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Five-Year Cancer Epidemiology at the National Referral Hospital: Hospital-Based Cancer Registry Data in Indonesia

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PURPOSE In 2016, there were 1,308,061 cases of cancer being treated in Indonesia, with 2.2 trillion rupiahs spent, amounting to $486,960,633 in US dollars (purchasing power parity 2016). The high burden of cancers in Indonesia requires a valid data collection to inform future cancer-related policies. The purpose of this study is to report cancer epidemiological data from 2008 to 2012 based on Hospital-Based Cancer Registry (HBCR) data from Cipto Mangunkusumo Hospital, Indonesia.

METHODS This was a descriptive study with cross-sectional design. Data were collected from Cipto Mangunkusumo Hospital HBCR 2008-2012. Demographical, diagnostic, stages of cancer, and histopathological types of cancer data were extracted.

RESULTS After screening, 18,216 cases were included. A total of 12,438 patients were older than 39 years of age (68.3%), with a female-to-male ratio of 9:5. Most patients have cancers at advanced stages (stages III and IV, 10.2%). The most common sites of cancer were cervix uteri (2,878 cases, 15.8%), breast (2,459 cases, 13.5%), hematopoietic and reticuloendothelial systems (1,422 cases, 7.8%), nasopharynx (1,338 cases, 7.4%), and lymph nodes (1,104 cases, 6.1%).

CONCLUSION From this HBCR, cancer incidence in female was almost twice the incidence in male, largely because of the burden of cervical and breast cancers. The cervix uteri as one of the top five cancer sites based on this HBCR, 2008-2012, are still approximately consistent with Global Cancer Incidence, Mortality and Prevalence 2018, which portrayed that Indonesia has been severely afflicted by cervical cancer cases more than any other Association of Southeast Asian Nations countries. The HBCR could serve as a robust database of epidemiological data for cancer cases in Indonesia.

INTRODUCTION

Cancer is one of the primary causes of death in both developing and developed countries. Based on data from the global cancer statistics (Global Cancer Incidence, Mortality and Prevalence [GLOBOCAN]), a prediction tool estimating cancer incidence and mortality worldwide by the International Agency for Research on Cancer, there has been an increasing trend in cancer incidence and death. There was an estimate of 18.1 million new cancer cases worldwide in 2018, from previously 14.1 million in 2012. Furthermore, cancer was responsible for an estimated 9.6 million deaths in 2018, from previously 8.2 million in 2012.[1-3] Although the increase is happening globally, the types of cancer are different between developing and developed countries, among various measures of demography. Overall highest cancer incidences based on the organ are lung (11.58%), followed by breast (11.55%) and colorectum (10.23%), with highest mortality in lung (18.43%), liver and biliary duct (9.91%), and stomach (8.19%).[2] For Indonesia, GLOBOCAN estimates were derived by incorporating weighted averages from Malaysia (2008-2010) and Brunei Darussalam (2010-2012) applied to 2018 population for incidence, with all-site estimates from neighboring countries partitioned using national frequency data from national cancer registry at Dharmais National Cancer Center, and by using the South-Eastern Asia model for mortality, which extrapolated mortality from the national incidence, using incidence-mortality

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CONTEXT

Key Objective

What are the top five cancer sites in an Indonesian hospital-based cancer registry (HBCR)?

Knowledge Generated

This first 5-year HBCR study from Indonesia's national referral hospital, Cipto Mangunkusumo Hospital, has revealed that the top five cancer sites were cervix uteri (16 percent), breast (14%), hematopoietic and reticuloendothelial systems (8%), nasopharynx (7%), and lymph nodes (6%). Cancer incidence in female was almost twice the incidence in male, largely because of the cervical and breast cancers.

Relevance

In the era of big data, Indonesia spearheaded a robust HBCR-Population-Based Cancer Registry framework since 2016 to inform health policies and improve cancer outcomes. The cervix uteri as one of the most common cancer sites in this HBCR are still approximately consistent with the Global Cancer Incidence, Mortality and Prevalence 2018 data, which have ranked Indonesia first among Association of Southeast Asian Nations countries in the total number of cervical cancer cases. The fourth most populous country in the world is seeing a significant uptrend of cancer burden within the past decade.

ratios derived from cancer registries in China (90 registries), Japan (nine registries), and Korea.[4,5]

More than half of the cancer incidence (56.8%) and death (64.9%) occurred in developing countries, with a prediction for the level to be higher in the future. In 2018, GLOBOCAN approximated 291 from 100,000 Indonesians suffered from cancers.[3] In 2013, according to the Basic Health Research (Riskesdas), cancer prevalence in Indonesia was 1.4 in 1,000 population.[6] In 2016, Social Insurance Administration Organization reported that from 1,308,061 cancer cases treated, a total of 2.2 trillion rupiahs was spent, amounting to $486,960,633 in US dollars (purchasing power parity 2016).[7,8] The high burden of cancer in Indonesia requires a valid data collection, which can help to decide future regulation regarding cancer.

As the world's fourth most populous country with more than 260 million population, it will do justice to improve Indonesian cancer epidemiological data to contribute to the GLOBOCAN model. For this reason, in 2008, we have established a Hospital-Based Cancer Registry (HBCR) for

Cipto Mangunkusumo Hospital, the highest national referral hospital in Indonesia's National Health Insurance (Jaminan Kesehatan Nasional [JKN]) scheme, to collect and provide real data on cancer. The JKN was initiated in 2014 by President Joko Widodo. Within 5 years, it has become the world's largest single-payer national health insurance. Indonesia has a total of 9,993 community health centers (puskesmas) in 2018 and 2,813 hospitals in 2017 to cover an area of 1.9 million km[2].[9] Dharmais National Cancer Center was built in Jakarta in 1993. Patients with cancer in Indonesia are eventually referred to both Dharmais National Cancer Center and Cipto Mangunkusumo Hospital, which are public hospitals, apart from a few patients treated at private facilities or going abroad. Meanwhile, most lung cancers are referred to Persahabatan National Respiratory Center in Jakarta, which is also a public hospital.

The HBCR has also served as a fundamental framework to spearhead Indonesia's effort in cancer big data in Indonesia. We undertook the initiation of the Population-Based Cancer Registry (PBCR) shortly after its hospital counterpart,

FIG 1. HBCR-PBCR Framework in Indonesia. In 2016, the Ministry of Health appointed Cipto Mangunkusumo Hospital as one of the regional cancer registry hospitals and Dharmais National Cancer Center as the national cancer burden control center. The vertical relationship between HBCR and PBCR shows that individual HBCRs are collected in a bottom-up fashion by the regional cancer registry hospitals, which form the regional PBCRs and submit them to the national cancer registry hospital. GLOBOCAN, Global Cancer Incidence, Mortality and Prevalence; HBCR, hospital-based cancer registry; PBCR, population-based cancer registry.
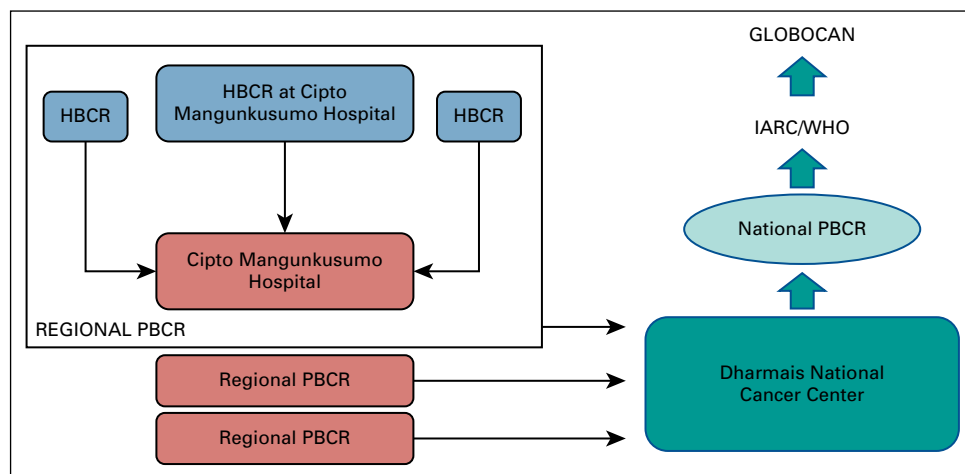
TABLE 1. Tumor Locations of the Patients With Cancer

Tumor Location	Frequency (N = 18,216)
Accessory sinuses	66
Adrenal gland	14
Anus and anal canal	27
Base of tongue	4
Bladder	242
Bones, joints, and articular cartilage	432
Brain	331
Breast	2,459
Bronchus and lung	284
Cervix uteri	2,878
Colon	317
Connective, subcutaneous, and other soft tissues	402
Corpus uteri	302
Endocrine glands	14
Esophagus	48
Eye and adnexa	261
Floor of mouth	5
Gallbladder	10
Gum	19
Heart, mediastinum, and pleura	37
Hematopoietic and reticuloendothelial systems	1,422
Hypopharynx	14
Kidney	132
Larynx	211
Lip	12
Liver and intrahepatic bile ducts	721
Lymph nodes	1,104
Meninges	159
Nasal cavity and middle ear	230
Nasopharynx	1,338
Oropharynx	13
Other and ill-defined digestive organs	11
Other and ill-defined sites in lip, oral cavity, and pharynx	6
Other and ill-defined sites	116
Other and unspecified female genital organs	1
Other and unspecified major salivary glands	29
Other and unspecified male genital organs	10
Other and unspecified parts of biliary tract	53
Other and unspecified parts of mouth	55
Other and unspecified parts of tongue	213
Other and unspecified urinary organs	5
Ovary	862
Palate	40

(Continued on following page)

in the hope that both databases can be potential game changers in the future GLOBOCAN prediction model and more robust estimates of Indonesia's cancer incidence and mortality. Medical records in Indonesian hospitals are not integrated. As a result, Cipto Mangunkusumo Hospital was appointed as the regional cancer registry hospital for Jakarta by the Ministry of Health since 2016 to collect HBCRs from hospitals in Jakarta, including this HBCR, and data from private facilities without established HBCRs. Regional data from all provinces are then reported to Dharmais National Cancer Center, which is the appointed national cancer burden control center by the Ministry of Health to establish the national PBCR since 2016 (Fig. 1). This study aims to report 5-year cancer epidemiological data, 2008-2012, from Cipto Mangunkusumo Hospital's cancer registry.

METHODS

This study was a descriptive study using cross-sectional design, based on data from the HBCR of Indonesia's National Referral Hospital, Cipto Mangunkusumo Hospital, from 2008 to 2012. Data collection was performed since the re-establishment of Cancer Registry, under the Oncology Center of Cipto Mangunkusumo Hospital in 2015. Subjects were taken by total sampling method. The inclusion criteria were patients suspected or diagnosed with cancer proven by histopathology or other investigations, that is, cytology, clinical examinations only, clinical investigation using ultrasound, unknown from referral cases, death certificate only, and surgery or autopsy. There were no exclusion criteria in this study. Deaths were confirmed solely from the medical records at Cipto Mangunkusumo Hospital.

Data Collection

Collecting data for HBCR involves several steps, from raw data collection, data abstraction and coding, first verification, data input, second verification, data quality stratification, data analysis, and reporting. Lists of patients were collected from all departments in the hospital, medical records, and hospital information system. The lists were filtered for duplication and hand-searched for the respective medical record, followed by data abstraction and coding. During abstraction, the summary of patients was coded into SRIKANDI form (a specific cancer registry form in the hospital). Then, the data were verified by an officer (by intervariable matching through the SRIKANDI form) and inserted into the cancer registry software (Canreg 5) to undergo second verification. For the 2008-2012 HBCR, the steps done for data filtering are separation of patients with cancer from the main hospital registry, elimination of duplicates, and filtering based on years. Capture-recapture method was used to finalize the data.

Data Analysis

Based on the data acquired, demographical, diagnostic, staging, and histopathological data were extracted. Univariate data analysis was conducted by using Microsoft Excel and SPSS 16.0.

TABLE 1. Tumor Locations of the Patients With Cancer (Continued)

Tumor Location	Frequency (N = 18,216)
Pancreas	165
Parotid gland	98
Penis	58
Peripheral nerves and autonomic nervous system	19
Placenta	98
Prostate gland	230
Pyriform sinus	1
Rectosigmoid junction	75
Rectum	504
Renal pelvis	5
Retroperitoneum and peritoneum	57
Skin	592
Small intestine	40
Spinal cord, cranial nerves, and CNS	48
Stomach	102
Testis	77
Thymus	20
Thyroid gland	668
Tonsil	84
Unknown primary site	156
Ureter	5
Uterus	108
Vagina	52
Vulva	45

Ethical Clearance

This study has been reviewed and accepted by The Research Ethical Committee of Faculty of Medicine, Universitas Indonesia, in accordance with the Declaration of Helsinki.

RESULTS

To our knowledge, this was the first established HBCR report in Indonesia conducted at the National Referral Hospital of Indonesia, Cipto Mangunkusumo Hospital. During the initial screening, 37,790 cases were collected, followed by another screening using capture-recapture method, which yielded 18,216 final cases. Of those cancer cases, 3,842 (21.09%) cases were from 2008, 3,483 (19.12%) cases were from 2009, 3,788 (20.80%) cases were from 2010, 3,447 (18.92%) cases were from 2011, and 3,656 (20.07%) cases were from 2012.

Demographic Profile

Table 1 and Figure 2 show the study characteristics of patients involved in the study. The characteristics are admission year, age, domicile, sex, cancer stage, tumor location, and diagnostic basis.

Distribution of cancer cases based on topography is shown in Tables 2 and 3. Table 2 stratifies the data by admission years, whereas Table 3 stratifies the data by age groups.

The 10 highest cancer cases for male and female are shown in Figure 3, accompanied by the number of cancer deaths in Figure 4. After stratifying by sex, nasopharyngeal cancer was placed the highest occurring cancer among male patients with 911 cases (13.6%), whereas cervical cancer was the highest among female patients with 2,878 cases (24.9%). Hematopoietic and reticuloendothelial system cancer was responsible for the highest number of deaths in male patients (102 deaths, 25.1%), whereas cervical cancer was responsible for the highest number of deaths in female patients (133 deaths, 25.9%). Meanwhile, the ten highest cancer cases in children (0-19 years of age) are shown in Figure 5. Hematopoietic and reticuloendothelial system cancer was the highest among male children, with 347 cases (35.2%), and also for female children, with 278 cases (33.8%).

DISCUSSION

In this 5-year HBCR, no differences are observed among annual numbers of cancer cases from 2008 until 2012. Most patients are older than 39 years of age (12,438 cases, 68.3%), whereas 3,971 (21.8%) patients are in the age group of 20-39 years and 1,807 patients (9.9%) are in the age group of 0-19 years. For domicile, 56.1% of the patients came from outside Jakarta, whereas 33.6% came from Jakarta. The rest (10.3%) have unknown domicile. From outside Jakarta, 15.6% came from Sumatra Island, 78.8% came from Java Island excluding Jakarta, 1.8% came from Kalimantan Island (Borneo), 1.4% came from Sulawesi Island (Celebes), 0.7% came from Bali and Nusa Tenggara (Lesser Sunda) Islands, 0.9% came from Maluku Islands (the Moluccas), and 0.8% came from Papua Island. This signifies the health disparity among the islands in the archipelago, in terms of health access, facilities, and capacity. A majority of patients outside Jakarta still came from Java, which is the most populous island in Indonesia with the best access to health resources, including the national referral hospitals. The data were heavily skewed to Java Island, including Jakarta. The stretched disparity in life expectancy between Java and the other islands in Indonesia inherently marks the probability of seeing higher cancer cases in Java.

The hospital had more female patients, which are 1.73 times more common than male patients or a ratio of 9:5. Of 18,216 patients, 11,538 patients (63.3%) were female, whereas 6,678 patients (36.7%) were male. There were 2,652 patients whose cancers (eg, cancers of the meninges, brain, or blood) were inapplicable to staging (14.6%) and 12,443 patients with unknown (staging data not found) staging (68.3%), whereas the rest are mostly at

FIG 2. Study characteristics of the 2008-2012 HBCR patients at Cipto Mangunkusumo Hospital, Indonesia. The demographic profile of the HBCR patients are grouped based on admission year, age, domicile, sex, cancer stage, tumor location, and diagnostic basis. See Table 1 for the grouping based on the tumor location. HBCR, hospital-based cancer registry.
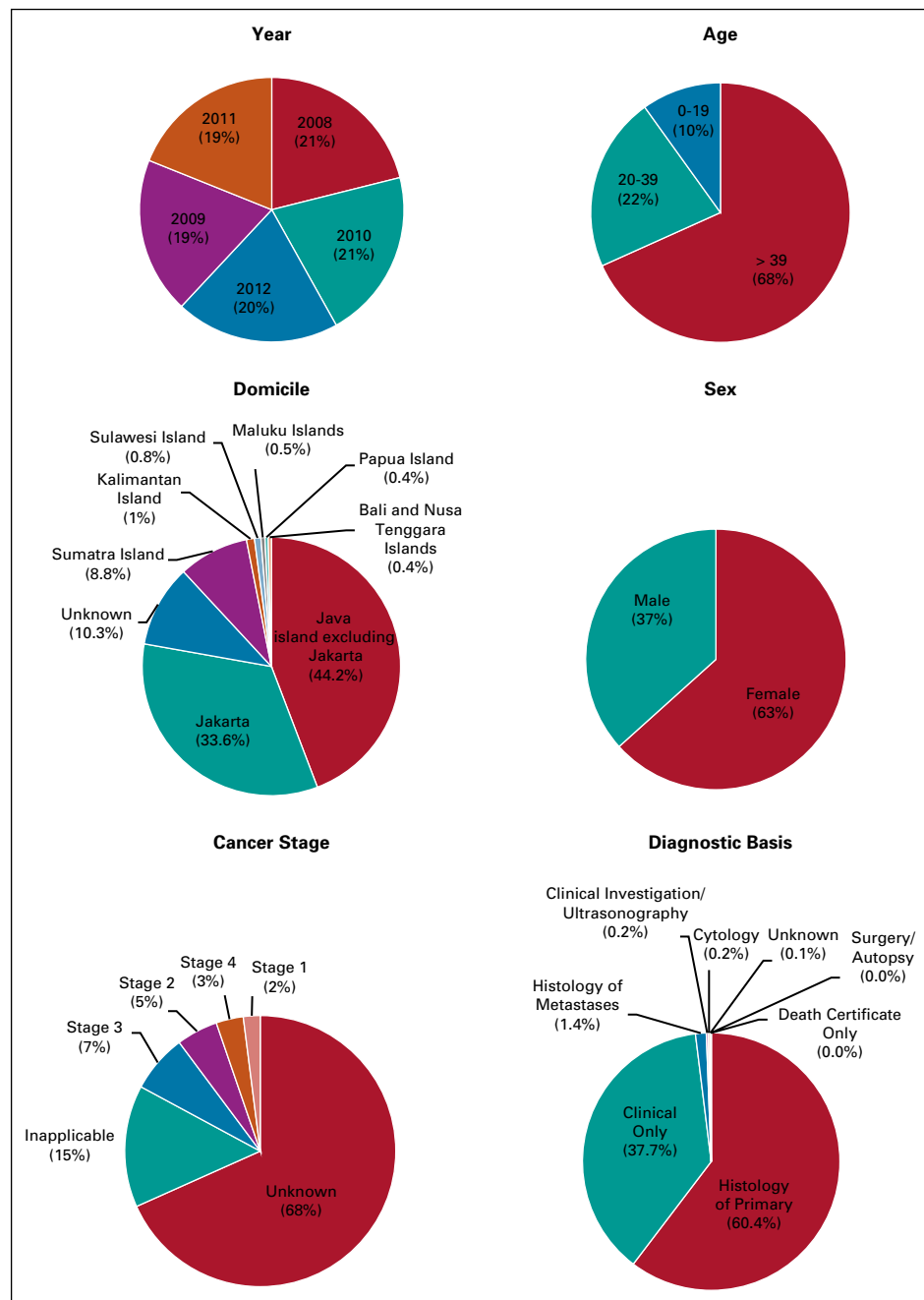
stage III (1,263 cases, 6.9%). A big proportion of unknown staging was mainly due to the low-coverage insurances during pre-JKN era (prior to 2014), leading to cancers directly treated without staging workups.

The most common site of cancer is cervix (2,878 cases, 15.80%), followed by breast (2,459 cases, 13.50%), hematopoietic and reticuloendothelial systems (1,422 cases, 7.81%), nasopharynx (1,338 cases, 7.35%), and lymph nodes (1,104 cases, 6.06%). The most used basis for diagnosis is histology of primary (60.35%), followed by clinical only (37.69%), histology of metastases (1.34%), and others such as cytology, death certificate, and surgery or autopsy.

This HBCR is one of the three main cancer centers in Indonesia. To achieve the goal of portraying cancer burden in the archipelago, one must keep in mind of this limitation. A comprehensive analysis spanning the three main HBCRs of Cipto Mangunkusumo, Dharmais, and Persahabatan is instrumental, before analyzing the regional and national PBCR data, some of which have been reported in previous studies.[10-14] Furthermore, a complete follow-up of death data was not achieved in the early days of the HBCR because of resource constraint and, therefore, should be addressed in the future by directly contacting patients or the local population and civil registration offices to capture death data beyond medical records.

TABLE 2. Distribution of Cancer Cases Based on Topography, Stratified by Admission Years

Topography	ICD-O	2008	2009	2010	2011	2012
Accessory sinuses	C31.0-C31.9	13	13	20	16	4
Adrenal gland	C74.0-C74.9	3	1	5	2	3
Anus and anal canal	C21.0-C21.8	5	1	9	11	1
Base of tongue	C01.9	1	3	0	0	0
Bladder	C67.0-C67.9	60	49	43	52	38
Bones, joints, and articular cartilage	C40.0-C41.9	111	75	77	75	94
Brain	C71.0-C71.9	28	52	107	78	66
Breast	C50.0-C50.9	667	525	434	350	483
Bronchus and lung	C34.0-C34.9	47	50	77	46	64
Cervix uteri	C53.0-C53.9	624	575	584	554	541
Colon	C18.0-C18.9	69	67	72	42	67
Connective, subcutaneous, and other soft tissues	C49.0-C49.9	78	69	82	74	99
Corpus uteri	C54.0-C54.9	81	45	70	52	54
Endocrine glands	C75.0-C75.9	3	0	3	4	4
Esophagus	C15.0-C15.9	5	10	18	5	10
Eye and adnexa	C69.0-C69.9	43	37	50	82	49
Floor of mouth	C04.0-C04.9	1	2	0	1	1
Gallbladder	C23.9	2	1	1	1	5
Gum	C03.0-C03.9	4	3	2	7	3
Heart, mediastinum, and pleura	C38.0-C38.8	5	2	7	9	14
Hematopoietic and reticuloendothelial systems	C42.0-C42.4	220	253	300	231	418
Hypopharynx	C13.0-C13.9	2	5	3	0	4
Kidney	C64.9	36	23	26	23	24
Larynx	C32.0-C32.9	41	41	33	42	54
Lip	C00.0-C00.9	6	1	2	3	0
Liver and intrahepatic bile ducts	C22.0-C22.1	121	158	158	139	145
Lymph nodes	C77.0-C77.9	189	235	245	211	224
Meninges	C70.0-C70.9	3	21	52	49	34
Nasal cavity and middle ear	C30.0-C30.1	56	40	32	70	32
Nasopharynx	C11.0-C11.9	332	240	297	232	237
Oropharynx	C10.0-C10.9	1	2	6	3	1
Other and ill-defined digestive organs	C26.0-C26.9	0	5	3	3	0
Other and ill-defined sites in lip, oral cavity, and pharynx	C14.0-C14.8	4	0	0	0	2
Other and ill-defined sites	C76.0-C76.8	35	18	15	25	23
Other and unspecified female genital organs	C57.0-C57.9	0	0	0	1	0
Other and unspecified major salivary glands	C08.0-C08.9	1	2	8	7	11
Other and unspecified male genital organs	C63.0-C63.9	1	0	2	4	3
Other and unspecified parts of biliary tract	C24.0-C24.9	9	8	13	10	13
Other and unspecified parts of mouth	C06.0-C06.9	16	9	15	5	10
Other and unspecified parts of tongue	C02.0-C02.9	58	42	43	39	31
Other and unspecified urinary organs	C68.0-C68.9	2	0	1	0	2
Ovary	C56.9	152	156	220	175	159
Palate	C05.0-C05.9	10	9	6	5	10
Pancreas	C23.0-C25.9	26	27	36	38	38

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TABLE 2. Distribution of Cancer Cases Based on Topography, Stratified by Admission Years (Continued)

Topography	ICD-O	2008	2009	2010	2011	2012
Parotid gland	C07.9	22	19	23	11	21
Penis	C60.0	18	13	11	8	8
Peripheral nerves and autonomic nervous system	C47.0-C47.9	5	3	4	4	3
Placenta	C58.9	18	18	31	14	17
Prostate gland	C61.9	51	46	47	43	45
Pyriform sinus	C12.9	1	0	0	0	0
Rectosigmoid junction	C19.9	7	17	17	20	14
Rectum	C20.9	132	91	80	93	108
Renal pelvis	C65.9	2	2	0	1	0
Retroperitoneum and peritoneum	C48.0-C48.8	8	4	14	13	18
Skin	C44.0-C44.9	143	133	127	100	89
Small intestine	C17.0-C17.9	5	7	5	15	8
Spinal cord, cranial nerves, and CNS	C72.0-C72.9	4	22	12	4	6
Stomach	C16.0-C16.9	18	16	28	21	19
Testis	C62.0-C62.9	10	12	11	18	26
Thymus	C37.9	4	4	7	2	3
Thyroid gland	C73.9	167	129	116	121	135
Tonsil	C09.0-C09.9	16	17	14	25	12
Unknown primary site	C80.9	22	30	45	32	27
Ureter	C66.9	0	0	1	0	4
Uterus	C55.9	1	0	4	98	5
Vagina	C52.9	6	14	11	15	6
Vulva	C51.0-C51.9	11	11	3	13	7
Total		3,842	3,483	3,788	3,447	3,656

For both sexes, cervical cancer was the most common cancer (15.80%), with an increase in the age group of 30-34 years (153 cases), peaking in age group of 50-54 years (597 cases). Breast cancer was the second most common cancer, increasing in incidence with age and peaking in 45-49 years (435 cases). Cancer of hematopoietic and reticuloendothelial systems has a different incidence distribution based on age, with the most common age group being 0-4 years (244 cases), and then kept decreasing until the age group of 10-14 years (131 cases). Older than 15 years of age, the differences in incidence among age groups were not large. For nasopharyngeal carcinoma, age corresponds linearly with the increasing incidence, peaking in the age group of 45-49 years (203 cases). Lymphoma was the fifth most common cancer, and the incidence is significantly higher in the age group of 40-59 years, peaking in the age group of 50-54 years (138 cases). Compared with the data from 2008, in Association of Southeast Asian Nations (ASEAN) countries, the top five sites of cancer were lung, breast, liver, colorectal, and mouth, whereas the top five sites of cancer death in ASEAN nations were lung, liver, colorectal, breast, and stomach.[15] According to data from Malaysian National Cancer Registry, between 2007 and 2011, the top 10 cancer sites were breast, colorectal, trachea, bronchus and lung, lymphoma, nasopharynx, leukemia, cervix, liver, ovary, and stomach.[16] In this HBCR, breast is similarly one of the top five cancer sites as in ASEAN's and Malaysia's top five sites, but cervix uteri ranked the highest in the HBCR's top five sites where it was not found in ASEAN's and Malaysia's top five sites. This finding is still approximately consistent with the latest GLOBOCAN data of 2018,[3] which reported that Indonesia had the highest cervical cancer cases among ASEAN countries. This showed that cervical cancer has played a major role in shaping women's health in Indonesia since at least a decade ago.

In this HBCR, cancer cases in male are most commonly found in nasopharynx, followed by hematopoietic and reticuloendothelial systems, lymph nodes, liver and intrahepatic bile ducts, and skin. There are 911 cases (13.6%) of nasopharyngeal carcinoma in male, with the incidence peaking in the age group of 45-49 years, and most patients came with stage III. The number of cancer deaths in male patients because of nasopharyngeal cancer was 50. In cancer of hematopoietic and reticuloendothelial systems, there are 768 cases (11.50%), with most incidence

TABLE 3. Distribution of Cancer Case Based on Topography, Stratified by Age Groups
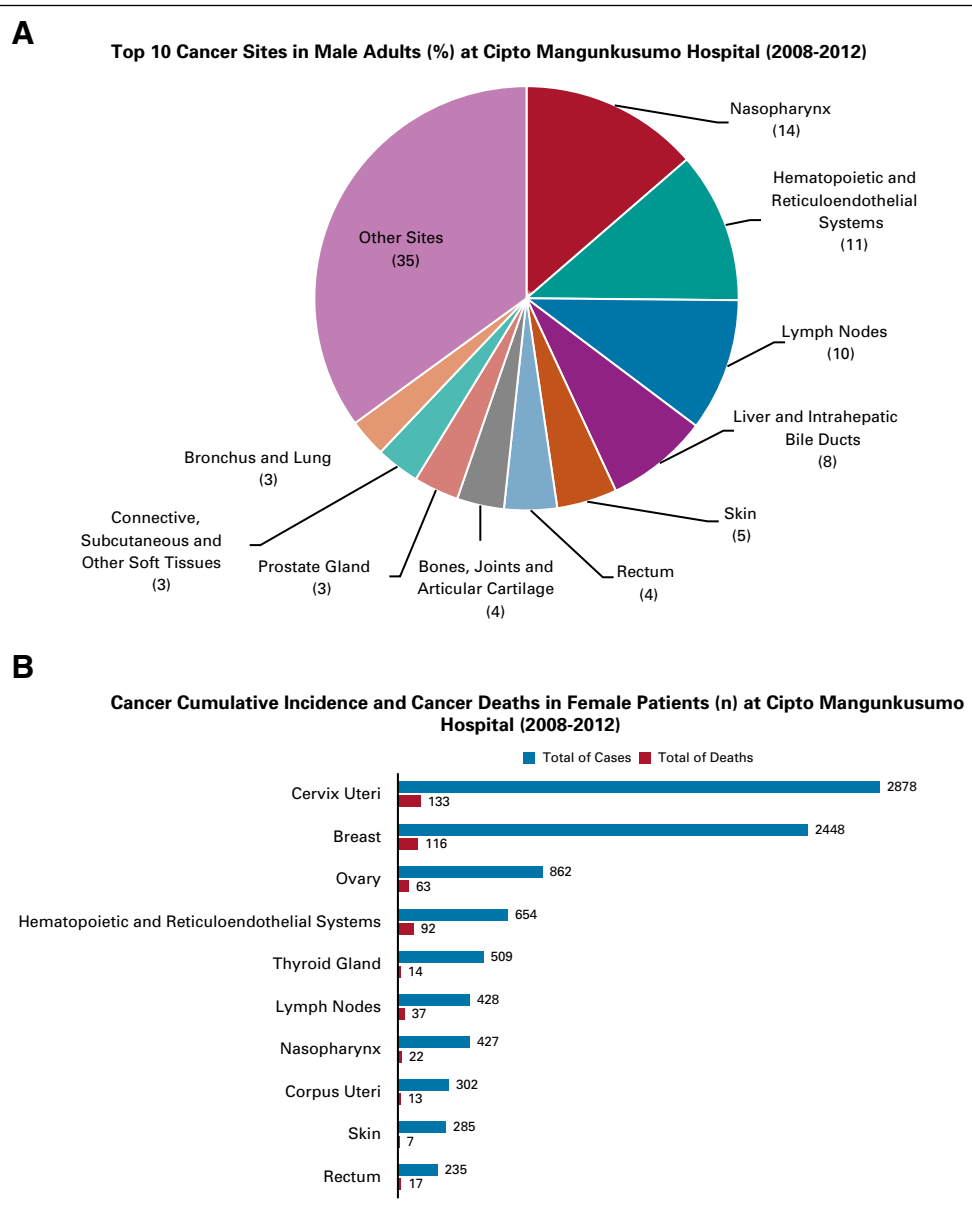
Topography	ICD-O	0-	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	> 75	Total
Accessory sinuses	C31.0-C31.9	0	1	3	1	2	2	8	9	11	6	6	2	6	4	2	3	66
Adrenal gland	C74.0-C74.9	5	2	0	1	1	0	1	0	1	0	1	1	1	0	0	0	14
Anus and anal canal	C21.0-C21.8	0	0	0	0	2	1	1	3	2	6	3	3	3	2	1	0	27
Base of tongue	C01.9	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	4
Bladder	C67.0-C67.9	1	0	4	2	2	6	11	16	24	21	37	21	30	30	21	16	242
Bones, joints, and articular cartilage	C40.0-C41.9	12	12	40	73	35	28	38	23	38	40	24	25	19	17	6	2	432
Brain	C71.0-C71.9	36	31	16	21	12	12	25	25	34	30	37	20	13	6	6	7	331
Breast	C50.0-C50.9	0	0	0	11	28	92	174	296	426	435	398	252	162	90	52	43	2,459
Bronchus and lung	C34.0-C34.9	5	2	2	0	4	8	6	17	26	32	36	49	35	37	9	6	284
Cervix uteri	C53.0-C53.9	0	0	0	2	2	63	153	280	458	564	597	366	205	121	45	22	2,878
Colon	C18.0-C18.9	3	0	2	2	9	17	18	21	36	39	36	46	30	30	18	10	317
Connective, subcutaneous, and other soft tissues	C49.0-C49.9	36	20	16	18	22	18	20	35	31	42	34	38	30	21	10	11	402
Corpus uteri	C54.0-C54.9	0	0	0	0	6	7	11	17	31	54	67	46	31	19	9	4	302
Endocrine glands	C75.0-C75.9	0	1	2	1	2	1	0	0	2	0	4	1	0	0	0	0	14
Esophagus	C15.0-C15.9	0	0	0	0	0	1	4	4	5	6	11	5	6	4	1	1	48
Eye and adnexa	C69.0-C69.9	151	21	4	1	0	4	5	8	7	7	13	14	10	7	5	4	261
Floor of mouth	C04.0-C04.9	0	0	0	0	0	0	1	0	0	0	2	0	1	1	0	0	5
Gallbladder	C23.9	0	0	0	0	0	1	0	2	0	1	1	1	1	2	0	1	10
Gum	C03.0-C03.9	0	1	0	1	0	2	1	1	1	1	3	1	2	3	2	0	19
Heart, mediastinum, and pleura	C38.0-C38.8	3	0	3	2	4	3	0	2	1	5	6	2	5	0	1	0	37
Hematopoietic and reticuloendothelial systems	C42.0-C42.4	244	170	131	81	75	73	76	90	79	90	75	69	74	50	32	13	1,422
Hypopharynx	C13.0-C13.9	0	0	0	0	0	3	2	1	2	2	1	0	3	0	0	0	14
Kidney	C64.9	42	8	5	2	2	2	2	3	6	20	14	15	3	1	3	4	132
Larynx	C32.0-C32.9	0	0	1	0	1	3	4	8	16	23	37	41	21	26	17	13	211
Lip	C00.0-C00.9	0	1	0	1	1	0	0	1	1	1	2	1	1	0	0	2	12
Liver and intrahepatic bile ducts	C22.0-C22.1	18	4	9	8	11	17	24	45	73	97	91	99	79	76	40	30	721
Lymph nodes	C77.0-C77.9	36	38	37	35	49	67	81	74	106	108	138	116	83	64	36	36	1,104
Meninges	C70.0-C70.9	1	6	0	3	3	7	8	24	34	33	17	13	3	3	3	1	159
Nasal cavity and middle ear	C30.0-C30.1	2	5	5	3	8	9	26	24	31	24	25	21	21	11	8	7	230
Nasopharynx	C11.0-C11.9	0	9	15	44	58	73	95	149	195	203	179	130	89	49	21	29	1,338
Oropharynx	C10.0-C10.9	0	0	0	0	1	0	1	1	2	1	1	1	0	3	1	1	13
Other and ill-defined digestive organs	C26.0-C26.9	0	0	0	0	0	1	0	1	0	1	2	3	1	2	0	0	11
Other and ill-defined sites in lip, oral cavity, and pharynx	C14.0-C14.8	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	2	6

(Continued on following page)

TABLE 3. Distribution of Cancer Case Based on Topography, Stratified by Age Groups (Continued)

Topography	ICD-O	0-	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	> 75	Total
Other and ill-defined sites	C76.0-C76.8	12	5	3	3	6	7	8	8	7	4	13	16	9	7	5	3	116
Other and unspecified female genital organs	C57.0-C57.9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Other and unspecified major salivary glands	C08.0-C08.9	0	2	0	0	1	1	1	5	4	5	2	1	1	2	2	2	29
Other and unspecified male genital organs	C63.0-C63.9	0	0	0	0	1	0	0	1	2	1	1	1	1	0	2	0	10
Other and unspecified parts of biliary tract	C24.0-C24.9	0	0	0	0	0	3	4	2	5	6	10	4	10	4	2	3	53
Other and unspecified parts of mouth	C06.0-C06.9	1	1	0	0	2	3	0	5	5	9	9	4	8	3	3	2	55
Other and unspecified parts of tongue	C02.0-C02.9	0	0	0	0	8	9	21	22	31	25	28	24	20	14	7	4	213
Other and unspecified urinary organs	C68.0-C68.9	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	1	5
Ovary	C56.9	9	5	12	29	41	49	66	74	119	133	135	94	51	31	5	9	862
Palate	C05.0-C05.9	0	0	0	0	2	3	2	3	7	6	5	4	1	4	1	2	40
Pancreas	C23.0-C25.9	1	1	2	1	0	4	1	6	17	29	21	20	23	20	12	7	165
Parotid gland	C07.9	1	0	2	2	5	5	8	13	8	10	13	9	6	8	5	3	98
Penis	C60.0	0	0	0	1	5	3	7	4	6	5	5	5	6	9	0	2	58
Peripheral nerves and autonomic nervous system	C47.0-C47.9	2	1	0	1	2	2	2	3	0	3	1	0	0	1	1	0	19
Placenta	C58.9	0	1	0	1	10	22	23	16	14	7	3	0	0	0	0	1	98
Prostate gland	C61.9	0	0	0	0	1	1	1	1	5	5	8	32	42	52	39	43	230
Pyriform sinus	C12.9	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Rectosigmoid junction	C19.9	0	0	1	1	5	3	5	6	9	5	7	13	10	4	3	3	75
Rectum	C20.9	2	2	5	8	15	29	35	54	55	66	62	59	44	41	14	13	504
Renal pelvis	C65.9	0	0	0	0	0	0	0	0	1	0	0	2	2	0	0	0	5
Retroperitoneum and peritoneum	C48.0-C48.8	2	0	2	1	2	3	4	4	7	9	8	8	3	4	0	0	57
Skin	C44.0-C44.9	4	7	8	18	15	28	26	36	49	54	64	66	65	57	41	54	592
Small intestine	C17.0-C17.9	0	0	0	0	1	2	1	3	2	8	7	6	7	1	1	1	40
Spinal cord, cranial nerves, and CNS	C72.0-C72.9	3	2	1	4	4	4	5	3	6	4	1	3	3	4	1	0	48
Stomach	C16.0-C16.9	0	0	1	0	1	2	5	9	10	18	16	20	6	7	3	4	102
Testis	C62.0-C62.9	7	2	1	2	8	10	16	12	5	4	2	4	2	1	1	0	77
Thymus	C37.9	0	0	0	0	2	1	3	2	1	6	1	3	1	0	0	0	20
Thyroid gland	C73.9	3	5	6	17	19	41	58	50	81	106	90	77	47	38	20	10	668
Tonsil	C09.0-C09.9	0	1	2	1	1	1	6	7	9	10	7	14	6	10	5	4	84
Unknown primary site	C80.9	25	3	8	11	5	6	10	5	12	17	17	7	18	5	5	2	156
Ureter	C66.9	1	0	0	0	0	0	0	0	1	0	0	2	0	1	0	0	5
Uterus	C55.9	2	0	0	0	2	2	11	22	25	23	13	4	3	1	0	0	108
Vagina	C52.9	0	0	1	0	0	2	4	3	2	6	12	3	8	5	5	1	52
Vulva	C51.0-C51.9	0	0	1	2	0	1	4	3	5	3	7	6	5	4	4	0	45
Total		670	371	351	416	505	768	1,135	1,564	2,193	2,481	2,477	1915	1,376	1,018	536	442	18,216

A

Top 10 Cancer Sites in Male Adults (%) at Cipto Mangunkusumo Hospital (2008-2012)

- Nasopharynx (14)
- Hematopoietic and Reticuloendothelial Systems (11)
- Lymph Nodes (10)
- Liver and Intrahepatic Bile Ducts (8)
- Skin (5)
- Rectum (4)
- Bones, Joints and Articular Cartilage (4)
- Prostate Gland (3)
- Connective, Subcutaneous and Other Soft Tissues (3)
- Bronchus and Lung (3)
- Other Sites (35)

FIG 3. Top 10 cancer sites in male and female adults (%) at Cipto Mangunkusumo Hospital, Indonesia (2008-2012). (A) In male adults, top 10 cancer sites were nasopharynx, hematopoietic and reticuloendothelial systems, lymph nodes, liver and intrahepatic bile ducts, skin, rectum, bones, joints and articular cartilage, prostate gland, connective, subcutaneous and other soft tissues, and bronchus and lung. (B) In female adults, top 10 cancer sites were cervix uteri, breast, ovary, hematopoietic and reticuloendothelial systems, thyroid gland, lymph nodes, nasopharynx, corpus uteri, skin, and rectum.

B

Cancer Cumulative Incidence and Cancer Deaths in Female Patients (n) at Cipto Mangunkusumo Hospital (2008-2012)

Legend: Total of Cases, Total of Deaths

Site	Total of Cases	Total of Deaths
Cervix Uteri	2878	133
Breast	2448	116
Ovary	862	63
Hematopoietic and Reticuloendothelial Systems	654	92
Thyroid Gland	509	14
Lymph Nodes	428	37
Nasopharynx	427	22
Corpus Uteri	302	13
Skin	285	7
Rectum	235	17

occurring in babies of age 0-4 years. Although cancer of hematopoietic and reticuloendothelial systems was the second most common cancer in male, its mortality was the highest in male with 102 cases. Lymphoma cases in male occurred in 676 patients (10.12%), with most patients in the age group of 50-54 years, and the number of cancer deaths was 62. Cancer of liver and intrahepatic bile ducts occurred in 522 patients (7.82%) with mortality in 84 cases, whereas skin cancer incidence in male was 307 cases (4.60%) with mortality in 11 cases. Meanwhile, according to the GLOBOCAN 2008, the top five sites of cancer in male in ASEAN countries were lung, liver, colorectal, mouth, and stomach, with almost the same rank for cancer death.[15] Compared with Malaysian National Cancer Registry between 2007 and 2011, in male, the top 10 cancer sites were colorectal, trachea, bronchus and lung, nasopharynx, lymphoma, prostate, liver, leukemia, stomach, bladder, and other skin.[16] Data from this HBCR were closely similar to Malaysia's data, but almost completely in contrast to ASEAN's data. However, this HBCR recorded more nasopharyngeal cancer because a separate hospital is dedicated to treat lung cancer (Persahabatan National Respiratory Center) and their data are not incorporated with this HBCR. This is one of the limitations of interpreting data from this HBCR.

In female, the most common cancer sites were cervix, followed by breast, ovary, hematopoietic and reticuloendothelial systems, and thyroid gland. Cervical cancer in female was found in 2,878 cases (24.94%), with a high incidence in the age group of 25-74 years and peaking in

FIG 4. Cancer cumulative incidence and cancer deaths stratified by sex (n) at Cipto Mangunkusumo Hospital, Indonesia (2008-2012). (A) In male patients, nasopharynx was the most common cancer site, but the highest proportion of deaths was due to the cancers of bronchus and lung. (B) In female patients, cervix uteri were the most common cancer site, but the highest proportion of deaths was due to the cancers of hematopoietic and reticuloendothelial systems.
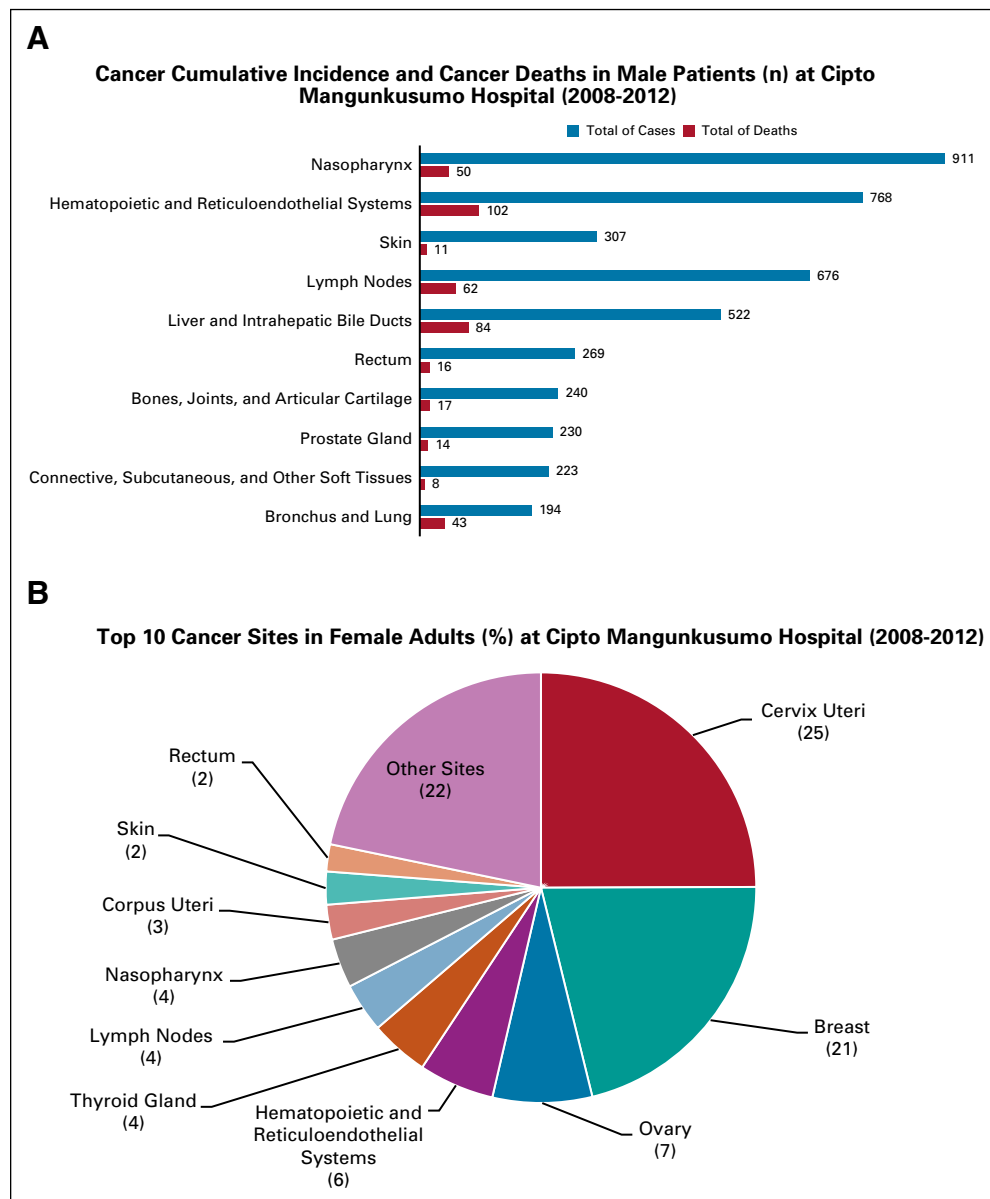
the age group of 50-54 years. Cervical cancer was also the highest in female cancer mortality (133 deaths, 26.76%). Breast cancer was the second most common cancer in female, with an incidence of 2,447 cases (21.21%). Breast cancer was more common in females of age > 20 years, peaking in the age group of 45-49 years. Breast cancer accounts for 116 deaths (23.34%) of a total of 497 deaths in female cancer cases. Most patients with breast cancer came with stage IIIB or IV. The third most common cancer found in female was ovarian cancer, with an incidence of 862 cases (7.47%). The incidence is increasing with age, peaking in the age group of 50-54 years. Most patients came with stage III to IVB, and the highest incidence was in stage IIIC. Mortality cases were found in 63 cases among patients with ovarian cancer. The fourth and fifth most common cancers in female were cancer of hematopoietic

and reticuloendothelial systems with 654 cases (5.67%) and cancer of thyroid gland with 509 cases (4.41%). Cancer of hematopoietic and reticuloendothelial systems has the third highest cancer deaths in female, at 92 cases, whereas cancer deaths in cancer of thyroid gland occurred in 14 cases. Compared with the cancer incidence in ASEAN countries in 2008, the top five cancer sites in female were breast, cervix, colorectal, lung, and liver, with almost the same rank for cancer deaths.[15] Meanwhile, in Malaysia, according to Malaysian National Cancer Registry between 2007 and 2011, in female, the top 10 cancer sites were breast, colorectal, cervix, ovary, trachea, bronchus and lung, lymphoma, corpus uteri, leukemia, thyroid, and stomach.[16] The data of this HBCR were consistent with ASEAN's and Malaysia's data in that breast, cervix, and ovary placed among the top five cancer sites, but, in this

A

FIG 5. Top 10 cancer sites in male and female children (%) at Cipto Mangunkusumo Hospital, Indonesia (2008-2012). (A) In male children, top 10 cancer sites were hematopoietic and reticuloendothelial systems, lymph nodes, eye and adnexa, bones, joints and articular cartilage, brain, connective, subcutaneous and other soft tissues, nasopharynx, kidney, unknown primary site, and liver and intrahepatic bile ducts. (B) In female children, top 10 cancer sites were hematopoietic and reticuloendothelial systems, eye and adnexa, bones, joints and articular cartilage, ovary, brain, lymph nodes, connective, subcutaneous and other soft tissues, thyroid gland, unknown primary site, and kidney.

B
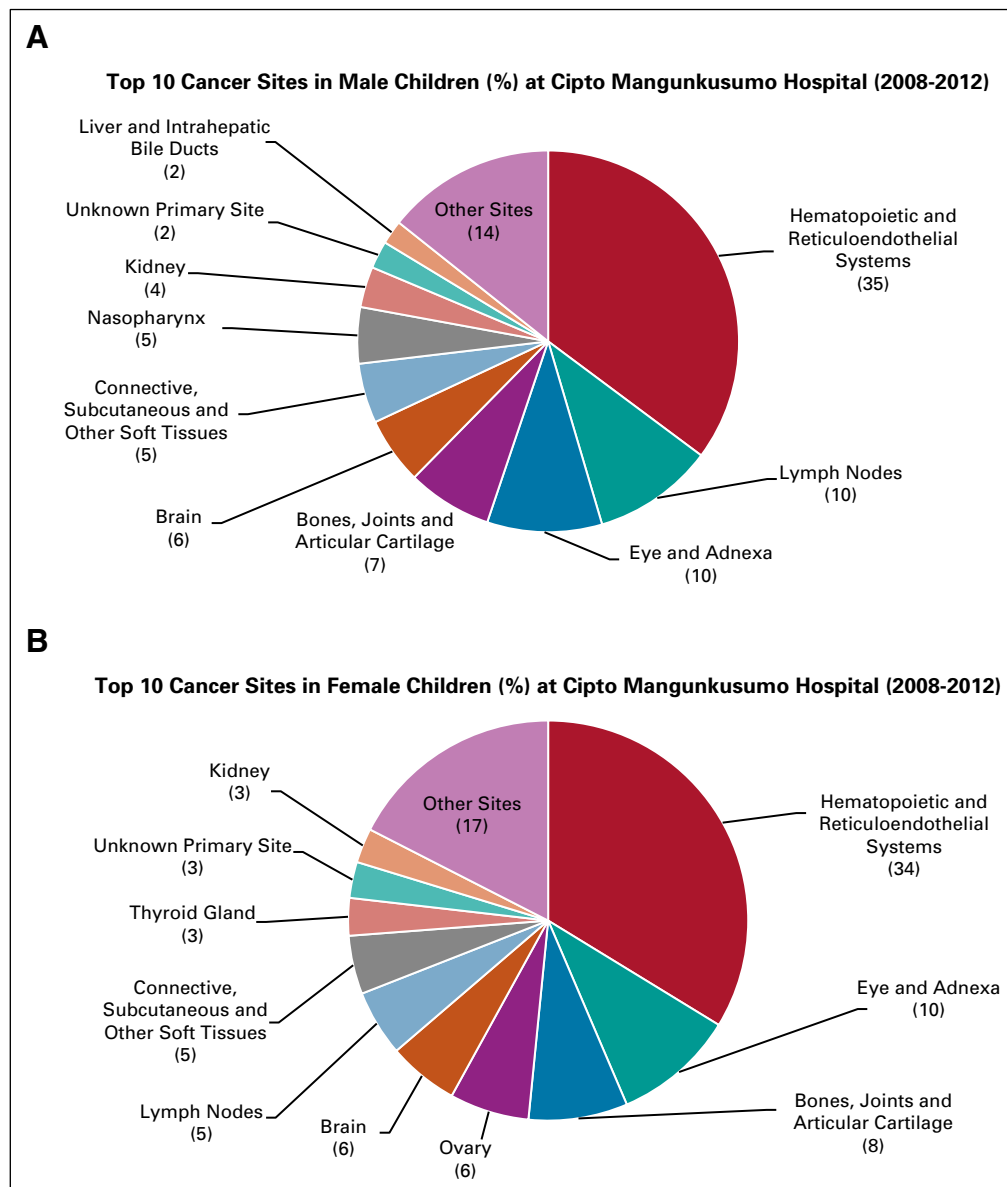
HBCR, cervix is the most common site followed by breast, as opposed to ASEAN's and Malaysia's data, which were breast followed by cervix. This might be due to improved case detection for cervical cancer compared with breast cancer. However, Indonesia's data followed suit with breast replacing cervix as the most common site of cancer in GLOBOCAN 2018.[3] Yet, Indonesia still has the highest cervical cancer incidence in ASEAN according to the latest data, albeit being placed the second most common site.[3] This might imply that Indonesia's preventive efforts against cervical cancer, such as pap smear, visual inspection using acetoacetic acid, and vaccination, are still lacking compared with other ASEAN countries.

The differences between the patterns of adult and childhood cancers are consistent with expectations. In male children, the top five cancer sites were hematopoietic and

reticuloendothelial systems (35.44%), lymph nodes (10.29%), eye and adnexa (9.78%), bones, joints and articular cartilage (7.23%), and brain (5.70%). In female children, the top five cancer sites were hematopoietic and reticuloendothelial systems (33.70%), eye and adnexa (9.82%), bones, joints, and articular cartilage (8.00%), ovary (6.67%), and brain (5.82%).

In conclusion, of the 18,216 cases recorded in this HBCR, ten most common sites of cancer were cervix uteri, breast, hematopoietic and reticuloendothelial, nasopharynx, lymph node, ovary, liver and intrahepatic bile ducts, thyroid gland, skin, and rectal. No differences were observed among annual numbers of cases from 2008 to 2012. Female patients were twice more common than male patients, because of the huge burden of cervical and breast cancers. Patients with cancer that can be staged,

mostly came with an advanced stage cancer (3 and 4). The cervix uteri as one of the top five cancer sites based on this HBCR are still approximately consistent with GLOBOCAN 2018, which portrayed that Indonesia has been severely afflicted by cervical cancer more than any other ASEAN countries. The HBCR could serve as a robust database of epidemiological data for cancers in Indonesia.

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Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians (Open Payments).

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