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Sensitivity and Specificity Sputum Cytology Examination to Histopathology Examination of Lung Malignancy Suspect Patient in Dr. Mohammad Hoesin General Hospital Palembang

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Abstract

Introduction: Incidence of lung cancer highest in Indonesia and the fifth most abundant in female after breast cancer. Lung cancer is first cause of cancer related mortality in male (21.8%) and second cause of cancer related mortality in female (9.1%) after breast cancer (21.4%). The result of study in 100 hospitals in Jakarta showed that lung cancer was the most abundant in male and forth in female. The sputum cytology in lung cancer is an initial examination for diagnosis. The sputum cytology examination is a simple, accurate, cheap and non-invasive for initial diagnosis of lung disease including lung cancer.

Methods: This study targeted lung malignancy suspect patient with sputum cytology examination in Dr. Mohammad Hoesin Hospital Palembang. The inclusion criteria were patients who will have a surgery and histopathology examination, patient >17 years old, patient that willingly take part in

this research. The exclusion criteria were patient with sputum that can't be retrieved. This study was using Cross Sectional method. The measurement of sensitivity and specificity of sputum cytology to histopathology examination calculated with Thornier-Remain formula.

Results: The lung cancer patient found most in category of > 40 years (63.6%), male and smoking (77.3%). The sputum cytology's result highest in non-malignancy (86.4%) and the histopathology examination's result highest in malignancy (72.7%). Sensitivity of sputum cytology in this study is 28.75% and the specificity 100%

Conclusion: The sensitivity of sputum cytology in 28.75% shown accuracy of sputum cytology method and specificity in 100% shown how often the sputum cytology method diagnoses the malignancy

Keywords: lung malugnancy, sputum cytology, sensitivity, specificity, histopathology

1. Introduction

The incidence of lung cancer in men is the highest in Indonesia and the fifth highest cancer in women after breast cancer. Lung cancer is the first cause of cancer death in men (21.8%) and the second cause of death from cancer in women (9.1%) after breast cancer (21.4%). Sputum cytology examination in lung cancer is the initial examination in establishing lung cancer.[1] Routine sputum cytology examination is done, especially in patients with cough complaints. The National Cancer Institute (NCI) in the United States recommends sputum cytology for periodic screening.[2]

Khalid et al. Performed sputum cytology testing for lung cancer diagnosis. This study examined 97 patients (80 men and 17 women) with suspected lung malignancies from radiological examination. The results obtained were 46 patients (45.3%) whose sputum was taken was declared lung cancer.[3] Cytological sputum in diagnosing lung cancer can be seen from the sensitivity and specificity. Sensitivity describes how often the sputum cytology method accurately identifies lung cancer in patients.

This study aimed to determine the sensitivity and specificity of sputum cytology examination against histopathological examination in patients with suspected lung tumors.

2. Methods

This study examined patients with suspected malignancy at Dr. Mohammad Hoesin Palembang. This study involved 24 patients with research data obtained using prime data in the form of sputum collection supervised by researchers together with patient data collection in the form of clinical characteristics including age, gender, smoking habits. The data collected from sputum cytology and histopathological examination results will be organized to facilitate further analysis and to be experimented with by an anatomical pathologist. The data that has been obtained will be analyzed and in this study the analysis used is univariate analysis. Univariate analysis is an analysis performed to analyze each variable from the research results. Then the sensitivity and specificity calculations were carried out using Thornier-Remain calculations to see the results of the sensitivity and specificity of cytological sputum on the examination by histopathological examination of suspected lung malignancies.

3. Results

An observational study with a cross sectional design with a total number of 24 patients, the examination that met the inclusion criteria was 22 patients and there were 2 patients who were excluded from the study because saliva was obtained on sputum cytology. Table 1 presents data regarding patient characteristics and malignancy according to sputum examination and histopathology. Of the 22 subjects, it was found in the age variable, from 22 subjects there were 8 subjects (36.4%) in the 17-40 year category and 14 subjects (63.6%) in the > 40 years category. In the gender and smoking variables, 17 (77.3%) male subjects smoked and 5 (22.7%) female subjects did not smoke. In the proportion of lung malignancies according to sputum cytological examination, 3 subjects (13.6%) were malignant and 19 subjects (86.4%) were not malignant. On histopathological examination, 16 subjects (72.7%) were malignant and 6 subjects (27.3%) were non-malignant.

Table 1. Patient characteristics and malignancy according to sputum examination and histopathology

Variable	n =22 (%)
Age	
17 – 40 years	8 (36.4 %)
> 40 years	14 (63.6 %)
Gender	
Male	17 (77.3 %)
Female	5 (22.7 %)
Smoking habit	
Smoke	17 (77.3 %)
Do not smoke	5 (22.7%)
Sputum Cytology	
Malignant	3 (13.6 %)
Not Ferocious	19 (86.4 %)
Histopathology	
Malignant	16 (72.2 %)
Not Ferocious	6 (27.3 %)

From the calculation of sensitivity and specificity using the Thornier-Remain screening method, it was found that the sensitivity in this study was 28.75% and the specificity was 100%. The results of the calculation of sensitivity and specificity can be seen in the following description:

Tabel 2. Sensitivitas dan spesifisitas sputum sitologi

	Histopathology of malignancy	**Histopathology is not malignant**	**Total**
Positive sputum cytology	3	0	3

Negative sputum cytology	13	6	19
Total	16	6	22

$$sensitivity = \frac{true\ positive}{true\ positive + false\ negative}\ x\ 100\ \%$$

$$sensitivity = \frac{3}{3+13}\ x\ 100\ \% = 28.75\ \%$$

$$specificity = \frac{true\ negative}{false\ positive + true\ \ negative}\ x\ 100\ \%$$

$$specificity = \frac{6}{0+6}\ x\ 100\ \% = 100\ \%$$

Distribution of suspected pulmonary malignancy patients by age

According to data from the Ministry of Health, lung cancer patients are at risk for infection at the age of more than 40 years. In addition, in a study by Khalid in 2010, the age group of patients suffering from pulmonary malignancies was the largest in the age group 50-83 years.[3] A study specifically conducted on patients over the age of 60 years conducted by Frith in 2014 found the highest prevalence of diagnosed lung cancer is over 65 years of age.[4] Barta in his 2019 research found that the age with a high risk of developing lung cancer is the age range of 55 to 74 years.[5] Recently in 2020 Domvri conducted a study that found that the average age of patients with lung cancer was 65-75 years in the population of North Greece. [6] In line with this study, the group that found the most age group for patients with lung malignancies was the group> 40 years, as many as 14 subjects (63.6%).

Distribution of patients with suspected lung malignancy by gender

In the gender category, it can be seen that the frequency of malignancy suspects in males is more, namely 17 subjects (77.3%) compared to women who are only 5 subjects (22.7%). Olak et al in 2004 specifically examined sex differences with a focus on women who had lung cancer.

Lung cancer accounts for 12.7% of all cancers in the United States and accounts for 28.5% of all cancer deaths. In 1987 lung cancer outperformed breast cancer as the leading cause of cancer death among women. Between 1950 and 1994, lung cancer in women had an increased mortality of 500%, from only 3% to 22%.[7] In contrast to the research by Xing in 2005 which found that men suffered more from lung malignancies.[30] Khalid's study also found as many as 51.25% of male patients suffer from pulmonary malignancies.[3] A 2020 study by Domvri that examined the number of ages in the population of Northern Greece with lung cancer found the ratio between women and men was 2: 1. [6]

Distribution of suspected lung malignancy patients based on smoking habits

In the smoking habit category, there were 17 subjects (77.4%) who smoked, more than those who did not smoke, namely only 5 subjects (22.7%). According to the Ministry of Health, the smoking factor is an important consideration in screening lung cancer patients. Compared to nonsmokers in the 2003 study by Alberg, smokers had a 20 times risk of developing lung cancer.[8] The 2005 Xing study found nearly half of its subjects were exposed to cigarette smoke from a young age and had a history of exposure to chemicals in place.[9] Ozlu in 2005 that 90% of lung cancer sufferers were smokers.[10] In Khalid's 2010 study, as many as 100% of the study subjects with male gender were smokers which is in line with this study because all study subjects were male men are smokers.[3] In Olak's 2004 study, the smoking habit in women was not higher than that of men, but in women the smoking habit started earlier, a significant cause was cigarette advertising.[7]

Sputum cytology sensitivity and specificity

Using the Thornier-Remain screening method, the sensitivity of sputum cytology was 28.75% and the specificity was 100%. From here also obtained a positive predictive value of 100% which indicates the probability of suffering from disease and negative predictive value of 31.58% which indicates the probability of really not suffering from the disease. Schreiber in 2003, who examined the performance of modalities for diagnosing lung cancer, obtained conventional sputum cytology which lost its function in the diagnostic process because it had a low sensitivity of 49%.[11]

Research by Choi in 2008 which compared conventional sputum with The Thinprep Processor method which is a tool for preserving sputum samples that can maintain sample quality and the cytoplasm of preparation to obtain conventional cytological sputum has a lower sensitivity, as many as 84.8% of samples were diagnosed as non-malignant, and the number False negative conventional sputum is greater, namely 69.4% compared to the Thinprep method, namely 49.6%.[35] Veena in 2012 who examined sputum cytology as a diagnostic tool in lung cancer concluded that the sensitivity of conventional cytological sputum examination had low sensitivity due to degenerative changes in the preparation. sputum.[12] A higher number was found in the study by Jay in 1980, the sensitivity of the sputum cytology examination was 87%.[13] In a study by Banbassat in 1987, the variable sensitivity figures were also suspected due to differences in tumor location and the number of samples examined.[14] Research by Erikilic in 2003 which compared conventional methods with cell block obtained a sensitivity of 69.4% and a specificity of 99.5%. for conventional sputum cytology examination.[15] The mean specificity of conventional sputum cytology examination was 89.7-100% of Jay's 1980 study.[37]

Proportion of lung malignancy according to sputum cytology and histopathology

Screening for lung malignancies is believed to improve patient life expectancy. Sputum cytology is considered to be an easy, effective and as a filtering tool for lung malignancies. In this study, lung malignancies according to sputum cytology were found as many as 3 subjects (13.6%), another case in histopathology, as many as 16 subjects (72.7%) were malignant. The differences that exist are actually not new findings, as in the study by Benbassat, it was found that the numbers ranged from 28.6% to 88.9% of malignant sputum in lung malignancies that had been histopathologically examined as malignancy. So that the findings of sputum cytology are not always directly proportional to the histopathological examination.[14] Research by Chrabanska in 2020 found only 1 in 8 conventional sputum cytology examinations that had malignancy, even though the histopathological results were positive for malignancy. Other techniques in sputum cytology examination such as bronchial washing, bronchial brushing, cell block were performed in Chrabanska's study, this study recommends the use of cell blocks to evaluate sputum cytology samples for diagnosis of lung cancer.[16]

4. Conclusion

In this study, a sensitivity value of 28.75% was obtained which indicates the accuracy of the sputum cytology method in identifying lung cancer in patients. A specificity value of 100% was obtained which indicates the frequency or how often the sputum cytology method diagnoses malignancy.

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