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Profile of Cancer Patients Referred for Radiotherapy in West Kalimantan: A Hospital-Based Descriptive Study at RSUD Dr. Soedarso Pontianak in 2024

Uray Ria Aprini*, Rendhy Tito Apreza
RSUD Dr. Soedarso, Indonesia
Email: riaprini@gmail.com*

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cancer profile; radiotherapy utilization; breast cancer; demographic characteristics; healthcare access.

Abstract

Cancer remains a major global health burden, with increasing incidence and mortality rates, particularly in developing countries such as Indonesia. Despite its essential role in cancer management, data regarding radiotherapy utilization in West Kalimantan are still limited. This study aims to describe the demographic and clinical profile of cancer patients referred for radiotherapy at RSUD Dr. Soedarso Pontianak in 2024. A quantitative descriptive study with a retrospective design was conducted using total sampling of 369 patients. Data were collected from medical records and analyzed descriptively using frequency distributions and percentages. The variables analyzed included sex, age group, region of origin, and cancer diagnosis. The results showed that the majority of patients were female (70%), with the most common age group being 41–49 years (32.8%). Most patients originated from Pontianak (28%), followed by Kubu Raya and Sintang. The most common cancer diagnosis was breast cancer (27%), followed by cervical cancer (26%) and nasopharyngeal cancer (18%). These findings highlight the predominance of female-related cancers and the influence of geographic accessibility on radiotherapy utilization. In conclusion, the profile of cancer patients referred for radiotherapy in this hospital is dominated by middle-aged women with breast cancer, emphasizing the need for improved cancer screening, early detection programs, and equitable access to radiotherapy services in West Kalimantan.

INTRODUCTION

Cancer is a disease characterized by uncontrolled proliferation of abnormal cells that can invade surrounding tissues and metastasize to distant organs. In 2020, the WHO declared cancer the leading cause of death worldwide, causing nearly 10 million deaths in 2020, or nearly one in six deaths globally (World Health Organization [WHO], 2025).

According to the International Agency for Research on Cancer (IARC), Indonesia recorded 408,661 new cancer cases and 242,988 cancer-related deaths in 2022, with a five-year cancer prevalence of 1,018,110 cases. In terms of sex distribution, women contributed a higher number of new cancer cases (220,266 cases), whereas cancer-related mortality was higher among men (128,740 deaths) (International Agency for Research on Cancer [IARC], 2022).

Efforts to strengthen cancer prevention, early detection, and access to treatment have been undertaken; however, their implementation remains uneven, leading to disparities in

survival outcomes, particularly in developing countries. In addition to causing premature death and morbidity, cancer contributes substantially to the loss of productive life years due to disability, measured by Disability-Adjusted Life Years (DALYs). In 2021, cancer accounted for approximately 7.38% of total DALYs in Indonesia compared to other diseases (Kementerian Kesehatan Republik Indonesia [Kemenkes RI], n.d.).

Healthcare expenditure for cancer under BPJS Kesehatan continues to rise and currently represents the second largest health spending category after cardiovascular disease. Funding for cancer treatment increased from IDR 3.1 trillion in 2020 to IDR 5.9 trillion in 2023, reflecting nearly a 50% increase. Government initiatives are expected to play a crucial role in addressing the projected rise in cancer burden. Nonetheless, survival studies in Indonesia remain limited, partly due to the lack of integration between cancer registry and mortality data. With ongoing system improvements, routine survival evaluation is anticipated to become more feasible in the future (Kementerian Kesehatan Republik Indonesia [Kemenkes RI], n.d.).

West Kalimantan Province is located in the western part of Borneo Island and is the second largest province in Indonesia after Central Kalimantan Province. West Kalimantan Province is one of the Indonesian provinces that shares a direct border with a foreign country, namely the State of Sarawak, East Malaysia. In fact, due to this location, West Kalimantan is the only province on the island of Kalimantan that officially has three Border Crossing Posts. These geographic features may influence healthcare access and referral pathways, particularly for specialized oncology services (Profil Kesehatan, n.d.).

Cancer prevalence data in West Kalimantan Province, based on physician diagnosis from the National Basic Health Survey (*Riskesdas*), showed an increase between 2013 (0.8 per 1,000 population) and 2018 (1.55 per 1,000 population) (Riskesdas, 2018). Despite the increasing burden of cancer, radiotherapy utilization and related service-level data in West Kalimantan remain limited. This is concerning given that radiotherapy constitutes a principal modality in cancer management, with approximately 50–70% of patients requiring radiation therapy at some point during the course of their disease (Abdel-Wahab et al., 2024).

The urgency of this research is underscored by the recent development of *RSUD* Dr. Soedarso Pontianak. In January 2025, the hospital inaugurated a new Molecular Theranostic Nuclear Medicine Installation (Hanggara et al., 2025; Syaekhu et al., 2025). This facility represents a major advancement in diagnostic and therapeutic capabilities for cancer. However, the installation of advanced technology is not sufficient. Effective utilization requires a clear understanding of the patient population it is intended to serve (Davis et al., 2021; Elshaug et al., 2017). This study provides the necessary baseline demographic and clinical profile to ensure these new resources are deployed effectively.

The novelty of this study lies in its specific geographic and clinical focus. It is the first hospital-based descriptive study to provide a detailed breakdown of sex, age, region of origin, and primary cancer diagnosis for all 369 patients referred for radiotherapy at the sole referral center in West Kalimantan in 2024. By mapping patient origins, this research quantifies the potential impact of distance decay on healthcare access in this remote province. By detailing the most common diagnoses, it provides specific targets for regional screening and early detection programs.

To date, no study has thoroughly evaluated cancer patients undergoing radiotherapy in this region. This preliminary study highlights the limited availability of comprehensive data

characterizing cancer patients receiving radiotherapy in this region. To address this evidence gap, the present study systematically analyzes key demographic and clinical variables including sex, age distribution, region of origin, and cancer diagnosis among patients undergoing radiotherapy. Further studies incorporating stage at diagnosis, treatment patterns, clinical outcomes, and access barriers are warranted to comprehensively assess radiotherapy needs and strengthen cancer care delivery in the region.

RESEARCH METHODS

This study conducted a quantitative descriptive study, retrospective design using a total sampling of 369 patients referred to radiotherapy installation to receive radiation therapy on January to December 2024 at RSUD dr. Soedarso Pontianak. The inclusion criteria are all patients that are referred to radiotherapy installation, while the exclusion criteria were patients who had incomplete medical records. The data variables analyzed were gender, age range, region of origin, and cancer diagnosis which were collected via medical records. Data analysis was performed descriptively using secondary data, which were processed using frequency distribution and percentage statistics with Microsoft excel. The results were used to draw conclusions regarding profile of cancer patients referred for radiotherapy at RSUD Dr. Soedarso Pontianak in 2024.

RESULT AND DISCUSSION

Distribution of Cancer Patients by Sex

A total of 369 patients were referred to the radiotherapy facility in 2024. The majority of patients were Female which up to 70%. The predominance of female patients in this study is largely attributable to the high prevalence of breast and cervical cancers, on this study which predominantly affect women and is consistent with the result new incidence cases of cancer Indonesia from GLOBOCAN 2022 data which showed that the most common case was female with the most common diagnose was breast cancer (International Agency for Research on Cancer [IARC], 2022). These findings also supported by the data from 2018 Riskesdas West Kalimantan Report which stated that cancers most happened in female (Riskesdas, 2018). The disparity in breast cancer incidence between men and women is also largely influenced by hormonal factors, as breast tissue in women is highly responsive to hormonal stimulation, particularly during critical periods of development. Furthermore, mutations in the BRCA1 and BRCA2 genes, which are more frequently detected in women, contribute to the higher occurrence of breast cancer among females compared to males (Anggada et al., 2025).

The American Cancer Society 2025 statistics publications shows the incidence of many common cancers continues to increase, particularly among women. Among individuals younger than 50 years, cancer incidence in women rose from being 51% higher than in men in 2002 to 82% higher in 2021 (Siegel et al., 2025).

The findings from Andalas University Hospital suggest that the gender-based distribution of cancer types is one of the main reasons why radiotherapy visits are predominantly made by female patients. The notably high proportion of breast cancer among women, accounting for more than half of all female cases, substantially increases the demand for radiotherapy, as radiation therapy is a key component in breast cancer management. In addition, cervical cancer, as the second most common diagnosis among female patients, further

contributes to the high utilization of radiotherapy services by women. Therefore, the predominance of female-specific cancers, particularly breast cancer, serves as an important explanatory factor for the higher number of radiotherapy visits among women at the hospital (Hanggara et al., 2025).

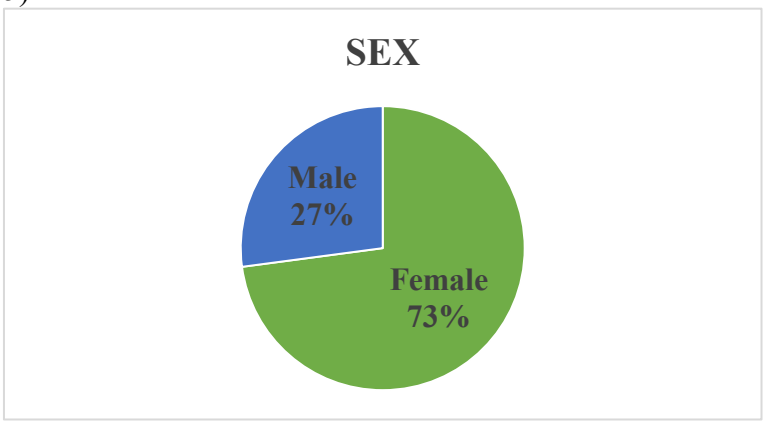

Figure 1. Distribution of Cancer Patients by Sex

Distribution of Cancer Patients by Age Range

In this study, the majority of patients referred to radiotherapy were women, with the highest proportion in the 41–49-year age group, and breast cancer as the most common diagnosis. This pattern is consistent with the epidemiological profile of cancer in Asian populations, where breast cancer is the leading malignancy among women and often presents at a younger age compared to Western countries (Chotai et al., 2025).

Previous studies have reported that the prevalence of breast cancer among Asian women peaks approximately a decade earlier, with the most affected age group being 40–50 years, whereas in Western populations, the peak incidence occurs at 60–70 years. Incidence data from East Asian countries showed that breast cancer incidence peaked at ages 45–49 years and declined or stabilized thereafter, contrasting with the exponential increase in incidence with age observed among non-Hispanic white women in the United States, where the highest incidence was found in women aged 75–79 years. Furthermore, the proportion of young breast cancer patients is higher in Asian populations, with studies reporting that up to 15–20% of breast cancer cases occur in women under 40 or 50 years of age, compared to approximately 5–7% in developed Western countries (Chotai et al., 2025).

The predominance of women aged 41–49 years in this study may reflect the earlier onset of breast cancer in Asian populations, influenced by demographic, hormonal, and lifestyle factors, as well as differences in screening practices. In Indonesia, population-based breast cancer screening programs are limited, and many cancers are detected when symptoms become clinically apparent, often during middle adulthood. This age group also represents individuals in their productive years, and cancer diagnosis at this stage may have significant socioeconomic and psycho-social consequences, including reduced work productivity, financial burden, and impact on family roles and quality of life. It is possible that increased screening for and detection of Lynch syndrome (higher risk of colorectal and uterine cancers), BRCA1 and BRCA2 (higher risk of breast and ovarian cancers) and other genetic variants could have increased cancer surveillance in high-risk individuals, which could result in earlier cancer diagnoses and increasing rates over time in younger age groups (Shiels et al., 2025).

A national increase in obesity has been hypothesized to be a contributor to increasing early onset cancer rates in the U.S. and worldwide, as well as increases at older ages. Obesity rates among young and mid-life adults have increased substantially over time in the U.S. Obesity is a risk factor for seven of the cancer types with increasing rates in early onset age groups such as colorectal, kidney, uterine, pancreatic, stomach, cervical cancers and myeloma with population attributable fractions in 2019 ranging from 5.3% of colorectal cancers to 53.1% of uterine cancers (Shiels et al., 2025).

The incidence of many types of early-onset cancer (in those ≤50 years of age) has increased in many countries. The reasons for this phenomenon are not entirely clear but likely relate to changes in risk factor exposures in early-life and/or young adulthood from the mid-20th century onwards. The increased consumption of highly processed or westernized foods, changes in lifestyles, the environment, morbidities, and other factors might all have contributed to such changes in exposures. Therefore, although available data on the incidence of early-onset cancers in low and middle-income countries are currently limited, the rise of early-onset cancers will likely be increasingly prominent in those countries, potentially leading to a global early-onset cancer pandemic (Ugai et al., 2022). Based on data from the Research and Development Agency (Litbangkes) of the Ministry of Health of the Republic of Indonesia, unhealthy lifestyle patterns and poor dietary habits, particularly low intake of fruits and vegetables, have significantly contributed to increased cancer susceptibility among individuals aged 35–54 years, an age group considered at elevated risk for cancer development (Hanggara et al., 2025).

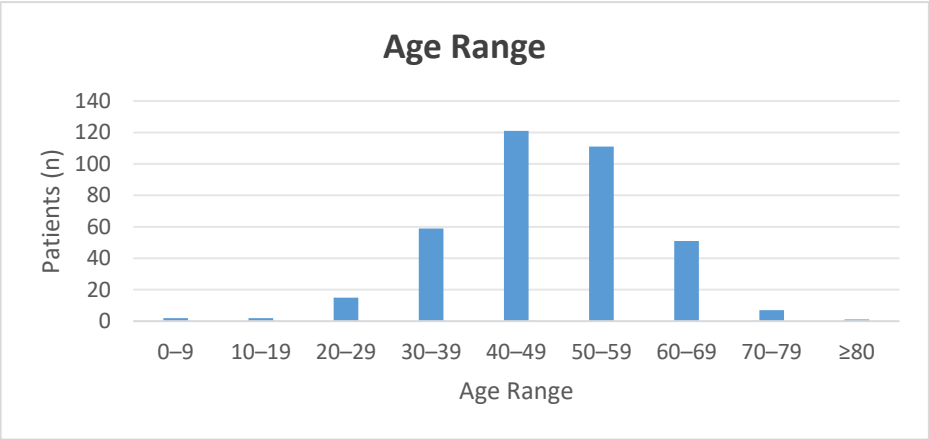

Figure 2. Distribution of Cancer Patients by Age Range

Distribution of Cancer Patients by Region of Patients' Residences

Among 369 patients, the largest proportion resided in Pontianak (28%), followed by Kubu Raya Regency (16%) and Sintang Regency (9%). Pontianak is the capital city of West Kalimantan, and radiotherapy services in the province are currently available only at RSUD dr. Soedarso Pontianak, which is located in Pontianak. The concentration of patients from Pontianak likely reflects greater geographic accessibility to the only radiotherapy facility in the province.

Distance to healthcare facilities is a critical determinant of service utilization, as increasing travel distance may act as a barrier to accessing care (Gupta et al., 2025). In this study, regencies located nearer to Pontianak, such as Kubu Raya (51 km) and Mempawah (67 km) demonstrated higher representation among patients compared with more distant regencies including Sintang (395 km), Melawi (439 km), Ketapang (354 km), and Kapuas Hulu (673

km). Travel from these remote areas may require several hours to days depending on infrastructure and transport availability. Such distances exceed thresholds reported in prior studies where distance decay effects begin to significantly reduce healthcare utilization.

Evidence indicates that distance decay can occur at relatively short distances. Studies from the United States reported reduced healthcare utilization beginning at 10 miles (16.1 km), particularly among patients receiving radiotherapy after breast-conserving surgery and older adults seeking primary care. Conversely, distance decay has also been observed at distances of 90–100 km or travel times exceeding 30–60 minutes, especially among patients requiring specialist services such as breast cancer, metastatic colorectal cancer, psychiatric care, acute myocardial infarction treatment, and *pediatric* trauma care. A French study further noted that distance decay was more pronounced in early-stage colon cancer patients than in those with advanced disease (Mseke et al., 2024).

Overall, most studies confirm that patient attendance declines as travel distance or time increases. Factors such as age, socioeconomic status, gender, geographic remoteness, climate, ethnicity, and transportation barriers, including travel costs and limited public transport further influence healthcare utilization. Rural residents are consistently shown to experience stronger distance decay effects than urban populations, partly due to lower health literacy and fewer financial resources. The financial burden of long-distance travel, including fuel, food, accommodation, and lost income, may make accessing healthcare services particularly challenging for individuals from rural and low socioeconomic backgrounds (Mseke et al., 2024).

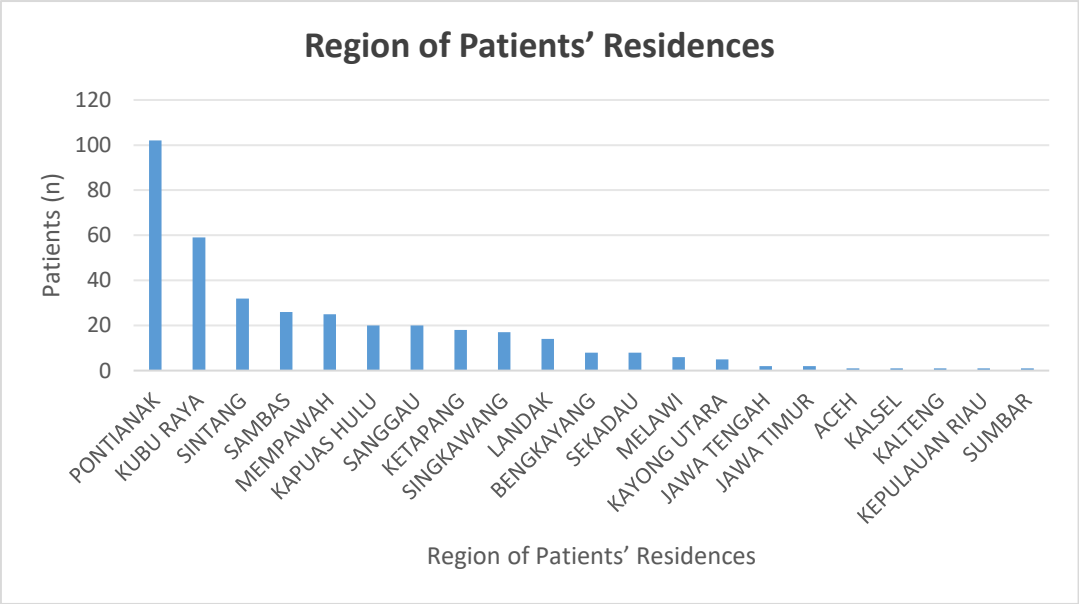

Figure 3. Distribution of Cancer Patients by Region of Patients' Residences

Distribution of Cancer Patients by Patients Diagnosis

This study showed that the highest number of cases was breast cancer, accounting for 98 cases (27%), followed by cervical cancer with 97 cases (26%), and nasopharyngeal cancer with 66 cases (18%). These results are consistent with data from GLOBOCAN 2022, which reported that breast cancer was the most commonly diagnosed cancer worldwide. Furthermore, data from the International Agency for Research on Cancer (IARC) in 2022 indicated that

breast cancer was the most common cancer among females in Indonesia, followed by cervical cancer. Breast cancer also ranked first as the most commonly diagnosed cancer across both sexes globally (International Agency for Research on Cancer [IARC], 2022).

Breast cancer (BC) is a multifactorial disease influenced by both non-modifiable and modifiable risk factors. Female sex and advancing age remain the strongest non-modifiable determinants, with incidence peaks observed at 40–60 years and again at ≥85 years old. Genetic predisposition accounts for approximately 5–10% of cases, primarily due to BRCA1 and BRCA2 mutations, while a positive family history independently increases risk. Reproductive and hormonal factors such as early menarche, late menopause, nulliparity, and delayed first childbirth further elevate risk, likely through prolonged lifetime oestrogen exposure (Youn & Han, 2020).

Among modifiable factors, obesity plays a central role, particularly in postmenopausal women, as adipose tissue becomes the primary source of oestrogen. Elevated BMI, physical inactivity, diabetes, and hypertension have all been associated with increased incidence and mortality, suggesting shared metabolic and inflammatory pathways. Dietary patterns may also contribute, with plant-based diets potentially protective and high-fat, high-sugar, and processed meat consumption associated with higher risk. Additionally, long-term tobacco exposure has been linked to increased breast cancer risk (Youn & Han, 2020).

Overall, the high proportion of female patients and breast cancer cases in this study underscores the increasing burden of breast cancer and the critical role of radiotherapy in its management. These findings highlight the need for strengthened breast cancer screening programs, early detection strategies, and adequate radiotherapy resources to improve cancer outcomes in West Kalimantan.

Several risk factors are associated with the development of cervical cancer. In addition to persistent infection with Human Papillomavirus (HPV) as the primary cause, risk is also influenced by long-term use of hormonal contraception, high parity, and early age at marriage. Hormonal contraceptive use may increase the susceptibility of cervical epithelial cells to HPV infection. High parity is linked to repeated cervical trauma that may facilitate malignant transformation (Oktora et al., 2025).

The aetiology of nasopharyngeal carcinoma (NPC) is multifactorial, with Epstein-Barr virus (EBV) recognized as the principal etiological agent, although additional environmental and genetic factors contribute to disease development. Established risk factors include increasing age, male sex, genetic susceptibility, geographic distribution, occupational and environmental exposures, and socioeconomic conditions (Mujaddid et al., 2025). The incidence rises after 30 years of age, peaks between 40–60 years, and declines after 60 years (Syaekhu et al., 2025).

Dietary factors are strongly implicated, particularly frequent consumption of salt-preserved foods such as salted fish, smoked meat, and salted vegetables, which contain high levels of nitrosamines and nitrates with carcinogenic potential. Tobacco smoking, alcohol consumption, and exposure to environmental carcinogens further increase risk, potentially acting synergistically with EBV infection in promoting carcinogenesis (Syafira et al., 2025).

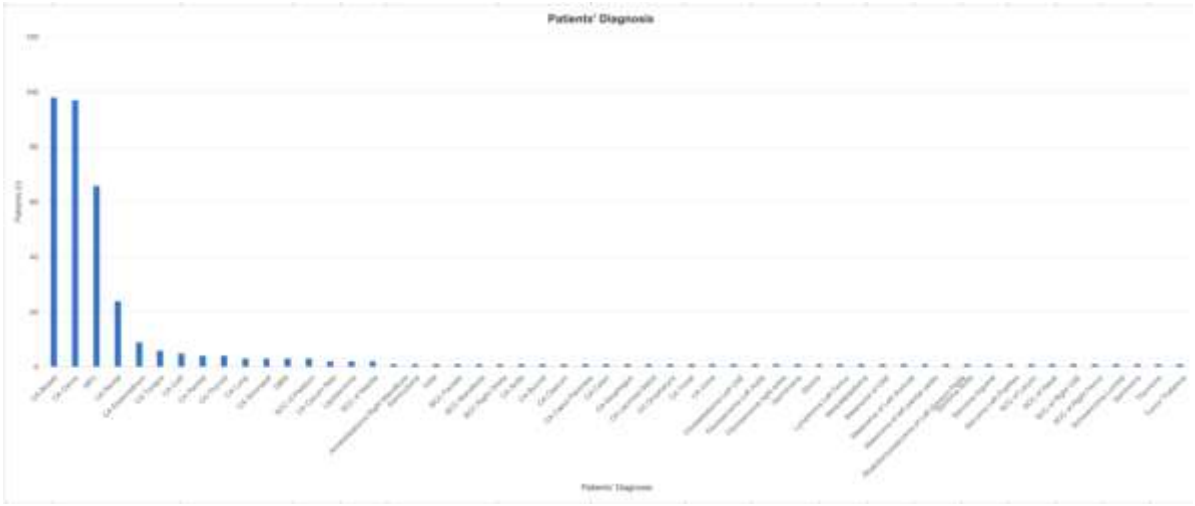

Figure 4. Distribution of Cancer Patients by Patients' Diagnosis

CONCLUSION

This descriptive study of 369 cancer patients referred for radiotherapy in 2024 provides the first detailed baseline profile of the population utilizing the sole radiotherapy facility in West Kalimantan. The analysis reveals that the typical patient is a middle-aged woman (41-49 years) diagnosed with breast cancer, originating from Pontianak City or its immediate neighbouring regencies. The predominance of female cancers (breast and cervical) is striking, accounting for over half of all referrals. Furthermore, the strong geographic gradient in patient origin demonstrates a significant "distance decay" effect, where proximity to the hospital in Pontianak is a major determinant of access to radiotherapy services. Based on these findings, several recommendations for future research, practice, and policy are proposed. For future research, studies should incorporate a prospective design to capture critical clinical data such as cancer stage at diagnosis, treatment intent (curative vs. palliative), and completion rates. A formal, population-based study to calculate the actual Radiotherapy Utilization Rate (RUR) for specific cancers (e.g., breast, cervical) is urgently needed to quantify the true unmet need in the province. For clinical practice and policy, this study provides a strong evidence base to: (1) Urgently expand and promote targeted screening programs for breast and cervical cancer, particularly for women in the 40-49 year age group; (2) Investigate and develop targeted interventions to mitigate geographic barriers, such as patient navigation programs, subsidized accommodation near the hospital, or telemedicine follow-up services; and (3) Leverage this data to advocate for an equitable distribution of radiotherapy resources and specialist workforce to ensure that the new Nuclear Medicine facility can be accessed by all who need it, not only those who live nearby.

REFERENCE

Abdel-Wahab, M., Giammarile, F., Carrara, M., Paez, D., Hricak, H., Ayati, N., Audisio, R. A., Bjelac, O., Gospodarowicz, M., Hande, V., Holmberg, O., Jaffray, D., Khader, J., Kunkler, I., Lievens, Y., Mikhail-Lette, M., Mahuwala, A. A., Pomper, M. G., Rosa, A. A., ... Scott, A. M. (2024). Radiotherapy and theranostics: A Lancet Oncology Commission. *The Lancet Oncology, 25*(11), e545–e580. https://doi.org/10.1016/S1470-2045(24)00407-8

Anggada, S. P., Irawiraman, H., & Hasanah, N. (2025). Profil penderita kanker di RSUD Aji Muhammad Parikesit Tenggarong Kalimantan Timur. *Jurnal Ilmu Kedokteran dan Kesehatan, 12*(2), 332.

Chotai, N., Renganathan, R., Uematsu, T., Wang, J., Zhu, Q., Rahmat, K., Pradaranon, V., Fong, J. C., Choridah, L., & Chang, J. M. (2025). Breast cancer screening in Asian countries: Epidemiology, screening practices, outcomes, challenges, and future directions. *Korean Journal of Radiology, 26*(8), 743–758. https://doi.org/10.3348/kjr.2025.0338

Davis, A. C., Chen, A., Osuji, T. A., Chen, J., & Gould, M. K. (2021). Defining complex patient populations: Implications for population size, composition, utilization, and costs. *Journal of General Internal Medicine, 37*(2), 351.

Elshaug, A. G., Rosenthal, M. B., Lavis, J. N., Brownlee, S., Schmidt, H., Nagpal, S., Littlejohns, P., Srivastava, D., Tunis, S., & Saini, V. (2017). Levers for addressing medical underuse and overuse: Achieving high-value health care. *The Lancet, 390*(10090), 191–202.

Gupta, A., Kiran, T., Pablo, L. A., Pinto, A., Frymire, E., Gozdyra, P., Khan, S., Green, M. E., & Glazier, R. H. (2025). Distance to primary care and its association with health care use and quality of care in Ontario: A cross-sectional study. *CMAJ, 197*(37), E1214–E1223. https://doi.org/10.1503/cmaj.250265

Hanggara, M. A., Hanum, F. J., & Adrial. (2025). Characteristics of cancer patients enrolled for radiotherapy in Andalas University Hospital. *Frontiers in Healthcare Research, 2*(1), 15–23. https://frontiersonhealthcare.org/index.php/id/article/view/44

International Agency for Research on Cancer. (2022). *Cancer today: Indonesia fact sheet (GLOBOCAN 2022).* World Health Organization. https://gco.iarc.fr/today

Kementerian Kesehatan Republik Indonesia. (n.d.). *Profil kesehatan Indonesia.* [Lengkapi dengan tahun, penerbit, dan URL]

Mseke, E. P., Jessup, B., & Barnett, T. (2024). Impact of distance and/or travel time on healthcare service access in rural and remote areas: A scoping review. *Journal of Transport & Health, 37*, 101819. https://doi.org/10.1016/j.jth.2024.101819

Mujaddid, I., Pratama, A. A., & Alimah, Y. (2025). Characteristics of nasopharyngeal carcinoma patients in Indonesia. *Journal of Eduhealth, 16*(1), 352. https://doi.org/10.54209/eduhealth.v16i01

Oktora, M. Z., Anggraini, D., & Dewi, N. P. (2025). Deteksi dini faktor risiko kanker serviks berbasis data klinis pasien di RSUP Dr. M. Djamil Padang. *Jurnal Pengabdian Masyarakat Kesehatan (JURABDIKES), 3*(1), 69. http://journal.scientic.id/index.php/asci/issue/view/27

Profil kesehatan Provinsi Kalimantan Barat. (n.d.). *[Lengkapi dengan penulis/instansi penerbit, tahun, dan URL]*.

Riset Kesehatan Dasar (Riskesdas) Provinsi Kalimantan Barat 2018. (2018). *Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan Republik Indonesia.* [Lengkapi dengan URL jika tersedia]

Shiels, M. S., Haque, A. T., Berrington de González, A., Camargo, M. C., Clarke, M. A., Davis Lynn, B. C., Engels, E. A., Freedman, N. D., Gierach, G. L., Hofmann, J. N., Jones, R. R., Loftfield, E., Sinha, R., Morton, L. M., & Chanock, S. J. (2025). Trends in cancer incidence and mortality rates in early-onset and older-onset age groups in the United States, 2010–2019. *Cancer Discovery, 15*(7), 1363–1376. https://doi.org/10.1158/2159-8290.CD-24-1678

Siegel, R. L., Kratzer, T. B., Giaquinto, A. N., Sung, H., & Jemal, A. (2025). Cancer statistics, 2025. *CA: A Cancer Journal for Clinicians, 75*(1), 10–45. https://doi.org/10.3322/caac.21871

Syafira, S., Siregar, S. F. E., Saputra, D., Febriansyah, R. I., & Ariyanto, J. (2025). Salted fish consumption factors on the incidence of nasopharyngeal cancer: A systematic review. *Miracle Journal of Public Health, 8*(1), 35. https://doi.org/10.36566/mjph/Vol8.Iss1/411

Syaekhu, M., Cahyadi, I., & Permata, Y. (2025). Hubungan antara gejala klinis dengan jenis histopatologi karsinoma nasofaring di RSUD Waled periode tahun 2019–2023. *Ibnu Sina: Jurnal Kedokteran dan Kesehatan, 24*(2), 511–518. https://doi.org/10.30743/ibnusina.v24i2.728

Ugai, T., Sasamoto, N., Lee, H. Y., Ando, M., Song, M., Tamimi, R. M., Kawachi, I., Campbell, P. T., Giovannucci, E. L., Weiderpass, E., Rebbeck, T. R., & Ogino, S. (2022). Is early-onset cancer an emerging global epidemic? Current evidence and future implications. *Nature Reviews Clinical Oncology, 19*(10), 656–673. https://doi.org/10.1038/s41571-022-00672-8

World Health Organization. (2025). *Cancer fact sheet*. https://www.who.int/news-room/fact-sheets/detail/cancer

Youn, H. J., & Han, W. (2020). A review of the epidemiology of breast cancer in Asia: Focus on risk factors. *Asian Pacific Journal of Cancer Prevention, 21*(4), 867–880. https://doi.org/10.31557/APJCP.2020.21.4.867