**Determining the risk of cancer when examining the bile ducts using fluoroscopy at Sanjiwani Hospital, Gianyar**

# ABSTRACT

**Aim:** Studying the determining of the risk of cancer when examining the bile ducts with fluoroscopy at Sanjiwani Gianyar Hospital, Gianyar aims to determine the effective dose received by the bile ducts during irradiation with fluoroscopy, find out whether there are differences between male and female patients in the effective dose, and find out whether there is a risk of cancer when examining the bile ducts with fluoroscopy.

**Study Design:** This study used a quantitative analytic design in the form of experiments and direct field observations. This study was conducted in the Radiology Unit of Sanjiwani Hospital, Gianyar, from December 2024 to February 2025.

**Methodology:** This study involved 30 bile duct cancer patients. Data were analyzed using IBM SPSS and Excel software to determine the risk of cancer in bile duct examination with fluoroscopy.

**Results:** After carrying out t-test for the absorbed dose, effective dose and cancer risk which were compared with the BAPETEN and ICRP values, the following results were obtained, namely, where the lowest absorbed dose value was 25 mGy and the highest absorbed dose value was 46 mGy. This value is certainly lower than the value set by BAPETEN, namely 50 mGy . And where the lowest effective dose value is 3,00 mSv and the largest effective dose value is 5,52 mSv, this value is lower than the effective dose value set by BAPETEN, namely 10mSv. And for the smallest cancer risk value, namely 0,021% and for the largest, namely 0,040%, this value is lower than the cancer risk value set by the ICRP, namely 0,08%.

**Conclusion:** It is know that the values for the absorbed dose, effective dose, and risk of cancer received by patients at Sanjiwani Gianyar Regional Hospital are still by BAPETEN and ICRP so that it does not harm patients undergoing bile duct cancer treatment at the Sanjiwani Gianyar Radiology Installation.

*Keyword: Fluoroscopy, Bile Duct , cancer,* effective dose, radiation.

# INTRODUCTION

Radiation is the emission of energy through matter or space in the form of heat, particles, and electromagnetic waves or light (photons). Radiation in the form of electromagnetic waves of photons is a type of radiation that has no mass and no electric charge, such as gamma rays and X-rays. Several imaging modalities that use X-rays are X-rays, mammography, dental,,CT Scan and fluoroscopy (Akhadi, 2000)



**Figure 1.** Fluoroscopy

Fluoroscopy is a tool used for visual (direct) study of the fall of a latent image from a fluoroscopy screen into a image in a film of film spot. In medical applications fluoroscopy is used to visualize the movement of internal structures. A radiographer or radiology doctor can observer images of organ structures dynamically or (real time imaging) following the desired imaging needs, and using a very long time (Silverman, dkk 2018).

The bile duct is a system of small tubes that connect the liver to the small intestine. The bile duct is responsible for transporting bile, a fluid produced by the liver to the small intestine to aid in the digestion of fats (Kusnandi, 2013). Cancer is a type non-communicable disease whose increase every year. Bile duct cancer or cholangiocarcinoma is a disease that occurs due to the presence of malignant cells in the epithelium, bile or can occur in the liver parenchyma (Khan, 2019).

One common method used to diagnose problems in the bile ducts is fluoroscopy. Fluoroscopy allows doctors to view the bile ducts in real time, providing important information about anatomical abnormalities and function of the ducts. However, the use of fluoroscopy of the ducts. However, the use of fluoroscopy also carries risk, especially radiation exposure that can increase the change of cancer. Radiation exposure from fluoroscopy can have long-term effect, including an increased risk of cancer. Several studies have shown that radiation exposure, especially in high doses and over a long period of time, can cause DNA damage that can potentially lead to cancer. Therefore, it is risk in patients undergoing bile duct examination (Kauffman, 2020).

Understanding cancer risk is also important for the development of safer screening protocols. By evaluating the necessary steps to protect patients. This includes the use of alternative imaging techniques that may have lower radiation risk. This study will contribute to the development of more effective early detection strategies that take radiation risk into account, and according to BAPETEN Regulatory Agency Number 4 of 2013 states that the absorbed dose value is 50 (Gy), the effective dose is 10 (mSv), and according to ICRP 2007 the value of cancer risk is 0.8 (%) (Saito, 2022).

# MATERIALS AND METHODS

## Materials

## 2.1.1 Study area

## The research was conducted at the Radiology Installation of the Sanjiwani Gianyar Hospital (RSUD) located at Jl. Ciung Wanara-Gianyar No.2, Gianyar, Gianyar District, Gianyar Regency, Bali.

### 2.1.2 Study tools and materials

The tools and materials used in this research include a fluoroscopy machine with the Siemens brand No. 802071751, and a radiographer’s computer to search for bile duct patient data using a fluoroscopy examination tool.

###  2.1.3 Study design

This study used a direct field observation design to determine whether there was a risk of cancer when examining the bile ducts with fluoroscopy.

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1. **Methods**

### Sampling techniques

Data collection was conducted using the following steps:

1. Data Capture Phase : open the data set application to search for bile duct patient data on the radiographer’s computer. Search the data based on month and year for the data needed, namely 30 bile duct patients.

### Study instruments

### The research procedure consisted of the following stages:

### Search for data such as tube voltage (kV), time current (mAs), and absorbed dose (Gy).

### Open the data collection application to search for bile duct patient data, search for the data based on month and year.

### Record and photograph as needed.

### Next, the equivalent dose (Sv), effective dose (mSv), and cancer risk (%) are carried out.

### After that, continue with the Normality Test and Homogeneity Test for absorbed dose (Gy), effective dose (mSv), and cancer risk (%).

### Next, a t-test is carried out on the absorbed dose (Gy), effective dose (mSv), and cancer risk (%) and then compared with the BAPETEN and ICRP values.

### Next, a One Way ANOVA Test is carried out to answer the existing problems formulation. 2

### Data collection method

### After obtaining data such as voltage (kV), time current (mAs), and absorbed dose (Gy). After the data was obtained, the equivalent dose (Sv), effective dose (mSv), and cancer risk (%) were calculated followed by a normality test and homogeneity test on the data on absorbed dose (Gy), effective dose (mSv), and cancer risk (%) and finally, carried out the t-test and One Way ANOVA test.

### Data management

### Normality Test: the normality test aims to find out whether the data distribution is normally distributed or not. Normally distributed data is a mandatory requirement that must be met before carrying out the One-Way t-test and the One Way ANOVA test. The data normality test method used was Kolmogrov-Smirnov and Shapiro with significance level of 95% ($α$= 0.05) to determine the data distribution. Guidelines for making decisions on data normality tests are:

### If the significant value (P value) is > 0.05 then the data is normally distributed.

### If the significant value (P value) < 0.05 then the data is not normally distributed.

### Homogeneity Test, homogeneity test is a statistical method used to test whether the variants of two more groups of data are homogeneous or not. Guidelines for decision making in the homogeneity test are as follows:

### If the significant value (P value) is > 0.05 then it can be concluded that the data variance is homogeneous (homogeneity test is fulfilled).

### If the significant value (P value) < 0.05 then it can be concluded that the data variance is not homogeneity test is not met).

### One-Way t-Test, aims to determine whether the null hypothesis should be rejected, with the existing sample data. From this test, it is expected to meet a confidence level of 95% with a significance of 0.05. the statistical hypothesis proposed is as follows:

### HO = The value of the absorbed dose, effective dose, and cancer risk obtained does not exceed the limits set by BAPETEN dan ICRP.

### HI = The value of the absorbed dose, effective dose, and cancer risk exceeds the limits set by BAPETEN and ICRP from the results of the statistical test.

### One Way ANOVA Test, after the normality teat, homogeneity test, one-way t-test with the following hypothesis:

### ANOVA test for comparison of each classification of male and female patients

### HO = (Initial Hypothesis): There is no difference in the average effective dose value of the classification of male and female patients.

### HI = (Alternative Hypothesis): There is a difference in the average effective dose value of the classification of male and female patient

### The guidelines for decision making in the One Way Test are as follows:

### If the significant value (P value) < 0.05 concludes that there is a significant difference (HI Accepted, HO rejected)

### If the significant value (P value) > 0.05 concludes that there is no significant difference (HI rejected, HO accepted) (Sugiyono, 2015).

# 3.RESULTS AND DISCUSSION

# In this study,data was collected from 30 patients (13 women and 17 men) the data taken were tube voltage (kV), time current (mAS), and absorbed dose (Gy). These data will be used to calculate the equivalent dose (Sv), effective (mSv), and cancer risk (%) received by bile duct patients. This research uses statistical test, namely normality test homogeneity test t-t test, One Way ANOVA test. The results of the bile duct examination were that there was no risk of cancer in any patient because the cancer risk value at Sanjiwani Gianyar Hospital dit not exceed the cancer risk set by the ICRP.

# 3.1 Comparision Of Absorbed Dose, Effective Dose, And Cancer Risk Values At Sanjiwani Gianyar Hospital With The Values Recommended By BAPETEN And ICRP

# The absorbed dose value received by patients at RSUD Sanjiwani Gianyar is lower than the absorbed dose value recommended by BAPETEN, where the lowest absorbed dose value obtained was 25 Gy and the highest absorbed dose value was 46 Gy. This value set by BAPETEN, which is 50 Gy. The effective dose value in patients at RSUD Sanjiwani Gianyar has a lower value compared to the effective dose value is 3.00 mSv and the highest effective dose value is 5.52 mSv, this value is lower than the effective dose value set by BAPETEN, which is 10 mSv. Cancer risk value by patients at Sanjiwani Gianyar Hospital with the potential cancer risk value set by BAPETEN. Where the pantients at Sanjiwani Gianyar Hospital is lower than that set by ICRP with the lowest value of 0.021% and the lowest og 0.040% with the value recommended by ICRP of 0.08%.

# Statistical Test Result

**Normality Test results of absorbed dose**

# To determine whether the data is normally distributed or not, it is done by comparing the significance value of 5% or 0.05. if the significance value of the normality test is greater than 0.05, then the data is considered normally distributed. Conversely, if the value is less than 0.05, then the data is considered not normally distributed.

**Homogeneity Test results of absorbed dose**

# Above, normality and homogeneity test are carried out according to the provisions if the sig value > 0.05 then the data is normally distributed, so that data is can be continued with a t-test (One Sample t-test) to determine whether the absorbed dose value that has been obtained does not exceed the established standard out for the absorbed dose value.

**T-Test results of absorbed dose**

# Because the table < t count (-18.262 < 1.699), HO is accepted, so the absorbed dose is given according to that determined by BAPETEN.

# Normality Test results of effective dose

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| To determine whether rhe data is normally distributed or not, it is done by comparing the significance value of 5% or 0.05. if the significance value of the normality test is greater than 0.05, then the data is considered to be normally distributed. Conversely, if the value 0.05 then the data is considered not normally distributed. Based on the normality test that was carried out in this research, significance value was obtained that was greater than 0.05. the next result is a homogeneity test to ensure whether the data from each group to be analyzed comes from the same population or not.  |
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**Homogeneity Test result of effective dose**

above, a normality test and homogeneity test were carried out in accordance with the provisions, if the sig value is > 0.05 then the data is normally distributed, so it can be continued with a t-test (One Sample t- test) to determine whether the absorbed does not exceed the predetermined standard or not. Next, a t-test will be carried out for the effective dose value.

**T-Test results of effective dose**

Because the table < t count (-58,833 < 1,699), then H0 is accepted, so the effective dose is given as determined by BAPETEN.

**Normality Test results of cancer risk**

To determine whether the data is normally distributed or not, it is done by comparing the significance value of 5% or 0.05. If the significance value of the normality test is greater than 0.05, then the data is considered to be normally distributed. Conversely, if the value is led than 0.05 then the data is considered not normally distributed. Based on the normality test that was carried out in this research, significance value was obtained that was greater than 0.05. the next result is a homogeneity test to ensure whether the data from each group to be analyzed comes from the same population or not.

**Homogeneity Test results of cancer risk**

Above, a normality test and homogeneity test were carried out in accordance with the provisions, if the sig value is > 0.05 then the data is normally distributed, so it can be continued with a t-test (One Sample t-test) to determine whether the absorbed dose value that has been obtained does not exceed the predetermined standard or not. Next, a t-test was carried out to determine the cancer risk value.

**T-Test results of cancer risk**

Because the table < t count (-68.028 < 1.699), the Ho is accepted, so the cancer risk value is as determined by the ICRP.

**Anova Test results of cancer risk**

The results of the One Way ANOVA statistical test showed that F count > F table (420 > 135), so HO was accepted and HI was rejected. After carrying out the normality test, homogeneity test and t-test, the One Way ANOVA test is now carried out to answer the second problem formulation. The One Way ANOVA test for cancer risk is carried out, showing that there is no significant difference between each cancer risk. These results can be demonstrated through hypothesis testing where the results of F count > F table or P (sig) > 0.05, which means HO is no difference in the average cancer risk value for each patient.

# RECOMMENDATIONS

It is further recommended that this research expand the data sample for bile duct cancer, to provide broader insight regarding cancer risk.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declares that NO generative AI technologies such as Large Language Models and text-to-image generators have been used during writing or editing of this manuscript.

# CONSENT

All authors declare that a ‘written informed consent was obtained from all the patient;

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