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# Epidemiology of 10 Cancer Types in Indonesia: A Multicenter Study

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**Abstract**

**Introduction:** Cancer remains one of the largest contributors to the burden of health and mortality around the world. A study estimated 19.3 million new cases of cancer in the year 2020. Naturally, different sociodemographic and geographic characteristics will cause disparities in estimating cancer epidemiology. Since valid epidemiological data on cancer types in Indonesia remains unavailable, this study intended to provide data on the pattern of distribution of the 10 most common cancer types amongst various hospitals in Indonesia. **Methods:** This was a cross-sectional study through the collection of registries and/or medical records that were obtained from March to September 2022. The data were then sorted and analyzed using SPSS 20.0. **Results:** Most patients were female, age 51 years old, and from Jakarta. Regarding the cancer incidence, breast cancer, followed by cervical, nasopharyngeal, lung, and rectal cancer are the most common cancers in this study. **Conclusion:** This study showed the profile of cancer based on the multicenter study conducted by the Indonesian Radiation Oncology Society (IROS) with support from RCARO-IAEA. The data provides a reflection for policy and decision makers for their prompt action to promote the prevention, diagnosis, and treatment of cancers in Indonesia.

**Keywords:** *Epidemiology, Cancer, Indonesia, Multicenter Study*

## Introduction

In countries all around the world, cancer remains a hindrance in the effort to improve life expectancy. The World Health Organization (WHO) estimates that cancer is the first and second most common cause of death before the age of 70 years.[1] These were observed in 112 of 183 countries in 2019. The burden of this disease and its mortality is growing at an alarming rate worldwide. According to 2020 GLOBOCAN cancer statistics, 19.3 million new cases of cancer are estimated to occur in 2020 (18.1 million if nonmelanoma skin cancer were excluded) and 10 million cancer deaths to occur in 2020 (9.9 million if nonmelanoma skin cancer is excluded).[2] The most common cancer types include prostate, lung, and colorectal cancer in males, and breast, colorectal, and lung cancer in females. Certain types of cancer may be more common in certain geographic regions due to differences in socio-demographic factors, such as population age, income, and cancer-associated risk factors. Registries act as a valuable data source for cancer epidemiology, as their utilization could help identify specific and modifiable risk factors for cancers to inform the public of health interventions that may modify those said factors and reduce the burden of cancer.[3]

**Table 1. Characteristics of participants (n=30,614)**

| | Mean/Median | Number (n) | Percentage (%) |
|---|---|---|---|
| **Gender; n (%)** | | | |
| Female | | 22,731 | 74.3 |
| Male | | 7,785 | 25.4 |
| Unknown | | 98 | 0.3 |
| **Age** | | | |
| Mean±SD | 50.19 ± 14.81 | | |
| Median (Min-Max)* | 51.00 (0.30 – 96.00) | | |
| **Province; n (%)** | | | |
| Bali | | 49 | 0.2 |
| Banten | | 828 | 2.7 |
| Bengkulu | | 93 | 0.3 |
| DI Yogyakarta | | 1,635 | 5.3 |
| DKI Jakarta | | 4,665 | 15.2 |
| Gorontalo | | 34 | 0.1 |
| Jambi | | 97 | 0.3 |
| West Java | | 4,238 | 13.8 |
| Central Java | | 6,714 | 21.9 |
| East Java | | 3,256 | 10.6 |
| West Kalimantan | | 115 | 0.4 |
| South Kalimantan | | 31 | 0.1 |
| Central Kalimantan | | 61 | 0.2 |
| East Kalimantan | | 154 | 0.5 |
| North Kalimantan | | 18 | 0.1 |
| Bangka Belitung Islands | | 102 | 0.3 |
| Riau Islands | | 90 | 0.3 |
| Lampung | | 195 | 0.6 |
| Maluku | | 51 | 0.2 |
| North Maluku | | 36 | 0.1 |
| Nanggroe Aceh Darussalam | | 308 | 1.0 |
| West Nusa Tenggara | | 125 | 0.4 |
| East Nusa Tenggara | | 41 | 0.1 |
| Papua | | 56 | 0.2 |
| West Papua | | 45 | 0.1 |
| Mountains Papua | | 2 | 0.0 |
| South Papua | | 3 | 0.0 |
| Central Papua | | 6 | 0.0 |
| Riau | | 516 | 1.7 |
| West Sulawesi | | 22 | 0.1 |
| South Sulawesi | | 394 | 1.3 |
| Central Sulawesi | | 85 | 0.3 |
| South East Sulawesi | | 55 | 0.2 |
| North Sulawesi | | 554 | 1.8 |
| West Sumatra | | 339 | 1.1 |
| South Sumatra | | 438 | 1.4 |
| North Sumatra | | 4,395 | 14.4 |
| Not from Indonesia | | 10 | 0.0 |
| Unknown | | 754 | 2.5 |
| **Private vs Public Hospitals; n (%)** | | | |
| Private | | 6,265 | 20.5 |
| Public | | 24,349 | 79.5 |
| **Collected data** | | | |
| Whole hospital data | | 26,000 | 84.9 |
| Only from the radiotherapy department | | 4,614 | 15.1 |

Unfortunately, valid epidemiological data on varying types of cancers in Indonesia remains inexistent. The closest thing to epidemiological data that represents the whole Indonesian archipelago was from a 2021 study, in which data was obtained from a single National Referral Hospital of Indonesia instead of being obtained directly from the hospitals.[4] According to GLOBOCAN 2020 data, in both sexes combined, the top 10 cancer types are responsible for >60% of newly diagnosed cancer cases and more than 70% of cancer deaths. Hence, it becomes important to know the epidemiology of these types of cancer, as it can be the basis of policymaking and health intervention, as well as the development of cancer treatments in Indonesia. Aside from that, knowing the epidemiology of cancer could also be helpful in the effort to increase cancer treatment services, such as radiation.[5] Thereby, this study aims to provide a representation and distribution

**Table 2. Diagnosis and treatments**

|  | Results |
|---|---|
| **Diagnosis; n (%)** |  |
| Breast | 11,037 (36.1) |
| Cervical | 5,297 (17.3) |
| Nasopharyngeal | 2,513 (8.2) |
| Lung | 2,261 (7.4) |
| Rectal | 2,119 (6.9) |
| Leukemia | 2,038 (6.7) |
| Ovarian | 1,925 (6.3) |
| Lymphoma | 1,614 (5.3) |
| Colon | 1,211 (4.0) |
| Prostate | 599 (2.0) |
| **Radiotherapy treatment; n (%)** |  |
| Irradiated | 11,205 (36.6) |
| Not irradiated/unknown data | 19,409 (63.4) |
| **Total data** | **30,614 (100.0)** |
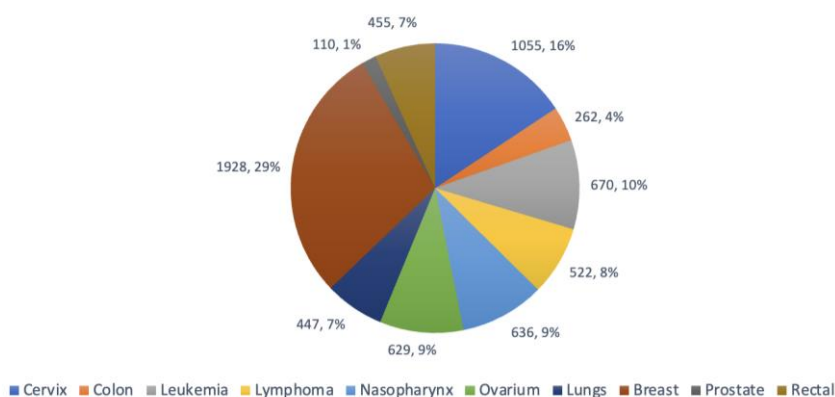


**Figure 1. Distribution of cases among patients from Central Java**
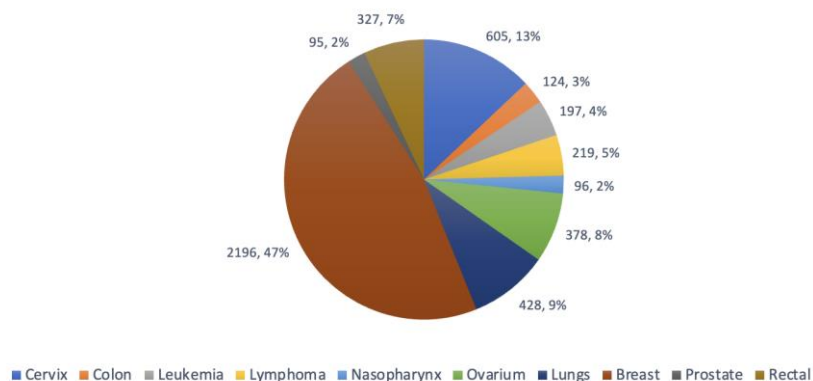


**Figure 2. Distribution of cases among patients from Jakarta**

pattern of 10 types of cancer in various hospitals in Indonesia.

**Method**

This was a retrospective study that utilized cancer registries and/or medical records from numerous radiotherapy centers around Indonesia in 2019. This paper was part of a research-themed "Indonesia Task Force for Radiation Oncology Access (INA-ROA)", under the research grant from the Regional Cooperative Agreement Regional Office (RCARO)-International Atomic Energy Agency (IAEA) with the theme of Closing the Gap in Radiotherapy Access in RCA Government Parties (RCA GPs). The data was collected from March to September 2022. The inclusion criteria for the data were all breast, cervical, lung, nasopharyngeal, colon, rectal, lymphoma, leukemia, ovarian, and prostate cancer patients recorded in cancer registries and/or medical records in radiotherapy centers. Due to time and resource restraints, only ten types of cancer were included in the study. The rationale for choosing the 10 types of cancer was the most
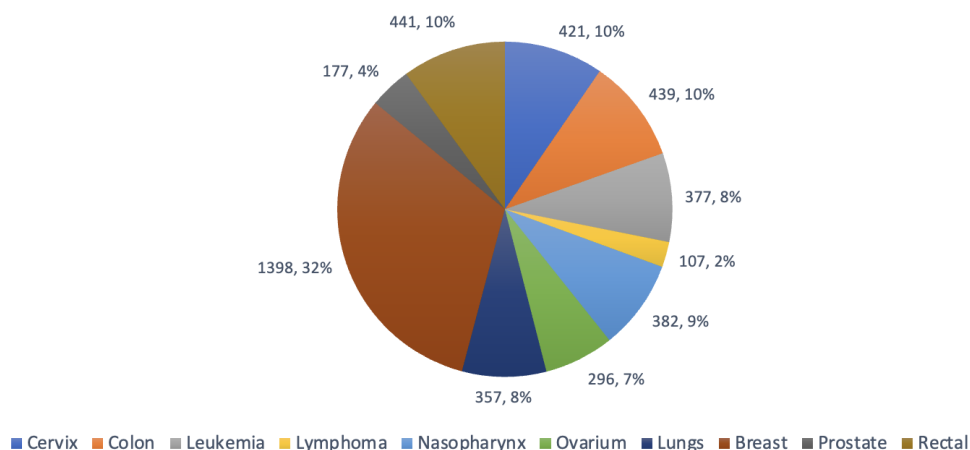
**Figure 3. Distribution of cases among patients from North Sumatra**

**Table 3. Stage distribution**

| Stage | n (%) |
|---|---|
| I | 685 (2.2) |
| II | 3,652 (11.9) |
| III | 3,952 (12.9) |
| IV | 3,321 (10.8) |
| Unknown | 16,366 (53.5) |
| Inapplicable | 2,638 (8.6) |
| **Total** | **30,614 (100.0)** |

common cancer with radiotherapy indication based on GLOBOCAN 2020 data. There were no exclusion criteria in the study. Before data collection, all centers participating in the study were briefed regarding data collection and informed consent to ensure the quality of the data. After data collection, double filtering was done using Indonesia's national identity number, medical record number, date of birth, and address to ensure that there were no duplicates. The analysis of demographic data was done using Microsoft Excel 365 and SPSS 20.0. The study adhered to the Declaration of Helsinki, cleared by the Ethical Committee of the Faculty of Medicine in Universitas Indonesia, with the Ethical Approval number:

1. KET-392/UN2.F1/ETIK/PPM.00.02/2022
2. KET-402/UN2.F1/ETIK/PPM.00.02/2022
3. KET-391/UN2.F1/ETIK/PPM.00.02/2022
4. KET-388/UN2.F1/ETIK/PPM.00.02/2022
5. KET-454/UN2.F1/ETIK/PPM.00.02/2022

**Result**

The demographic data of 10 types of cancer patients in Indonesia shows that most of the cancer patients are female (74.3%), the average age at 51 (0.30-96.00) years old, and most are concentrated in Jakarta (15.2%). Most of the cancer patients went to public hospitals (79.5%). Unfortunately, only 36.6% of the patients received radiotherapy treatment and the rest remains not irradiated/unknown data.

In Indonesia, the 10 types of cancers, ranked the most common are breast (36.1%), cervical (17.3%), nasopharyngeal (8.2%), lung (7.4%), rectal (6.9%), leukemia (6.7%), ovarian (6.3%), lymphoma (5.3%), colon (4.0%), and prostate (2.0%).

In Central Java, the most common cancer amongst 6,714 patients is breast cancer (29%), followed by the cervix (16%), leukemia (10%), nasopharynx (9%), ovarium (9%), lymphoma (8%), rectal (7%), lungs (7%), colon (4%), and prostate cancer (1%).

In Jakarta, the most common cancer amongst 4,665 patients is breast cancer (47%), followed by the cervix (13%), lungs (9%), ovarium (8%), rectal (7%), lymphoma (5%), leukemia (4%), colon (3%), nasopharynx (2%), and prostate cancer (2%).

Lastly, in North Sumatra, the most common cancer amongst 4,395 patients is breast cancer (32%), followed by cancers of the rectum (10%), colon (10%), cervix (10%), nasopharynx (9%), leukemia (8%), lungs (8%), ovarium (7%), prostate (4%), and lymphoma (2%).

Amongst the known staged patients, the stage that was most densely populated was stage III cancer.

Although most (53.5%) of the patients' cancer staging was unknown.

## Discussion

In Indonesia, the two most common types of cancer among the two sexes were breast and cervical cancer. This differs from the global most common type of cancer which according to GLOBOCAN 2020 data is breast cancer, followed by lung, prostate, nonmelanoma of skin, colon, stomach liver, rectum, cervix, and uterus cancer.[2] In 2021, a single-centered study was conducted by deriving their data from Cipto Mangunkusumo Hospital which is the National Referral Hospital. The result of the study provides an existing locally sourced estimate that ranked the top 10 cancer incidences for males and females. In the male, it was cancer of the nasopharynx, hematopoietic and reticuloendothelial systems, skin, lymph nodes, liver and intrahepatic bile ducts, rectum, cancers of the bones, joints, and articular cartilage, prostate gland, cancers of connective, subcutaneous, and other soft tissues, and at the lowest rank was cancer of the bronchus and lung. In females, the most common cancer is cancer of the cervix uteri, breast, ovary, hematopoietic and reticuloendothelial systems, thyroid gland, lymph nodes, nasopharynx, corpus uteri, skin, and rectum.[4]

As we can see here, rather than the global estimates, the ranking of cancer amongst females in the National Referral Hospital more resembles the ranking in this study. As the data were derived from the National Referral Hospital, it means that the obtained data should in theory represent the entire nation. Although in real life there may be unprecedented factors that may cause biases in the data, such as different access of different regions to the National Referral Hospital which is in the capital city of Jakarta. Regions or populations with poor access to health could result in underreported cancer cases that may be more prevalent in regions with the poorest access to the national hospital. Secondly, the cases that were represented at the National Referral Hospital are more inclined to advanced cancer cases instead of the most prevalent cancer. Therefore, the current study took data from different types of hospital, not exclusively the national referral hospital. Other limitations may be duplicate admission which could raise problems when it comes to the determination of incidence and prevalence rates.[6] To minimize duplication in this study, prevention steps have been taken. The listed participant data were arranged according to demographic data. Duplicated data then were deleted. These worries were proven in our study, in which different regions have different top 10 rankings of cancer cases as shown in figures 1 to 3. Hence, our study was able to obtain what the previous study was not able to, that is to provide more valid and accurate numbers that represent each region from multi-centers compared to a more generalized estimate from a single-centered approach.

This study showed that Central Java, Jakarta, and North Sumatra have the highest cancer participants in the provinces. The result is different compared to the Indonesia Report on Results of National Basic Health Research (RISKESDAS) 2018, where DI Yogyakarta, West Sumatra, and Gorontalo had the highest number of cancer patients.[7] This might be a result of distinct data collection methods, where RISKESDAS includes cancer patients from all health care facilities. However, the current top 3 province's most prevalent cancer type is in line with Indonesian GLOBOCAN 2018 data with breast cancer dominance in both sexes.[8] Explanations might be related to the true increase in breast cancer incidence or its detection. Several cancer risk factors, including unbalanced diet, obesity, and smoking, are known to be high and keep inclining.[9–11] This may affect the real number of breast cancer. Indonesia also had been promoting early detection programs which may lead to increased awareness and health-seeking behavior, which then leads to an increase in breast cancer detection.[12]

From three major regions in Indonesia, there seems to be an ominous trend that breast cancer is the most common cancer type. This trend could be seen in women all around the world, as is shown in the GLOBOCAN 2020 database as well as the official databases of the World Health Organization (WHO) and the American Cancer Society.[13] This again reflects that breast cancer remains an important problem to be highlighted. This serves as a reflection to increase awareness of risk factors as preventive measures to minimize incidence, as well as to improve public knowledge on early signs to increase screening and employ early and prompt treatment to reduce mortality. This number is also important for policymakers in Indonesia to increase access to treatment.

The United States Cancer Statistics (USCS) showed that annually new cancers of the breast, prostate, skin melanoma, kidney, and renal pelvis cancers were mostly diagnosed at stage II (localized). Lung cancer, on the other hand, was mostly diagnosed at stage IV (distant spread). The stages of cancer at diagnosis are particularly important and are a significant determining factor in the 5-year survival rate. Previous studies in the National Referral Hospital of Indonesia, where advanced stages (III and IV) are the most prevalent stage at diagnosis.[4] As seen in Table 3, most cancers in this study were found to be in stage III. This stage, undoubtedly, proves to be a challenge for treatment and prognosis. To put matters into perspective, the CDC estimates a 26% reduction in the 5-year survival rate of lung cancers found at stage III compared to cases found at stage II.[14] This reflects to increase in screening efforts as delays in time-to-treatment initiation may increase patient mortality.[15] Several factors contribute to the later cancer identification. Patient socioeconomic background, for example, lower income, is associated with delay in diagnosis. Although Indonesia has applicate national universal health coverage for years, other expenses, for example for transportation and accommodation, is considered financial burden that prevent patient from seeking help. Patients with affluent backgrounds might have less access to health awareness and family support.[12,16] Researchers also found that some patients underestimate the preceding symptoms until daily activity limitations occur and seek medical help at an advanced stage.[12,17] A qualitative study determined several barriers, including insufficient community awareness of early detection, patients' lack of urgency in seeking medical attention, restricted access to healthcare facilities, and healthcare providers' uneven adherence to recommendations for screening and diagnostic procedures.[18]

In terms of radiotherapy as one of the treatment modalities, based on the survey, not all patients were irradiated. In Indonesia, based on RISKESDAS 2018, only 17.3% of cancer patients were treated with radiotherapy.[7] Radiotherapy prescription is affected by the implemented guidelines in the cancer center. For instance, based on the National Referral Hospital of Indonesia guideline for colorectal cancer, radiotherapy is exclusively prescribed for rectal cancer.[19,20] In contrast, the NCCN Guidelines for Colon Cancer and Rectal Cancer have broader application of irradiation.[21,22] Even though radiotherapy is prescribed, in developing countries, additional elements include cost, diagnostic imaging availability, and suitable surgery, the geography of the nation, physicians' and patients' lack of awareness, and cultural convictions and turning to conventional medical methods also play a role in the non-irradiated/unknown group; however, the study's focus was not on these elements.[23] Some notes should be taken into account. In this study, not all centers provided whole hospital data (only provided data from the radiotherapy department), which may cause an over/underestimate of the current data. Moreover, this report did not perform a subgroup analysis of the not-irradiated/unknown data. The full version of the radiotherapy utilization analysis will be provided in the follow-up study/publication.

As a recommendation for future studies, more sociodemographic data of patients need to be obtained to elucidate the population and factors at risk that may affect their access to health that leads to the detection of these cases, so those hidden populations can be highlighted and given appropriate attention.

## Conclusion

The highest cancer incidence was found in Central Java, Jakarta, and North Sumatra. A trend that seems to be a universally ominous presence is the incidence of breast cancer which remains on top in cancer among women. Radiotherapy is facing challenges in its utilization, either from healthcare facilities or providers and patients themselves. The dominance of advanced-stage diagnosis in the current study indicates the urge for early detection. Therefore, this study provides a reflection for crucial policy and decision-makers in Indonesia to improve preventive, diagnostic, and treatment efforts for the top 10 cancer types in Indonesia.

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