Breast Cancer Survival Rate of Luminal vs Non-Luminal Subtype at Prof. Dr. Margono Soekarjo Regional General Hospital Purwokerto in 2021-2023

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Abstract

Introduction: Breast cancer is a malignancy that originates from breast tissue such as epithelium, ducts and breast lobules. Breast cancer often occurs at a young age, due to many risk factors including alcohol consumption, diet, radiation and family history. Based on receptor gene expression in tissues, breast cancer is classified into two, namely luminal subtypes in the form of Luminal A and Luminal B, and non luminal subtypes in the form of Positive Human Epidermal Growth Factor Receptor 2 and Triple Negative Breast Cancer (TNBC). The survival rate for each subtype has a different time, so further understanding is needed to determine the right treatment for patients. This study aims to determine the relationship between survival rate and luminal and non luminal breast cancer subtypes. **Methods**: This study uses secondary data, namely the medical records of breast cancer patients at Prof. Hospital. Dr. Margono Soekarjo Purwokerto. The sample in this study were breast cancer patients at RSMS for the 2021-2023 period who fit the inclusion and exclusion criteria. **Results**: Of the 84 samples that complied, the survival rate for patients with the luminal subtype was 52.9%, while the survival rate for the non luminal subtype was 42.4%. **Conclusion**: The survival rate of breast cancer patients with luminal subtype is higher than that of non luminal breast cancer patients, and there is a relationship between survival rate with luminal and non luminal subtypes.

Keywords: breast cancer, luminal subtype, non luminal subtype, survival rate.

Introduction

Cancer is a disease caused by uncontrolled growth of abnormal cells that damage the form and function of organs. Gene mutations are one of the causes of cancer. Several factors influencing gene mutations include chemical, physical, and natural factors.[1] Cancer can disrupt the body's metabolic processes because the growth and development of cancer cells are very rapid.[2] Breast cancer is one of the most common types of cancer worldwide.

According to Globocan 2020 data, there are 2,261,419 new cases of breast cancer, accounting for approximately 11.7% of all cancer cases globally each year. In developing countries, the incidence and mortality rates of breast cancer are higher compared to developed countries, with incidence rates of 55.9 and 29.7 per 100,000 population, and mortality rates of 15.0 and 12.8 per 100,000 population, respectively.[3]

Breast cancer is a malignant disease originating from breast tissue, such as epithelial, ductal, or lobular tissue. Breast cancer often occurs at a young age due to various risk factors, including alcohol consumption, diet, radiation, and family history. Family history is a major risk factor for breast cancer occurrence.[1] Based on gene receptor expression in tissues, breast cancer is classified into Luminal A, Luminal B, Human Epidermal Growth Factor Receptor 2 Positive, and Triple Negative Breast Cancer (TNBC). Triple Negative Breast Cancer (TNBC) is one subtype of breast cancer with a poor prognosis.[4]

Breast cancer can undergo metastasis. The most common distant metastasis sites are the lungs, bones, liver, brain, and contralateral breast. Several factors influencing metastasis include tumor size, hormonal status, HER2 status, lymphovascular invasion, histopathological grade, uPA/PAI1 protein levels, and genetic profile.[5] Immunohistochemistry examination is one of the

methods used to diagnose breast cancer. This examination aims to determine the hormone receptor status of cancer cells. Hormone receptors are receptors associated with specific hormones, such as progesterone, estrogen, and HER2. Hormone receptors play an important role in determining whether cancer cells are responsive to hormonal therapy or not.[6]

Survival refers to the survival rate of a population within a specific time frame. Measuring survival rates is one way to assess the effectiveness of new treatments.[7] Based on the background above, the author is interested in conducting a Scientific Study Report titled "Breast Cancer Survival Rate of Luminal vs Non-Luminal Subtype at Prof. Dr. Margono Soekarjo Regional General Hospital Purwokerto in 2021-2023" with the aim of determining the relationship between survival rate and luminal and non-luminal subtypes of breast cancer.

Methods

This study type used an observational analytical method. The data for this study used secondary sources, namely medical records of breast cancer patients at Prof. Dr. Margono Soekarjo Regional General Hospital Purwokerto. The study sample consisted of breast cancer patients at the Prof. Dr. Margono Soekarjo Regional General Hospital from 2021 to 2023 who met the inclusion criteria. The inclusion criteria in this study were patients diagnosed with breast cancer during the period of 2021-2023, with cancer subtype, metastasis, and immunohistochemistry. The exclusion criteria in this study were patients with incomplete medical records.

Results

This study was conducted in March-April 2023 at Prof. Dr. Margono Soekarjo Regional General Hospital Purwokerto. The sample size taken in this study was 84 research subjects. After data collection, the data were processed and analyzed using univariate and bivariate analysis.

Univariate analysis provided a description of the characteristics of the study subjects and the distribution of research variables.

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Table 1: Distribution of breast cancer subtypes

Subtype	Frequency (n)	Percentage
Luminal	51	60,7%
Non-Luminal	33	39,3%

	Total	84	100%

Table 1 shows that out of a total of 84 samples, 51 (60.7%) were luminal subtype and 33 (39.3%) were non-luminal subtype. The luminal subtype was found more frequently than the non-luminal subtype.

Table 2: Distribution of age in breast cancer subtypes

Age	Luminal	Non-Luminal	Total
30-39 years	8	6	7
40-49 years	19	10	29
50-59 years	15	11	26
>60 years	9	6	15
Total	51	30	84

Mean age : 49,88 years

The distribution of patient ages is shown in Table 2, with an average age of 49.88 years for breast cancer patients at Prof. Dr. Margono Soekarjo Regional General Hospital from 2021 to 2023.

The age range of 50-59 years had the highest occurrence of luminal subtype breast cancer, while the non-luminal subtype was most commonly found in the age range of 50-59 years.

Table 3: Distribution of breast cancer metastasis

Metastasis	Luminal	Non Luminal	Total
Without metastasis	18	8	26
Lung Metastasis	25	18	43
Bone Metastasis	3	1	4
Brain Metastasis	0	1	1
Lung, Brain Metastasis	1	0	1
Lung, Bone Metastasis	3	5	8
Lung, Liver Metastasis	1	0	1
Total	51	30	84

Table 3 shows the distribution of metastasis among the study subjects. There were 18 cases without metastasis in the luminal subtype and 8 cases without metastasis in the non-luminal subtype. While the most common metastasis site was the lungs, with 25 cases in the luminal subtype and 18 cases in the non-luminal subtype, followed by metastasis to other organs.

Bivariate analysis was performed to determine the relationship between breast cancer subtypes and survival time. Survival was categorized as "event" for deceased patients and "censored" for patients who were still alive.

Table 4: Survival of luminal and non-luminal breast cancer patients

Subtype	Event (n)	Censored (n)	Percentage
Luminal	24	27	52,9%
Non-Luminal	19	14	42,4%

Table 4 shows the distribution of breast cancer patients based on event status, with 43 deaths ("event") and 41 patients still alive ("censored"). The 3-year survival rate was 52.9% for luminal subtype patients and 42.4% for non-luminal subtype patients. The average survival rate for subjects 3 years after diagnosis was 48.8%.

The survival rate can be observed in Figure 1, which shows the survival time and survival rate for each subtype. During the same time period, the survival rate for the luminal subtype appears to be higher than the non-luminal subtype.
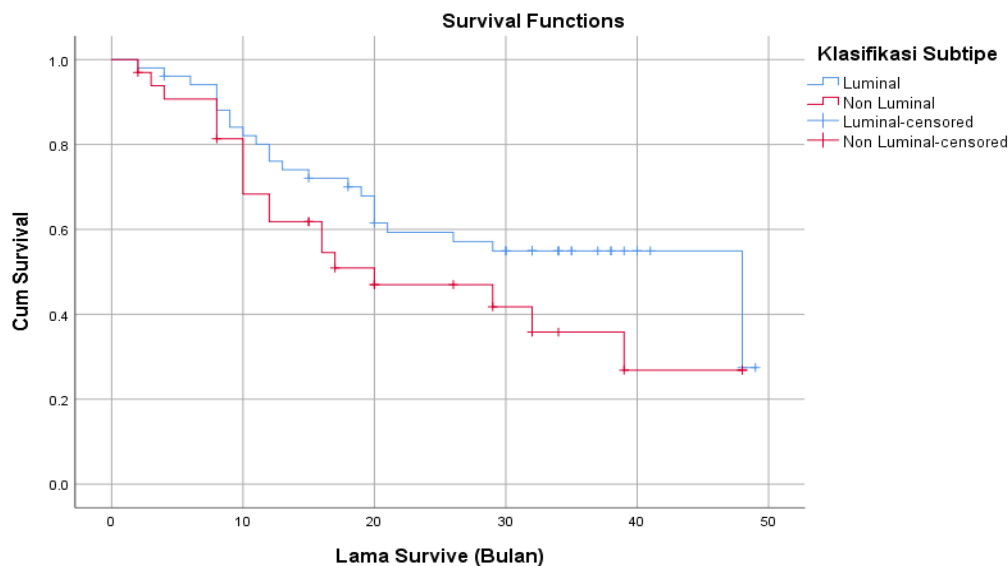

Figure 1: Breast cancer patient survival rate

Discussion

Luminal breast cancer is one of the most common subtypes of breast cancer. Luminal breast cancer occurs when cancer cells grow from cells that resemble epithelial cells in the milk ducts or breast lobules. This luminal subtype is defined by the presence of estrogen and/or progesterone hormone receptors on the surface of cancer cells. Luminal breast cancer expressing positive estrogen and/or progesterone hormone receptors typically has a better prognosis compared to other types of breast cancer that do not express these hormone receptors.[8]

Survival in luminal breast cancer, like other types of breast cancer, depends on various factors, including the cancer stage at diagnosis, response to treatment, age, overall health condition, and other personal risk factors. In the case of luminal breast cancer, the positive hormone receptor status can also affect the prognosis and survival of patients.[8]

The survival rate of patients with luminal subtype breast cancer can vary depending on various factors, including cancer stage, response to treatment, patient age, overall health condition, and other personal risk factors. Generally, luminal subtype breast cancer with positive hormone receptors has a better prognosis compared to other types of breast cancer that do not express these hormone receptors. According to the American Cancer Society, for stage I and II luminal breast cancer with positive hormone receptors, the five-year survival rate is around 90% or higher. However, if the cancer has spread to other tissues or organs (stage III and IV), the survival rate may decrease.[9]

Survival rates in luminal and non-luminal breast cancer have been extensively studied by researchers. In general, these studies show that patients with luminal subtype breast cancer have a better prognosis compared to patients with non-luminal subtype. Several factors that can influence prognosis and survival in breast cancer patients are tumor size, cancer stage, age, hormone receptor status, response to treatment, and genetic factors. Regarding cancer stage, which includes metastasis as one of the factors, it has been found that metastasis in breast cancer is often found in the lungs, bones, brain, and liver.[10]

Recent studies suggest that the use of targeted therapies such as hormone inhibitors or HER2-targeted therapy can improve survival in patients with luminal or non-luminal subtype breast cancer, depending on the tumor molecular profile and patient characteristics. However, further research is still needed to clarify the role of targeted therapy in luminal and non-luminal subtype breast cancer.[10]

Luminal and non-luminal breast cancer subtypes have distinct molecular characteristics. Luminal breast cancer is dominated by cancer cells that express estrogen and progesterone hormones, while non-luminal breast cancer does not express these hormones and is more often associated with overexpression of the HER2/neu protein or basal-like characteristics. These molecular characteristic differences impact the response to treatment and patient prognosis.[10]

The results of this study show that the survival rate of patients with luminal subtype breast cancer is higher than that of non-luminal subtype. This is because luminal breast cancer is more responsive to hormonal therapies such as hormone inhibitors and tamoxifen, as luminal cancer cells have estrogen and progesterone hormone receptors that can be inhibited by hormonal therapy. Additionally, luminal subtype breast cancer tends to have a lower cell proliferation rate, resulting in slower growth and development.[10]

Luminal breast cancer with positive hormone receptors typically has a better prognosis compared to other types of breast cancer that have negative hormone receptors. On the other hand, non-luminal breast cancer, such as HER2+, which express excess HER2 protein, can have a worse prognosis without appropriate treatment. Triple-negative non-luminal breast cancer, which does not express hormone receptors or HER2, can have a worse prognosis and be difficult to treat.[11]

Studies comparing both subtypes have shown that patients with luminal subtype breast cancer have a better prognosis compared to patients with non-luminal subtype. For example, a study conducted in the United States in 2014 showed that the average life expectancy of patients with luminal subtype breast cancer at an early stage (stage I or II) was around 91.3%, while the average life expectancy of patients with non-luminal subtype at the same stage was around 85.8%.[12]

While the research results show that the survival rate of patients with non-luminal subtype is lower compared to the luminal subtype, at 31.9%. Non-luminal breast cancer subtypes often have a higher cell proliferation rate and are more aggressive, making them more difficult to treat. Additionally, non-luminal subtypes also tend to have higher recurrence rates.[10]

As a general overview, the average survival rate for non-luminal breast cancer patients at an early stage (stage I and II) is around 80-90% within five years after diagnosis. However, at advanced stages (stage III and IV), the average survival rate tends to be lower, around 22% for stage III and around 5% for stage IV within five years after diagnosis.[12] It is important to remember that each patient is unique, and prognosis outcomes can vary depending on individual factors and response to treatment. Therefore, this should be a consideration for clinicians and patients in choosing treatment options and early detection.[9]

Conclusion

The survival rate of luminal subtype breast cancer patients is higher compared to non-luminal subtype. This is due to the biological differences between the two subtypes, including the presence of estrogen and progesterone hormone receptors in the luminal subtype, making it more responsive to hormonal therapy. On the other hand, the non-luminal subtype tends to be more aggressive and difficult to treat. Therefore, further review and understanding of the appropriate treatment for breast cancer patients with different subtypes are needed.

Recommendations

1. Further research is needed to investigate the factors influencing the survival rate in breast cancer patients with different subtypes.
2. Early detection, prognosis determination, and targeted treatment for luminal and non-luminal subtype breast cancer patients are necessary for comprehensive care in improving the survival rate.

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