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Original Research

A trend analysis of breast cancer incidence in Sri Lanka, 2005-2019

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Abstract

Introduction: Breast cancer is the commonest cancer among females globally as well as in Sri Lanka. There were 2.3 million women diagnosed with breast cancer and 684 996 deaths due to breast cancer globally in 2020.

Objective: To analyse the trends and patterns of incidence of breast cancer in Sri Lanka between 2005 and 2019.

Methods: Cancer incidence data published in National Cancer Registry, Sri Lanka (NCR-SL) from 2005 to 2019 was analyzed. Age standardized rates (ASR), and age specific incidence rates were used to determine the trends of the breast cancer. Trend analysis of these two rates were performed using joinpoint regression program and $p<0.05$ was used to determine the statistical significance of the trends.

Results: ASRs of breast cancer among males and females in Sri Lanka have been increased gradually from 2005 to 2019. Female to male ratio for breast cancer incidence in 2019 was 35:1. ASR of breast cancer among females was 18.4 per 100 000 population in 2005, while it was 33.5 per 100 000 population in 2019. The ASR of both females and males demonstrated an increasing trend and average annual percent changes (AAPC) were of 4.24 (95% CI: 3.4, 5.0) and 7.72 (95% CI: 4.0, 11.6), respectively.

Conclusions & Recommendations: Current ASR of breast cancer is comparatively low in Sri Lanka, but the increasing trend is alarming. The trend has been influenced by the changes of incidence rates after the age of 65 years. It is time to implement evidence-based interventions to control breast cancer in Sri Lanka.

Keywords: *breast cancer, incidence, age standardized rates, average annual percentage change*

Introduction

Breast cancer is the most common cancer among women in Sri Lanka as well as in the world(1). Even after considering both male and female cancers together breast cancer is the most common cancer in Sri Lanka (2). There were 2.3 million women diagnosed with breast cancer and 684 996 deaths globally in 2020 (1). According to the GLOBOCAN, ASR of breast cancer in the world was 47.8 in 2020 and it was 36.8 and 41.2 in Asia and South Eastern Asia, respectively(1).

In 2019, there were 4 651 breast cancer patients in Sri Lanka and ASR values among males and females were 1 and 33.5, respectively (2). However, comparatively higher increasing trend of ASR in breast cancer has been observed in countries with low socioeconomic index than in countries with a high socioeconomic index (3). On the other hand, survival of breast cancer for at least 5 years after diagnosis ranges from more than 90% in high-income countries, to 66% in India and 40% in South Africa (3).

Risk factors for breast cancer are increasing age, obesity, harmful use of alcohol, family history of breast cancer, history of radiation exposure, reproductive history (such as age that menstrual periods began and age at first pregnancy), tobacco use and postmenopausal hormone therapy increase the risk of breast cancer (4). Even if all these modifiable risk factors could be controlled, this would only reduce the risk of developing breast cancer by about 30% (5). Other than gender (female) and age (over 40 years),approximately half of breast cancers develop in women who have no identifiable breast cancer risk factors (6). Therefore, early detection of breast cancer through screening is considered to be an effective intervention globally. Compared with no screening, annual screening in women 50-74 years old can reduce one third of breast cancer mortality (7). Breast cancer treatment can be highly effective, especially when the disease is identified in first and second stages (8). Therefore, breast cancer early detection and effective treatment plays a major role in controlling breast cancer. But screening programme can have disadvantages such as side effects, over-diagnosis, and increased costs (9). Decisions must be taken based on most recent evidence to plan and implement effective interventions which are well-suited to local settings. Attention has been drawn to initiate a national mammographic screening programme in the country (4).

Policy makers in the country requires strong evidence on the current trends of cancers in Sri Lanka to take decisions on resource allocations, infrastructure development and programme planning in the future. Therefore, trend analysis of breast cancer based on latest data would be a timely needed requirement. In this article we analysed most recently published cancer incidence data on breast cancer from 2005 to 2019 and explored the current trends in breast cancer in Sri Lanka. The objective of this study is to analyse the trends and patterns of incidence of breast cancer in Sri Lanka between 2005 and 2019.

Methods

This analysis included newly diagnosed patients with breast cancer since 1 October 2005 to 31 December 2019 in Sri Lanka. Data were extracted from the published NCR-SL 2005 to 2019 (2). Data on breast cancer incidence which were categorized under ICD code 50 according to the ICD-10 classification was used in this analysis. The ASR per 100 000 population was used for the main tend analysis. The age standardized populations published by the WHO were used to calculate ASR for each year. In addition, age specific incidence rates were calculated using the same population data for males and females.

Joinpoint Trend Analysis Software (version 4.9) was used for trend analysis (10) and its significance. Overall trend and trends in specific age groups and their significance were analysed. Joinpoint regression analysis recognizes statistically significant changes between different points over a given period. It also provides the AAPC between these points, which is a measurement of trends in cancer rates over time (11). This article measured the trends yearly. Level of significance was considered at p value of 0.05.

Results

This analysis included cancer incidence data published in NCR-SL for 15 years. It incorporated data of 46 232 breast cancer patients. Out of them, 2.8% (n=1276) were males and 97.2% (n=44 956) were females. Female to male ratio incidence ratio for breast cancer was 35: 1.

The ASR of breast cancers among females was 18.4 per 100 000 population in 2005. It gradually increased over the years to 33.5 in 2019 (Figure 1). Highest age specific incidence rate among females was reported in the 70-77-year age group (164.6 per 100 000 population) in 2019. Among males, the highest age specific incidence rate was observed in 75 years and above age group (7.5 per 100 000 population) in 2019. The proportions of breast cancer patients in different age groups were analysed in 2005, 2010, 2015 and 2019 years. The percentage of female breast cancer patients aged 65 years and above has increased by 10% during the period of 2005 (19%) to 2019 (29%) (Figure 2). According to the joinpoint regression analysis AAPC for ASR of breast cancers among females was 4.2 (95% CI: 3.4, 5.0). A statistically significant upward trend of ASR among males was also demonstrated during the study period. AAPC of male breast cancer ASR was 7.7 (95% CI: 4.0, 11.6) (Figure 3).

Further analysis was done using data related to breast cancers among females. AAPC of 5-year age cohorts among females aged more than 30 years is given in table 1. In each group there was an upward trend in age specific incidence rates and all of them were statistically significant. Highest AAPC value (13.1) was observed among 70-75-year group between 2011 to 2019.

Table 1: Annual percentage changes of age specific incidence rates according to 5-year age groups from 2005 to 2019

Age group		APC	95% CI	p value
30 – 34 years		2.9	1.3, 4.5	<0.001
35 – 39 years		4.4	2.4, 4.6	<0.001
40 – 44 years		3.3	2.1, 4.6	<0.001
45 – 49 years		3.7	2.5, 4.9	<0.001
50 – 54 years		2.7	1.6, 3.8	<0.001
55 – 59 years		2.7	1.3, 4.1	<0.001
60 – 64 years		3.0	1.1, 4.9	<0.005
65 – 69 years		7.5	6.5, 8.9	<0.001
70-75 years	2005-2011	4.8	0.9, 8.9	<0.05
	2011-2019	13.1	10.3, 15.9	<0.001
> 75 years		6.8	5.3, 8.3	<0.001

Figure 1: Age standardized rates (ASR) of breast cancer among males and females in Sri Lanka, 2005-2019

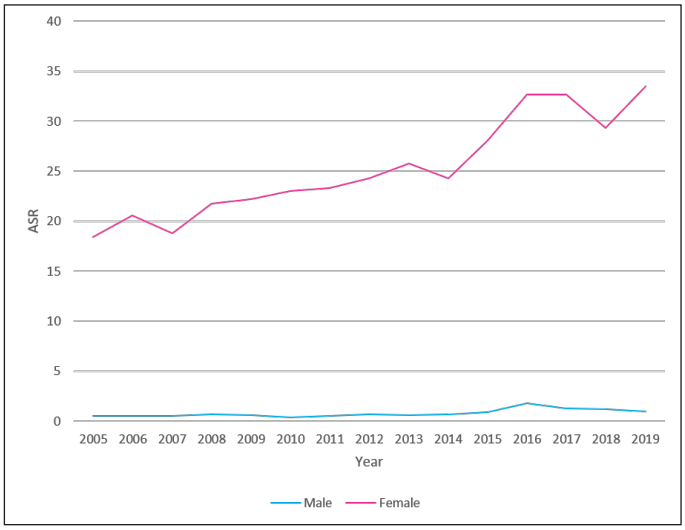


Figure 2: Percentage of women with breast cancer according to different age groups in 2005, 2010, 2015 and 2019 years

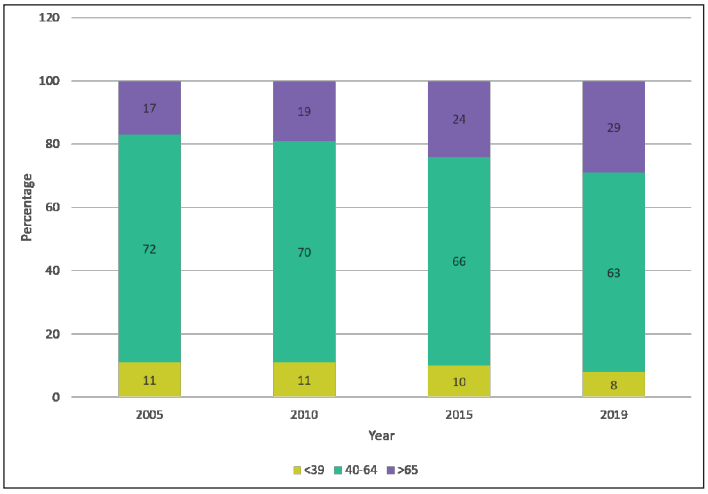
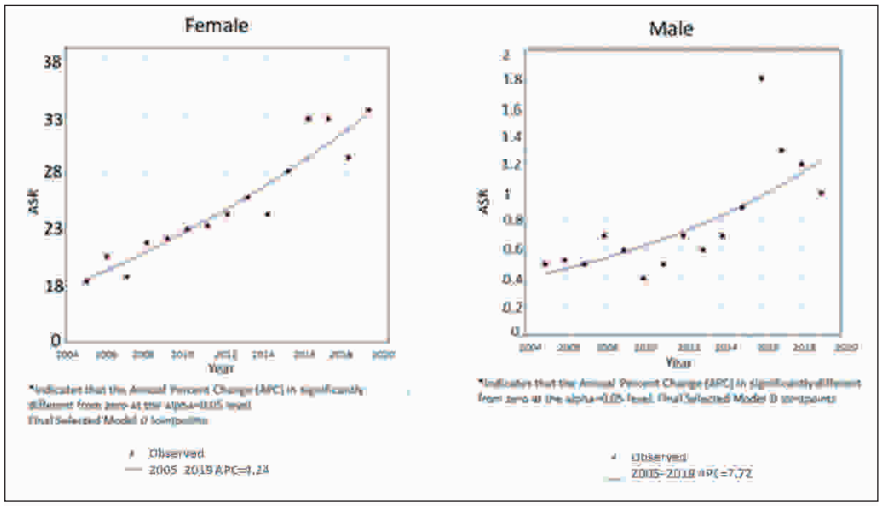


Figure 3: Jointpoint analysis of trend on breast cancer trend in Sri Lanka, 2005-2019



Discussion

This analysis was based on NCR-SL data published by the NCCP of Ministry of Health, Sri Lanka. The quality of the data can be assured as satisfactory, because NCCP follows a systematic and scientific system to collect data which was done and monitored by trained and qualified professionals. The possibility of under reporting was minimum because NCCP collected data from all government treatment centres, pathology laboratories which covers almost all cancer patients in the country. Duplicate registrations and a series of consistency checks were performed by the trained staff of NCCP(2).

Most updated (2019) ASR for breast cancer among females and males in Sri Lanka is 33.5 and 1 per 100 000 population, respectively (2). The global ASR among females for breast cancer was 47.8 and it was 41.2 in South-eastern Asia (1). Currently Sri Lanka has a comparatively low ASR compared to global and regional values. This may be due to several reasons. The global ASR may have been affected by the higher values of some western and developed countries(12). The ARS of Western Europe is 90.7 and in Australia and New Zealand ASR was 95.5 in 2020 (1). The high rates of breast cancer in developed countries may be due to the higher prevalence of the known risk factors for the disease, such as early age at menarche, nulliparity, late age at first birth, late age at any birth, low parity, and late menopause (6). On the other, the higher breast-feeding rates(13) and lower female smoking rate of Sri Lanka (14) may have contributed for the low ASR.

However, ASR of breast cancer among females is gradually increasing over the years in Sri Lanka. Similar pattern has been observed in an analysis done in Sri Lanka in 2018 (15). AAPC in the current analysis was 4.24 (95% CI: 3.5, 5.4) in Sri Lanka which is higher than the global trend (AAPC of 1.9) calculated for 2000 to 2016 period. Countries like Japan (AAPC=4.83; 95% CI: 4.06, 5.61), Malta (AAPC=2.45; 95% CI: 0.82, 4.11) and China (AAPC=2.35; 95% CI: 1.57, 3.14) had highest increasing trends in the world which is closer to Sri Lankan value. However, some countries like India (AAPC=1.06; 95% CI: -0.15, 2.29), England (AAPC=0.19; 95% CI: -0.04, 0.43) displayed stable trends. Brazil (AAPC=-3.19; 95% CI: -4.52, -1.85) and Philippines (AAPC=-2.23; 95% CI: -2.66, -1.8) showed a decreasing trend(16).

Many reasons may have contributed for this increasing trend in Sri Lanka. Improvements in detection rate due to improvement in awareness among public and advancements in diagnostic facilities in the country may have contributed towards this. However, the possibility of having a true increase in breast cancer incidence cannot be rejected by above reasons. It is rational to decide the observed change may be due to combine effect of reasons discussed above. As described above, ASR of breast cancer in Sri Lanka is lower than the global and regional values. However, AAPC of Sri Lanka for breast cancer is one of the highest values in the world. Aging population of Sri Lanka and rapidly changing lifestyle patterns may have contributed for this trend. Increasing trends in "westernizing" lifestyle has contributed to the increasing breast cancer trend in developing countries (17). Weight gain is a known risk factor for breast cancer specially among post-menopausal women (18). According to the "STEPS survey 2015" done in Sri Lanka, obesity among females has been increased. The prevalence of overweight and obesity has been increased from 21% in 2005 to 34.4% in 2015 (14, 19). The prevalence of overweight and obesity among the female age group of 45-59 years is as high as 45.5% in 2015. All these factors may have contributed for this alarming increasing trend in ASR of breast cancer in Sri Lanka. If this pattern of breast cancer continues during next decade without an effective intervention, the burden of breast cancer will be remarkably high. Therefore, more intensified and upgraded programme may be needed in near future.

ASR among males was also demonstrated an increasing trend in Sri Lanka. AAPC was 7.72 ($p<0.05$) among males. In most of the countries female to male ratio for breast cancer is around 100:1. However, in Sri Lanka, it was 35:1 (2). Globally it is believed that breast cancer incidence among men is less than 1% from the total number (20). However, in Sri Lanka it is almost three times higher than the global value (2.8%). Above disparities in both

incidence rates and time trends between males and females may indicate sex differences in underlying risk factors, pathogenesis, and/or over-diagnosis. Even though the actual number of breast cancer was small, the increasing trend of breast cancer among males should be taken seriously because available evidence reveals the prognosis is poor in breast cancers among men than women(21).

When analysing further, there were increasing trends across all age groups after 30 years among females. Current tendencies in female obesity, unhealthy diet and sedentary lifestyle may have contributed for this pattern. Table 1 demonstrate the distribution of AAPC among different age groups. The highest AAPC was observed after 65 years of age. Ageing population and effects of post-menopausal stage may have contributed for this observation. However, this increasing pattern has been observed in earlier age groups like 50-55 years in developed countries (3). Figure 2 illustrates that the percentage of female breast cancer patients aged 65 years and above in 2005 was 19% and it has increased to 29% in 2019.There for it is important to explore the reasons for this trend. The key question to be answered is "was it due to late diagnosis?". Data on staging and mortality of breast cancer in Sri Lanka is not widely available. If they were available this analysis could be more informative and complete. However, in a study done among 800 breast cancer patients in 2017, it was observed that only 46.6% (n=373) has been diagnosed at early stage (Stages I and II) of the cancer in Sri Lanka —(22). In comparison in a developed country like Australia, 86% of the patients belong to Stages I and II(23). It is important to note that there is no organized screening programme for breast cancer in Sri Lanka. Majority of the diagnoses were by self-examination (98.4%) and only 13% patients has been diagnosed by any kind of screening —(22). Even though staging data is not available above information provides a clue for the possibility of delays in diagnosis of breast cancer. Therefore, late diagnosis may have some impact on above mentioned trend towards the late stage of the life. On the other hand, it important to monitor the incidence of breast cancer among 35-39 years age females who also had higher AAPC value (4.4; 95% CI: 2.4, 4.6; $p<0.001$). A similar pattern was observed in substantial number of countries in recent past (16). Even though exact reason for this phenomenon is not yet understood, it is believed that physical inactivity, unhealthy diet and increasing obesity may have contributed (16). Main limitation of this study is the unavailability of staging and mortality data for breast cancer in Sri Lanka.

Conclusions & Recommendations

Even though, the current ASR of breast cancer in Sri Lanka is low compared to the developed countries, the increasing AAPC trend is one of the highest in the world and it is alarming. The trend is much more obvious after the age of 65 years of age. The possibility of late diagnosis of breast cancer cannot be excluded. In addition, breast cancer incidence among males is comparatively high in Sri Lanka. Further research and analysis are essential to explore the possible causes for these observations. When considering the high AAPC of breast cancer in Sri Lanka, it is pertinent to seriously consider implementation of evidence-based interventions to control breast cancer before becoming a massive public health problem.

Public Health Implications

- Breast cancer is the most common female cancer in Sri Lanka. The trends of breast cancer incidence among males and females are increasing. Even though the ASR is still low compared to the developed countries, Sri Lanka has recorded one of the highest increasing trends in AAPC in the world during last 15 years.
- Ageing population and rapid changes in lifestyle may have contributed for this trend. If this trend continues during up coming years, the health impact due to breast cancer in Sri Lanka will be massive. Therefore, it is timely to take necessary action based on available evidence to reorient the existing health care services for breast cancer prevention and control.

Author Declarations

Competing interests: The authors declare no competing interest.

Ethics approval and consent to participate: The current study analysed anonymous data of breast carcinoma collected through the NCR-SL of the NCCP at the Ministry Health. Hence, the data for the study were fully publicly available online and the study did not involve a specific person or specimen or contact with patients. Ethical approval was obtained for the study from Ethic Review Committee of the Faculty of Medicine, University of Colombo (EC-10-106).

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Author contributions: All authors planned the study; SW and MA extracted the data; MA and JV helped with the data analysis and provided comments on the manuscript; JV helped with the graphical presentation of data and the first version of the manuscript; and UP wrote the final version of the manuscript. All authors have read and approved the final version of the manuscript.

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