procedures, periodic checks during work were carried out once a year and for examinations when terminating the employment relationship, they had never arrived. Currently, there are no employees who have moved or quit. The answers of the informants and key informants relate to whether the initial examination is carried out on everyone who will work as a radiology employee, periodic medical examinations during work and medical examinations for radiology employees who will terminate the employment relationship.

c. Radiation protection equipment

Based on the results of interviews with key informants and informants, regarding radiation protection equipment. With complete radiation protection equipment available, standard or not radiation protection equipment, the results of the interview are as follows:

"What we have, you can say is standard, there is an apron, there is a screen, there are PB goggles, there is no thyroid protector, there is no gonadal protection either. , TLDs exist. Apron if I'm not mistaken 10 or 9, well here 10 is rich, 1 glasses, 1 pair of gloves."
(JD, male, 51 years old, August 2021)

"There are 10 aprons, then 2 lead glasses, 1 lead gloves, then the walls are safe, lead glass is also safe, no thyroid protector, no gonads, TLD there is."
(AR, 41 years old male, August 2021)

"Actually, it's quite complete, but we're already old, the apron is not standard, it's leaked because I haven't been born for a long time, there's already an apron, oh if the gonads don't have a thyroid yet. That's what we just proposed, including the replacement of the old apron, it's not standard, right for our safety too."
(ONR, 25 years old male, August 2021)

Basically, the existing radiation protection equipment, such as radiation screen, TLD, Pb goggles, Pb gloves are in good condition and meet the standards, except for some aprons whose condition is not good and does not meet the standard. And there are protective devices that don't exist such as gonadal shields and thyroid protectors. The answers of the informants and key informants related to the availability of complete radiation protection equipment, standard or not radiation protection equipment.

DISCUSSION

Radiation Protection Training

Based on the results of interviews with researchers, key informants and informants in the radiology installation of dr. Tadjuddin Chalid Hospital has attended radiation protection training organized by BAPETEN (Nuclear Energy Supervisory Agency), has a certificate and SIB (Work Permit) every 4 years is requalified or refreshed to extend SIB

(Work Permit) as a radiation protection officer. Based on the documentation study, there are certificate documents and SIB (Work Permit) and reinforced by the certificate given by PPR as evidence of having participated in the level 2 radiation protection officer refresher program organized by BAPETEN (Nuclear Energy Supervisory Agency).

According to the Regulation of the Head of BAPETEN No. 16 of 2014, concerning Work Permits for certain officers who work in radiology installations that utilize ionizing radiation sources, article 17b concerning special requirements for radiation protection officers, namely; Have a minimum diploma of D-III majoring in exact sciences or engineering, as evidenced by a legalized photocopy of the diploma, Have a certificate of having attended and passed the training of Radiation Protection Officers from an accredited training institution; and Take and pass the exams organized by BAPETEN.

The implementation of radiation protection training needs to be carried out so that employees are aware of nuclear laws and regulations, the development of radiation sources in the use of nuclear power, radiation measuring instruments, and emergency measures in accordance with radiology developments so that they can support efforts to utilize nuclear power with a high level of safety.

Health Monitoring

According to the Regulation of the Head of BAPETEN No. 6 of 2010 concerning monitoring the health of radiation employees, medical examinations for radiation employees are carried out at the beginning before carrying out activities as radiation employees which are useful to see the condition and health status of employees who are able or not carrying out their duties as radiation employees who is charged to him, while working, aims to monitor the health condition of the employee who is in a healthy health condition to carry out his duties which are carried out annually, and at the time of termination of employment, the aim is to determine the health condition of the radiation employee when he stops working.

Based on the results of interviews with researchers that informants and key informants in the radiology installation of dr. Tadjuddin Chalid Hospital has carried out an initial medical examination when recruiting employees in accordance with standard operating procedures at dr. Tadjuddin Chalid Hospital when there are new employees working, especially in the radiology installation section, medical tests are required, besides that they are given an understanding of how to work in radiology installations and the hazards that exist. For periodic inspections during work, it is carried out once a year and examinations at the time of termination of employment have not been carried out because at the radiology installation of dr. Tadjuddin Chalid Hospital has not retired or moved.

Radiation Protection Equipment

Based on the results of interviews with researchers that the informants and key informants provided radiation protection equipment including 10 aprons, 1 radiation screen, 2 pb goggles, 1 pair of PB gloves, 9 TLD, no gonadal protection and no thyroid protector. In line with the observations, 5 aprons were in bad condition or had leaks so they were no longer suitable for use. Such conditions have the potential for radiation exposure to be absorbed more by radiation employees, so it is necessary to procure apron with suitable conditions for use.

This is not in accordance with the Regulation of the Head of BAPETEN Number 8 of 2011 concerning Radiation Safety in the Use of Diagnostic and Interventional Radiology X-Ray Aircraft, Article 35 paragraphs 1 and 6 regarding radiation protection equipment provided for each radiation worker and radiation protection equipment including apron, screen that PB coated and equipped with PB glass, PB goggles, PB gloves, PB thyroid protector, and gonad protector.

This study is in line with research conducted by Silvia 2012, where this study aims to determine the radiation safety management system for employees at radiology installations in terms of aspects of radiation protection training, health monitoring and radiation protection equipment. In the results of the study, it is known that radiation protection employees have attended radiation protection training, have certificates and SIB. Initial inspections and periodic inspections have been carried out but at the time of terminating the employment relationship it has not been carried out because there are no employees who have terminated the employment relationship

CONCLUSION

In accordance with the results that the author got at the radiology installation of dr. Tadjuddin Chalid Hospital, regarding radiology safety management systems, it can be concluded as follows:

1. Radiation protection employees have attended radiation protection training organized by BAPETEN (Nuclear Energy Supervisory Agency), have certificates, SIB (Work Permits), and refresher certificates. Every 4 years a requalification or refresher is carried out to extend the SIB (Work Permit).
2. Health monitoring of radiology installation staff at dr. Tadjuddin Chalid Hospital has been implemented.
3. Radiation protection equipment owned at the radiology installation of dr. Tadjuddin Chalid Hospital is still inadequate and 5 aprons have leaks, this is not in accordance with the Regulation of the Head of BAPETEN No. 8 of 2011

SUGGESTION

Based on the results of the study, the author finally gives some suggestions for the

radiology installation of dr. Tadjuddin Chalid Hospital, regarding radiology safety management systems:

1. Implementation of radiation protection training for radiation protection officers at the radiology installation of dr. Tadjuddin Chalid Hospital, has been implemented and proven by the existence of a certificate and SIB, so it is necessary to maintain and improve the knowledge gained during the training both in theory and practice.
2. Conducted health checks when terminating employment, useful for monitoring the effect of radiation on employees
3. Must Provide or replace radiation protection equipment in the form of gonadal protectors, thyroid protectors, and (5 pieces) aprons in good condition and meet standards to protect employees in carrying out their activities without compromising health and work safety.

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