The burden of cancer in Bali: An epidemiology report 2017-2019

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ABSTRACT Background: Our pandemic of covid-19 has not ended yet. However, we have to move forward that other important aspects of research need to be continued, cancer cases as one health problem that we should have noticed. Because nearly half of the new cases and more than half of the cancer deaths worldwide in 2018 are estimated to occur in Asia partly because the region has nearly 60% of the global population.1−3 One in 5 men and one in 6 women worldwide develop cancer during their lifetime. As one of the parts of the Indonesian Country, Bali had no cancer registry yet. Methods: Our crossectional study gathers secondary data of pathology reports from 2017 – 2019 and records clinicopathological aspects like age, gender, and cancer topography. We collected cancer registries from government and private hospitals in Bali. We used consecutive sampling for the malignant lesion. The data were statistically analysed by SPSS version 23. Results: There are 4821 cancer cases recorded, 3020 cases (62.6%) in females and 1801 cases (37.4%) in men. The most common cancer in females was breast cancer accounted for 15% of cases, and nasopharyngeal cancer accounted for 4.9% as the most common cancer in men. In addition, the peak age of cancer is predominantly at 50 – 54 years in females and 60 – 64 years old in men. The highest frequency of females and males who had cancer were between ages 51-55 years old. Moreover, based on each sex, the prevalence rate of males who suffered from cancer was 2.8%, and females were 4.7%. Conclusions: Our study gives preliminary data about cancer epidemiology based on clinicopathology data (age, gender and cancer topography), especially in Bali. We believe our study will be valuable for further research and primary prevention of the cancer burden in Bali.

KEYWORDS Cancer, Epidemiology, Bali

Introduction

Increasing of population size year by year, the WHO predicts that the number of cancer cases and death will increase to 24 million and 14.6 million, respectively, by the year 2035.1 The global pattern shows that both for men and women, nearly half of the new cases and more than half of the cancer death worldwide in 2018 are estimated to occur in Asia, in part because the region has nearly 60% of the global population. The global cancer burden is estimated at 18.1 million new cases and 9.6 million death in 2018. One in 5 men and one in 6 women worldwide develop cancer during their lifetime.2 Moreover, the incidence of cancer in Indonesia ranks the order 8 in South Asia, which has a cancer burden of about 136.2 per 100,000 population. Lung cancer has the highest incidence rate for men (19.4 per 100,000 population with an estimated death rate of 10.9 per 100,000 population. In females, breast cancer has the highest incidence rate, 42.1 per 100,000 population, with an estimated death rate of 17 per 100,000 population. The health ministry data also show cancer prevalence increased from 1.4 per 1000 population in 2013 to 1.79 per 1000 population in 2018.2,3
The increase of cancer incidence is due to several factors, including population growth and ageing and the changing prevalence of certain causes of cancer linked to social and economic development. In addition, environmental exposure appears to be the dominant risk factor for many common cancers, suggesting that a high fraction of cancer is potentially preventable. For all those reasons, we are very curious about cancer epidemiology, especially in Bali. Therefore, we conducted research on secondary pathological data during 2017-2019.

**Methods**

This study was a descriptive cross-sectional study. The sample used was collected from secondary pathology anatomy laboratory data from Government and Private hospitals in Bali from 2017-To to 2019. We used consecutive sampling methods and assessed sex, age and cancer topography as clinicopathological data. The data were statistically analysed by SPSS version 23.

**Results**

Data analysis has been carried out and obtained the proportion distribution of breast cancer based on age group and sex (Table 1). The peak age of cancer is predominantly at 50 – 54 years in females and 60 – 64 years old in men. However, the highest frequency was between ages 51-55 years old in both females and men.

We also assessed the sex between 2017-2019, which indicates an increase in numbers for males and women per year and unfortunately each year dominated by females (chart 1).

The top 5 cases during 2017-2019 based on cancer topography (Chart 2) was breast cancer (C.50) 926 cases (15%), cervical cancer (C.53) 645 cases (10.4%), Skin cancer (C.44) 329 cases (5.3%), nasopharyngeal cancer (C.11) 306 cases, (4.9%), and rectal cancer (C.20) 249 cases (4.0%).

In addition, cumulative cases during 2017 – 2019 showed an increasing pattern per year of breast, cervical, thyroid, nasopharyngeal and skin cancer (Chart 3).

Based on data distribution between sex and cancer topography in female-dominated by breast cancer, followed by cervical cancer, ovarium cancer and uterine cancer. On the other hand, the most cancer type which affects male are nasopharyngeal, colon and rectal, skin, bladder, penile and prostate cancer (Chart 4).
Table 1 Data Distribution Based on Age Group and Sex

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y.o)</td>
<td>Female</td>
<td>Man</td>
</tr>
<tr>
<td>0-4</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>5-9</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>10-14</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>15-19</td>
<td>18</td>
<td>33</td>
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<tr>
<td>20-24</td>
<td>43</td>
<td>18</td>
</tr>
<tr>
<td>25-29</td>
<td>52</td>
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<td>30-34</td>
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<td>65-69</td>
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<td>217</td>
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<tr>
<td>70-74</td>
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<td>161</td>
</tr>
<tr>
<td>≥75</td>
<td>171</td>
<td>228</td>
</tr>
<tr>
<td>Total</td>
<td>3020 (62.6%)</td>
<td>1801 (37.4%)</td>
</tr>
</tbody>
</table>

Discussion

Based on the data projection from Bali Provincial Statistic Agency, the population during 2017-2019 was 12,875,605. The prevalence rate for females and males who suffered from cancer was 3.7%. Based on each sex, the prevalence rate of males who suffered from cancer was 2.8% (total male population 6,484,077), and females who suffered from cancer was 4.7% (total female population 6,391,528). In addition, our study also found that breast cancer was the most common cancer in females, which accounted for 15%, and nasopharyngeal cancer cases 4.9% occupy the most common cancer in males. Compared to Indonesian statistic data (Globocan 2018), breast cancer (30.9%) was the commonest cancer in females. The second place was cervical cancer (17.2%), the third place was ovarian cancer (7.1%), the fourth was colorectal cancer (5.8%), and the fifth was thyroid cancer (4.2%).

In addition, for males, the most common cancer was lung cancer (14%), the second one was colorectal cancer, the third one was liver cancer (8.9%), the fourth was nasopharyngeal cancer (8.7%), and the fifth was prostate cancer (7.1%). Compared to our study, we found the pattern of cancer in females in line with the data projection in Indonesia which breast and cervical cancer was the commonest cancer in females. However, for male pattern cancer in Bali was different from Indonesia, our data shows that nasopharyngeal at the first place and Indonesian statistic data shows lung cancer.

In addition, worldwide data shows that breast cancer is the most commonly diagnosed cancer in females 24% and has become the leading cause of death in most low- and middle-income countries. However, with ageing population, the global burden increase in overall low- middle- and high-income countries. In 2018, 2.1 million new cases of breast cancer and 627,000 deaths were estimated worldwide.1,5 Our study result shows that breast cancer is women’s most common cancer. The aetiology of breast cancer is multifactorial. Researchers found hormonal, diet, reproductive, and genetics as universal risk factors for breast cancer. However, more specifically, epidemiological data shows breast cancer is more frequently found in a society with a western lifestyle, which means a habit with high calories intake, especially animal fat and protein, without any physical exercise and obesity.1,5,6 There is also mesmerizing evidence from epidemiological studies that exogenous sex steroids play a pivotal role in developing breast cancer. Besides it, the consumption of alcohol has been associated with a moderate increase in breast cancer.5,7

The International Agency for Research on Cancer (IARC) concluded a relationship between physical activity and the risk of breast cancer, which higher level of activity related to risk reduction.5 Based on all the above, a prospective study for risk factors needs to be evaluated.

The incidence rate of cancer in males and females (all sites) tends to be highest in northeastern and lowest in southern Asian countries. The incidence rate for total cancers by gender and country, Indonesian at the fourth rank after Cambodia, China and India.8 Based on prevalence data in fourteen of the fifteen Asian countries, there are 3.6 million males and 4.0 million females living with cancer diagnosed within the past five years. The genetic and molecular differences might influence the disparity of the risk of cancer between men and females. For example, Breast cancer shows familial clustering, in which two high penetrance genes have been identified, like BRCA1 and BRCA2, that greatly increase the risk of developing breast cancer. Early menarche, late menopause, post-menopausal hormone replacement therapy, nulliparity and older age at first childbirth are associated with increased risk of hormone-positive breast cancer.5

Moreover, in our study, the most common cancer in male cancer is nasopharyngeal cancer and it’s different from Indonesian statistic data that lung cancer was the commonest cancer in males. However, in other countries like southern china, the annual incidence of nasopharyngeal cancer is 15-50 cases per
100,000 population. The rates in men are commonly double or triple than in the female. In high-risk populations, nasopharyngeal cancer incidence rises after the age 30 old, peaks 40 – 60 years, and declines. The aetiology of nasopharyngeal cancer based on epidemiological trends in the past few decades have shown that lifestyle and environmental factors have become the main contributors to nasopharyngeal cancer carcinogenesis. One piece of literature said causative carcinogens had not been identified yet. However, the genetic susceptibility, EBV infection and possibility of consumption of salted and fermented foods with high nitrosamine content relate to nasopharyngeal cancer with non-keratinizing type, especially in endemic areas. Other environmental factors like smoke, dust, chemical fumes, wood dust, formaldehyde have been proposed as possible contributing factors. Our study has not identified those environmental factors yet, and it will be a potential aspect to reveal for future research.

In addition, the peak age of cancer is predominantly at 50 – 54 years in females and 60 – 64 years old in men. Based on a literature study, cancer can occur at any age, but older age is more susceptible to cancer. The general theory suggests it is caused by ageing process and a decrease in immune system capability. Increasing with age will cause mutation to accumulate in our tissues throughout life, and some of these mutations contribute to cancer. The cancer research UK website also states that older age is the main risk factor for cancer. They purported that DNA damage accumulating over time can result from the biological process or external exposure as a risk factor. The risk of cancer is modified by interaction between environmental exposure, genetic variants, and tissues microenvironments due to ageing, which alters selective pressure and appears as somatic changes. Changes include fitness of progenitor or stem cells, immune infiltrate oxygen or nutrient availability, cytokines and growth factors levels and extracellular matrix. Those microenvironmental factors will create a new adaptive phenotype, which can contribute to cancer development. In addition, some cancer risk rises in certain tissues in the setting of increased cellular proliferation caused by chronic inflammation or hormonal stimulation. Chronic inflammation induced by agents like virus-like HPV 16,18 that prone to cause cervical cancer, EBV infection as an agent in an endemic area for nasopharyngeal cancer, etc. They purported that prolonged infection will create pre-cancerous lesions that can transform into malignant lesions. For that reason, the interaction between host, environment and agent factors become complex mechanisms for cancer development.

Conclusions
This preliminary study gives us an overview that the prevalence rate for females and males who had cancer was 3.7%. The cancer cases increased 30.8% and 47% in males and increased 32.6% and 53.4% in females during 2017 – 2019. The peak age of cancer cases for both males and women is between 51 – 55 years old. The most common cancer in females was breast cancer, and nasopharyngeal cancer became the most common cancer case in men. Based on this data, hopefully, it will guide us in the health community to give more attention, especially to the primary prevention of cancer burden in Bali. Further study is needed to identify agent, host, and environmental factors related to each cancer type.

Declarations
Competing interest
The authors declare no competing interest in this study.

Ethics approval and consent to participate
Ethical clearance number : 477/UN14.2.2.VII.14/LT/2021
Study agreement number : LB.02.01/XIV.2.2.1/3148/2021

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