DOI:10.31557/APJCC.2021.6.1.27

RESEARCH ARTICLE

Sri Lankan Patterns of Female Cancers: Incidence and Mortality Over 1995-2010

Palatiyana V. S. C Vithana[1], Dompeyalage S. A.F Dheerasinghe[2], Hadagiripathira M. I Handagiripathira[3], Shreeni Alahapperuma[4], Irosha Nilaweera[5], Suraj Perera[6]

[1]Family Health Bureau, Ministry of Health Sri Lanka, Colombo, Sri Lanka. [2]Ministry of Health Sri Lanka, Colombo, Sri Lanka. [3]National Hospital of Sri Lanka, Colombo, Sri Lanka. [4]National Cancer Control Programme, Colombo, Sri Lanka. [5]National Cancer Control Programme Colombo, Sri Lank. [6]National Cancer Control Programme Colombo, Sri Lanka.

Abstract

Background: Neoplasms are the second leading cause of deaths in Sri Lanka. Present study analysed the trends in incidence and mortality of all cancers, breast cancer, cervical, ovarian and uterine cancers among Sri Lankan females over 1995-2010. **Methods:** Cancer incidence was obtained from national hospital-based cancer registries. Cancer mortality was abstracted from World Health Organization database and Department of Census and Statistics Sri Lanka. Number of new cases and deaths were obtained by five-year age group for all cancers by sex and breast, cervical, ovarian and uterine cancers for females. Particular cancer specific incidence and mortality rates were directly age-standardised to the Segi-Doll world standard population. Age-standardised incidence and mortality for young adults (20-34 years), adults (35-64 years) and older adults (over 64 years) by the type of the female cancer over 1995-2010 were calculated. **Results:** Age-standardised rates for incidence for all cancers among females rose from 63.3 to 87.5 per 100 000 population during 1995-2010 and its morality increased from 44.5 to 53.5 per 100 000 population. In spite of having similar trends in both sexes, cancer incidence among females remained higher while mortality persisted lower than males. Breast cancer was the commonest cancer among females with its incidence and mortality increasing through-out. Cervical cancer incidence increased during 1995-2000, declined slightly in 2005 and remained stable over 2006-2010.Cervical cancer mortality remained stable over 1995-1999, declined in 1999-2003, increased slightly throughout 2003-2006 and remained stable during 2007-2010. Ovarian cancer incidence remained stable over 1995-2010. Its mortality remained stable over 1995-2000, declined slightly during 2000-2003 and increased in 2003-2010. Uterine cancer incidence and mortality increased steadily throughout 1995-2010. For all these cancers, incidence and mortality in 0-34 years remained low. **Conclusions:** Increasing trend of cancer incidence and mortality among females over 1995-2010, directs the need of revisiting female cancer control programmes.

Keywords: Breast cancer- cervical cancer- cancer incidence- cancer mortality- females- ovarian cancer- Sri Lanka

Asian Pac J Cancer Care, **6 (1)**, 27-33

Submission Date: 09/21/2020 Acceptance Date: 02/07/2021

Introduction

In global context, according to GILOBOCAN 2012, breast cancer is the second most commonest cancer overall with 1.7 million cases (12%) and ranking as the fifth leading cause of death accounting for 522 000 deaths (6.4%) while being the most frequent cause of death in less developed regions with 324 000 deaths, 14.3% of total [1]. Breast cancer is seen mainly among females with a female to male ratio of 100:1 [2]. It accounts for 25% of the cancers among females [1]. Hence, breast cancer is considered mainly as a female cancer in present paper. Among female specific cancers next come, cervical, uterine and ovarian cancers with cervical cancer being seventh in overall with 528 000 new cases in 2012. Of 266000 deaths (7.5% of female cancers)

Corresponding Author:
Dr. Palatiyana V. S. C Vithana
Family Health Bureau, Ministry of Health Sri Lanka, Colombo, Sri Lanka.
Email: chiranthikav@gmail.com

resulting from cervical cancer, 87% of deaths occurs in less developed regions [1]. For 2012, 320 000 new cases of uterine cancer (4.8% of all female cancers) and 76 000 deaths (2.1% of female cancers) were estimated [1]. Ovarian cancer with an incidence of 239 000 new cases (3.6% of female cancers) and 152 000 deaths (4.3% of female cancers) in 2012 comes as seventh most common cancer and eighth commonest cause of cancer deaths among females. Highest incidence estimates of uterine and ovarian cancers are for developed world [1].

Sri Lanka with its population 20.4 million in 2012 has faced epidemiological transition from communicable diseases to non-communicable diseases within past two decades [3]. Among adults of 35-64 years, cancer mortality increased over 1950-2005 and had become the second leading cause of death among female aged 35-64 years in 2002-2006 [4]. Neoplasms were the second leading cause of hospital death in 2012 [5].

National Cancer Control Programme was established in 1980. National hospital-based cancer registry was commenced in 1985 and first publication came out in 1990. Five yearly reports were published in 1995, 2000 and 2005. From 2006, annual publications were done with last published report for 2010. Sources of data expanded throughout the period with the establishment of new cancer treatment centres. For the period of 1985-2000, it was only from main cancer hospital, National Cancer Institute, Maharagama. For 2005-2007, data flow was from six cancer treatment centers. Additionally, four oral and maxillo-facial surgical (OMFS) units had sent data in 2006 and 2007. In 2008, data flow was from seven cancer treatment centers, 16 OMFS units and 17 pathological laboratories. For 2009-2010, data came from nine treatment centers and 17 OMF units. Additionally 15 and 13 pathological labs supplied data respectively in 2009 and 2010 [6].

Population based cancer registry in the district of Colombo was established in 2012 with the technical support from the International Agency for Research on Cancer [7]. Still it is limited to Colombo district and only the first report which is for the single year of 2012, is still published. National Hospital-based Cancer registry reports provide large-scale data about cancer incidence by specific cancer type, age, gender and ethnicity providing potential for identifying important trends. However, being summary reports they fall short in fully addressing their potential in doing detail analysis of cancer trends over years. Mortality data comes from the Register General Department. The Registrar General's Department collects and compiles information on vital statistics. Department of Census and Statistics coordinates the dissemination and provides guidance for other government ministries. When a death is registered, a certificate is issued to the informant. A duplicate copy, with death declaration, is sent to the Registrar-General by divisional secretaries. There, all the returns are checked for possible entry errors. If any inconsistency is found it is referred back to the district office. The error free abstracts are used in the manual compilation of vital statistics and coded by a trained coder into International Classification of Diseases- 10 (ICD-10) classification. ICD 10 classification has been used since 1997. Detailed information is processed using computers [8].

Well woman clinics (WWCs) was introduced in 1996 [9]. In WWCs, breast cancer early detection is conducted using clinical breast examination (CBE) and increasing awareness on breast self-examination (BSE). Women with high risk for breast cancer or having positive finding of CBE, are referred for mammography. Breast cancer early detection coverage was on only 2.2% among 35-59 year women in Gampaha district in Sri Lanka [10]. In WWCs, cervical cancer screening is conducted using Pap smear test [9]. There are no organised screening programmes for ovarian and uterine cancers in the country.

Females are bit hesitant to go for screening and to prioritize their health when it comes to female only cancers [11] in spite of having good literacy rate of 94.6% [5]. In order to evaluate effectiveness of present interventions and to plan for future, it is important to assess the recent trends in cancer incidence and mortality. Present study analyses incidence and mortality trends of female breast cancer, cervical, ovarian and uterine cancers in Sri Lanka over 1995-2010 and investigates the trends among young adults (20-34 years), adults (35-64 years) and older (over 64 years) age groups.

Materials and Methods

This study analyses female cancers consisting of breast, cervical, uterine and ovarian cancer trends among Sri Lankan females over 1995-2010.

Data sources

Sri Lankan cancer incidence among females by cancer type and five year age group were obtained published national hospital based cancer registry reports for 1995, 2000, 2005, 2006, 2007,2008,2009 and 2010 [6, 12-18]. Data were in the format coded using International Classification of Diseases (ICD)-09 for 1995 and International Classification of Diseases for Oncology (ICD-O) for 2000 onwards. Sri Lankan female deaths by the cancer type and five-year age group were taken from World Health Organization (WHO) database for 1996-2003 and 2006 and Department of Census and Statistics Sri Lanka for 1995 and 2004-2010 where WHO data were not available [8, 19]. Data for both of sources are from Sri Lankan vital registration system. Mortality data used for present analysis were confined only to the data classified by ICD 9 and 10. For the said period, it was in ICD-9 and 10 formats. Denominator Sri Lankan populations by sex were obtained from the Department of Census and Statistics Sri Lanka [3].

As data were extracted from published sources, ethical clearance or any special permission were not obtained. Sources of data are referred as applicable.

Analysis

Descriptive data analysis was conducted using Microsoft Excel 10. Cancer-specific incidence and mortality by five-year age categories were grouped

for females into all cancers, breast, cervical, ovarian and uterine cancers and for males only for all cancers. The rates were directly age-standardised per 100 000 population to the Segi and Doll world standard population [20-21]. Results were presented for all cancers contrasting the sex differentials. Age-standardised incidence and mortality for young adults (20-34 years), adults (35-64 years) and older adults (over 64 years) by the female cancer types over 1995-2010 were presented.

Results

From 1995-2010, total number of cancer incidence and mortality increased among Sri Lankan females. Incidence increased from 3875 of new cases in 1995 to 8970 in 2010. Cancer deaths rose from 2654 to 5398 over 1995-2010. Female population also expanded from 8.9 to 10.4 million during 1995-2010.

Female, age-standardised rates (ASR) for incidence for all cancers continued to rise over 1995- 2010 from 63.3 to 87.5per 100 000 population with a slightly higher figure of 88.7 per 100 000 in 2000. Though trends are basically similar in both sexes, incidence among females was higher than males throughout 1995-2010 with sex differential narrowed during 2007 -2010 (Figure 1).

ASR for cancer morality in females, increased from 44.5 to 58.6 per 100 000 population over 1997-2000, followed by a decline up to 39.5 per 100 000 in 2001 and rose gradually over 2001 to 2010 to 53.5. Female mortality remained lower than males over 1995-2010 with a slightly wider sex differential from 2001 onwards except for 1998 where both mortalities were equal (Figure 1).

Breast cancer was leading cause of the cancer incidence among females over 1995-2010.Incidence increased through-out the period, in all ages and 20-34, 35-64 and over 64 years with it being more prominent in two older groups. It is highest in over 64 years in 1995, became highest in 35-64 years in 2000 and equalised in these groups in 2007-2008 and thereafter became highest among over 64 years while 20-34 years had a lower incidence. Mortality increased over 1996-2000 and 2003-2010 in all ages, 35-64 and over 64 years while it remained low and steady in 20-34 years. Over 64 years had highest with 35-64 years having next highest mortality. Mortality slightly declined in over 64 years from 1995 to 1996, in 2001-2003 and in 2007 while it continued to rise in 35-64 years (Figure 2).

Cervical cancer was the second leading cancer in

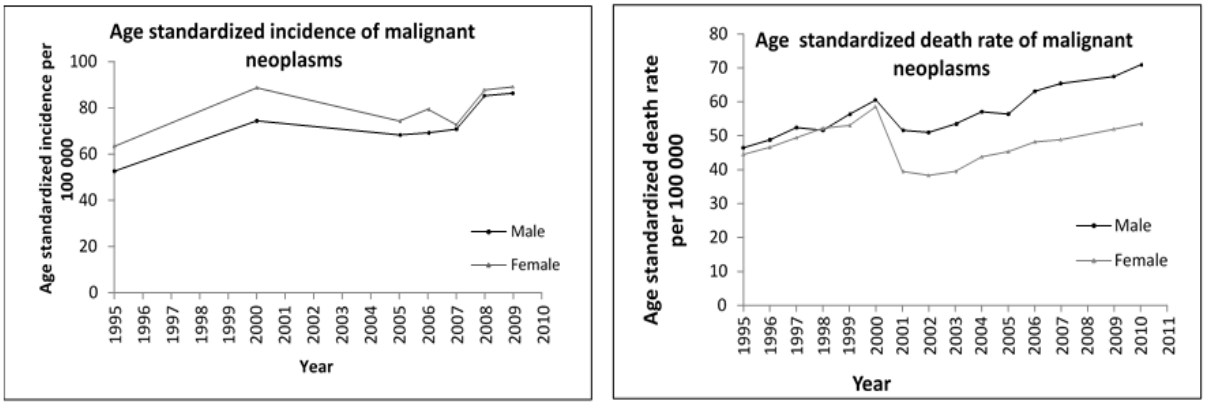

Figure 1. Sri Lankan Cancer Incidence and Mortality 1995-2010*; * Age-standardised to Segi and Doll world standard population [20-21]. Source of data: Incidence- National Cancer Control Programme Sri Lanka [6, 12-18], Mortality- World Health Organization Information System and Department of Census and Statistics Sri Lanka [19,8]

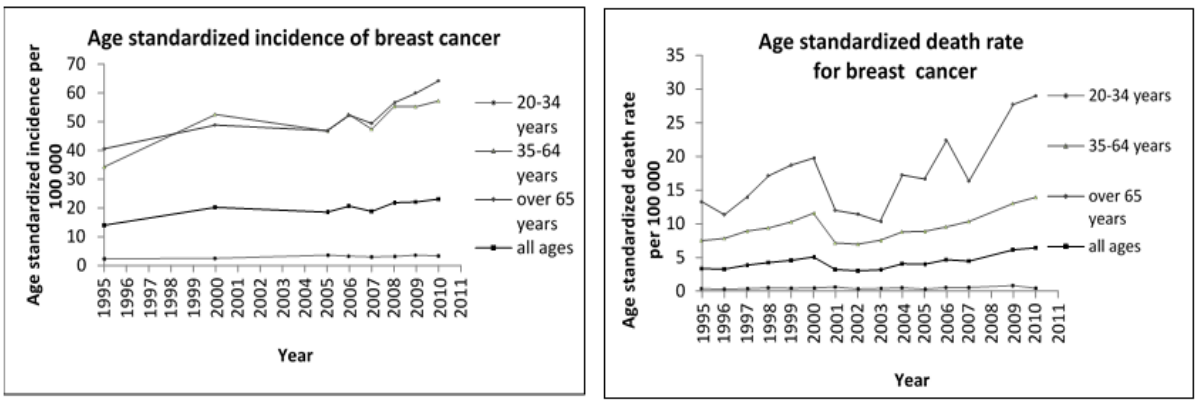

Figure 2. Sri Lankan Female Breast Cancer Incidence and Mortality 1995-2010*. *Age-standardised to Segi and Doll world standard population [20-21]. Source of data: Incidence- National Cancer Control Programme Sri Lanka [6, 12-18], Mortality- World Health Organization Information System and Department of Census and Statistics Sri Lanka [19, 8]

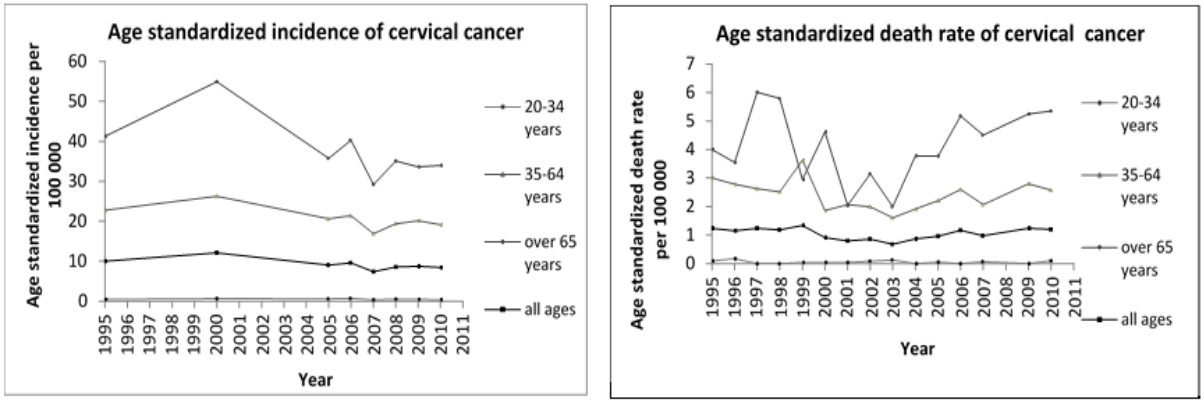

Figure 3. Sri Lankan Cervical Cancer Incidence and Mortality 1995-2010*, *Age-standardised to Segi and Doll world standard population [20, 21]. Source of data: Incidence- National Cancer Control Programme Sri Lanka [6, 12-18], Mortality- World Health Organization Information System and Department of Census and Statistics Sri Lanka [19, 3]

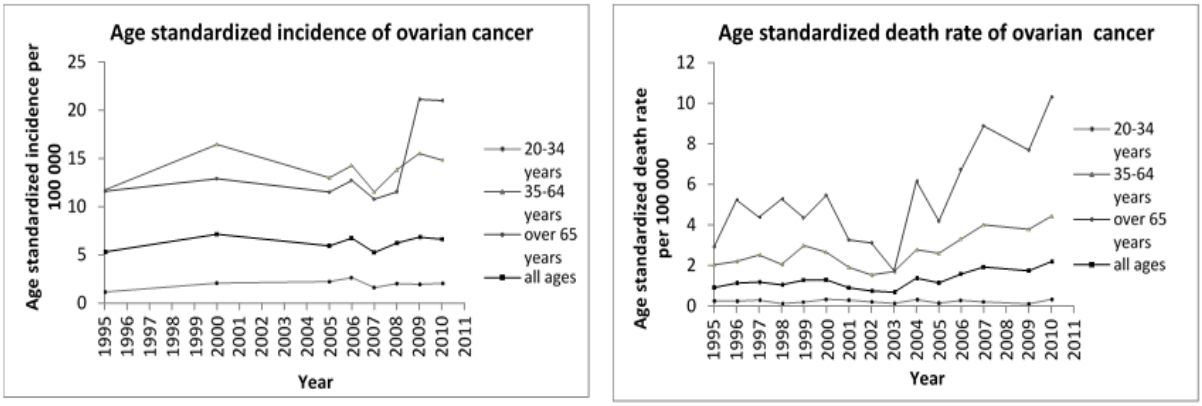

Figure 4. Sri Lankan Ovarian Cancer Incidence and Mortality 1995-2010*, * Age-standardised to Segi and Doll world standard population [20, 21]. Source of data: Incidence- National Cancer Control Programme Sri Lanka [6, 12-18], Mortality- World Health Organization Information System and Department of Census and Statistics Sri Lanka [19, 3].

the females over 1995-2010. Incidence increased from 1995 to 2000, followed by a slight decline in 2005 and remained stable over 2006-2010 in all ages, 35-64 years and over 64 years. Mortality declined from 1995-2001, increased in a lesser extend throughout 2003-2010 in all ages, 35-64 and over 64 years, in spite of fluctuations. Mortality remained low in 20-34 years. Over 64 years had highest with 35-64 years having next highest in both incidence and mortality (Figure 3).

Ovarian cancer was the third in the incidence of four female cancers. Incidence remained stable throughout 1995-2008 in all ages and all three age groups with 35-64 years being highest while over 64 years being second highest during 1995-2008. It increased among over 64 years in 2009-2010. Mortality remained stable over 1995-2000 for all the age groups, declined slightly over 2000-2003 among all ages 35-64 years and over 64 years. It increased from 2003 to 2010 in spite certain fluctuation seen in over 64 years. Over 64 years had highest mortality with 35-64 years being next highest, while 20-34 years had low and stable mortality (Figure 4).

Uterine cancer incidence increased steadily throughout 1995-2010 in all ages, 35-64 and over 64 years, with having highest incidence in 2008 while it remained low in 20-34 years. Mortality increased steadily over 1995-2010 in all ages, 35-64 and over 64 years. It remained low in 20-34 years. Over 64 years had highest and 35-64 years next highest in both incidence and mortality (Figure 5).

Discussion

Cancer incidence as well as mortality increased among females over 1995-2010. Cancer incidence was higher in females. Mortality was higher among males. Breast cancer was the leading cancer among females, with increasing trend in both incidence and mortality. Cervical cancer was second highest in list with an initial increase in incidence followed by a slight decline and thereafter remained stable. Its mortality had declined and thereafter increased. Ovarian cancer was the third in the incidence with a stable incidence and a slightly increasing mortality in latter period. Uterine cancer incidence and mortality increased over the period.

Increasing cancer incidence and mortality among Sri Lankan females as well as males over 1995- 2010, reflects the epidemiological transition from communicable diseases to non-communicable disease occurring over recent decades. Sri Lanka has experienced

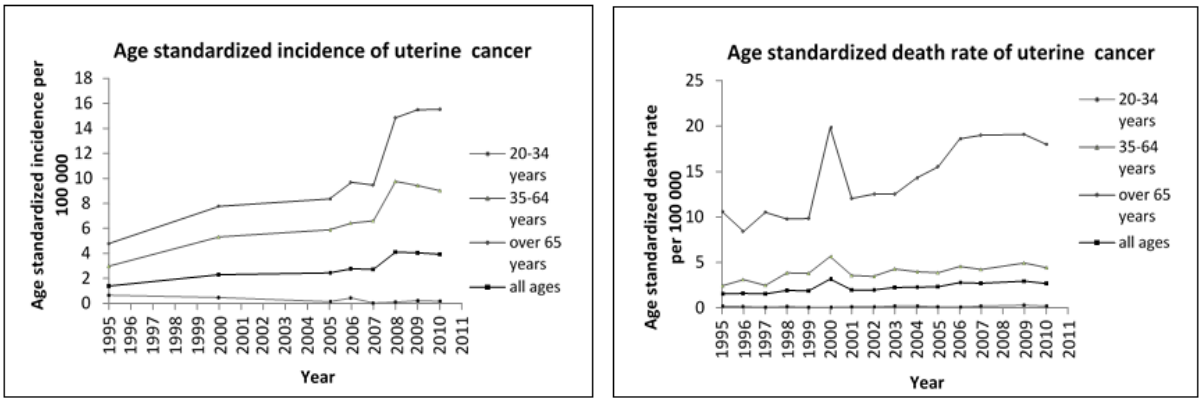

Figure 5. Sri Lankan Uterine Cancer Incidence and Mortality 1995-2010*, * Age-standardised to Segi and Doll world standard population [20, 21]. Source of data: Incidence- National Cancer Control Programme Sri Lanka [6, 12-18], Mortality- World Health Organization Information System and Department of Census and Statistics Sri Lanka [19, 3].

epidemiological transition reflected by profound decline in infectious diseases and pregnancy-related mortality in adults with an increase in circulatory diseases and external causes in males, cancers in females [4].

Females having higher incidence of cancers and a lower mortality compared to male, is consistent with GLOBOCAN 2012 estimates for South East Asia [1]. Commonest cancer among females is breast cancer and next commonest is cervical cancer in Sri Lanka. Globally, it is second cause of female cancer mortality in more developed region while first is lung cancer [1] while being commonest in South East Asia among females [22].

Breast cancer is early detectable and cervical cancer is preventable. Early treatment of these two cancers was proven to increase the survival and reduce the mortality [1]. In 1996, with the introduction of WWCs, breast cancer early detection and screening of cervical cancer using Pap smear test were initiated. This with parallel increased awareness might have accounted for having high incidence and low mortality due to cancer among females compared to males. However, this contrasts from global figure of male cancer incidence being 25% higher with 14.8% of male cancer incidence consisting of prostate cancer due high early detection of prostate cancer [1]. Female mortality being lower than males is consistent with the findings of more developed regions [1].

Breast cancer showed an increasing incidence through-out the period. It is highest in over 64 years in 1995, became highest in 35-64 years in 2000, equalised in these groups in 2007-2008 and became highest again in over 64 years in 2009-2010 while 20-34 years had a lower incidence. This increased incidence in 35-64 years could be attributed to the age of occurrence as well as to the early detection parallel to the provision CBE and awareness on BSE for 35-60-year group with initiation of WWC programme in1996.

Being commonest cause of cancer deaths among females, breast cancer mortality increased over 1996-2000 and 2003-2006 with over 64 years having highest mortality and 35-64 years having next highest mortality. This might be due to late detection of breast cancer being more in over 64 years than 35-64 years. Yet Sri Lankan findings are consistent with breast cancer being first commonest cause of cancer deaths in the South East Asia and in less developed countries in 2012 [1].

Breast cancer being commonest, reflects the need of reviewing the ongoing early detection programme. Recent studies highlighted the inadequacy of coverage of breast cancer detection and poor knowledge, attitudes and practices on breast cancer early detection among community as well as primary health care workers [23-24]. CBE coverage in WWCs was only 2.2% among 35-59 year women in Gampaha district in 2007. The overall procedure on CBE conducted by public health midwives at WWC was observed to be substandard in entire district in an assessment of conducted using Lot Quality Assurance Sampling in 2008 [11]. So, adopting evidence-based strategies is needed for the programme. A qualitative study conducted in the same district among public health midwives revealed non-availability of guidelines, inadequacy of training, lack of skills and material to provide health education, inability to provide privacy during CBE, lack of community awareness and motivation in 2008 [11].

Cervical cancer was the second leading cancer in the females over 1995-2010. Though cervical cancer is the second commonest female cancer in Sri Lanka, globally it is the fourth most common cancer in females [1]. The average risk of dying from cervical cancer before 75 years is three time higher in lesser developed than developed regions [1]. In the South East Asia, it is the second commonest cancer among females [1].

Cervical cancer incidence increased from 1995 to 2000, followed by a slight decline in 2005 and remained stable over 2006-2010. Initial increase may be parallel to introduction of Pap smear screening under WWC in 1996. Mortality which declined from 1995-2001, increased in a lesser extend throughout 2003-2010. This reflects that fact of lack of organised screening programme in past. However, not having decreasing trend in incidence and the raising trend in mortality directs towards the need of strengthening of the cervical cancer control programme.

According to GLOBOCAN estimates ovarian cancer incidence is highest in more developed regions [1]. It is

sixth commonest cancer among females in South East Asia [1]. In present study, ovarian cancer was the third in the incidence of four female cancers and incidence remained stable throughout 1995-2010 in all ages. The highest incidence seen among 35-64 years shows need for giving more emphasis in diagnosing ovarian cancer as disease per say is having only vague symptoms from younger age. In spite of initial stable rates followed by a slight decline in mortality, its increase from 2003 to 2010 directs on need of early diagnosis and timely treatment.

Uterine cancer incidence and mortality increased steadily throughout the period. This reflects the need of more focused interventions with the intention of uterine cancer control. Increasing awareness, early diagnosing and timely treatment should be achieved. Globally it accounted for 4.8% of female cancers and in terms of mortality only 2.1% of cancer deaths among females reflecting the reasonable prognosis associated with the disease in developed world [1]. Therefore, there is need of strengthening early diagnosis and timely treatment of it in Sri Lankan set up. However, it is seventh commonest cancer among females in South East Asia [1].

Strengths of the present study are that it presents in recent trends of female cancer incidence and mortality using data best available. Incidence and mortality data were age-standardised to the to the world standard population as proposed by Segi (1960) and modified by Doll et al.(1966) to overcome confounding due to different age structures over the years [20]. Age-standardization to the world standard population allows comparison with similarly ASRs from the world and regions.

Incidence data were obtained from the published national hospital- based cancer registry reports. Not having a national population-based cancer registry data for the country for 1990-2010 was a barrier in getting 100% coverage of cancer incidence and mortality. There is a limitation in coverage of population in national hospital-based cancer registry. For national hospital- based cancer registry, data for 1990-2000 were only from National Cancer institution and there-after, expanded to the data from newly establishing treatment units, pathological labs and OMF units. This has an effect of having data that are more complete in later years. However, national hospital- based cancer registry not having data of the patients taking treatment in private sector and abroad has result a certain underestimation of cancer incidence. Yet, histological confirmation was high with 92% in 2007 and over 94% in 2008-2010 [6, 16-18].

As data is obtained from published cancer registries, it included the codes used in those. In cancer registries before 2007, behaviour code 1 (uncertain whether benign or borderline malignancy) or 2 (carcinoma in situ) were included as cancers. From 2007 onwards, only behaviour code 3(Malignant primary site) was included as cancers. ICD 9 was used for coding incidence in 1995 and ICD O was used from 2000 onwards [6, 12-18]. These might have had certain effects on comparisons and decrease in incidence of breast, cervical, ovarian and all cancers from 2000 to 2005.

In spite of all the effort of getting best available mortality data, inherent issues of the under-registration of deaths could not be overcome particularly as over this period there was a civil conflict in the country. Since 1982 to 2000, there was an internal conflict was there and cease fire was there over 2001-2005. Internal conflict lasted up to 2009. Sudden increase of mortality in 2000 could be due to probable artefact resulted from restoration following decreased registration in previous years [4]. Even though trained coder does the coding at the central Registrar General Department [8, 25], accuracy of documented cause of death leading to misclassification is unavoidable. One study conducted in quality and coverage of death registration in a district of Sri Lanka; found that 15.5% of medical officers misclassified the underlying cause of death (Fonseka, 1996). Another study conducted in a sample of deaths that had occurred in 2006-2008 shows that the majority of medical records was of average quality. Concordance between the underlying cause of death in the vital registration data and that from the 'gold standard' (medical records review), diagnosis was only 41.4% (n=249). The sensitivity of all leading causes of death and positive predictive value were below 67% [26].

Due to limitation of availability of data, present study does not show latest trends in incidence and mortality after 2010. Hence, effectiveness of very recent interventions such development of guidelines on early detection of breast cancer in 2011 and of gynaecological cancer in 2014 with revision of primary health care worker curriculums in 2015 cannot be assessed. Hence, further analysis would be needed to see the effectiveness of very recent interventions on female cancer control such development of guidelines on early detection of breast cancer in 2011 and of gynaecological cancer in 2014 with parallel revision of primary health care worker curriculums in 2015, when data are available. A study on cost-benefit analysis of using of different strategies in breast and cervical cancer control are present needs.

Increasing trend of breast cancer incidence as well as mortality directs the need of revisiting breast cancer control programme in the country. Cervical cancer, the second in list with an initial increase in incidence followed by a slight decline and thereafter remaining stable rather than declining, with a slightly increasing trend in mortality after initial decline, reflects the inadequacy of screening strategy with opportunistic screening using Pap smear test. Need of strengthening the cervical cancer programme exists. The stable incidence and a slightly increasing mortality in latter period for ovarian cancer and increasing incidence and mortality for uterine cancer draws the attention for strengthening awareness, early diagnosis and timely treatment for the gynaecological cancers.

References

1. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F. Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. International Journal of Cancer. 2014 Oct 09;136(5):E359-E386. https://doi.org/10.1002/ijc.29210

2. Cook MB, Dawsey SM, Freedman ND, Inskip PD, Wichner SM, Quraishi SM, Devesa SS, McGlynn KA. Sex Disparities in Cancer Incidence by Period and Age. Cancer Epidemiology Biomarkers & Prevention. 2009 03 17;18(4):1174-1182. https://doi.org/10.1158/1055-9965.epi-08-1118
3. Department of Census and Statistics Sri Lanka (2015a). Population and Housing: Estimates on Mid-year Population [Online]. Department of, Census Statistics Sri, Lanka. Available: http://www.statistics.gov.lk/page.asp?page=Population and Housing [Accessed 29 August 2015].
4. Vithana C, Linhart C, Taylor R, Morrell S, Azim S. Trends in Sri Lankan cause-specific adult mortality 1950–2006. BMC Public Health. 2014 06 25;14(1). https://doi.org/10.1186/1471-2458-14-644
5. Ministry of Health Sri Lanka (2015). Annual Health Bulletin 2012. Available at: http://www.health.gov.lk/en/publication/AHB-2012/Annual Health Bulletin - 2012.pdf (Accessed: 3 September 2015).
6. National Cancer Control Programme Sri Lanka (2016) Cancer incidence data: Sri Lanka 2010. Sri Lanka.
7. National Cancer Control Programme Sri Lanka (2012b) Commencement of population based cancer registry in the Colombo district. Sri Lanka.
8. World Health Organization (2015a) Statistical Information System. Detailed data files of WHO mortality, population and live births database. Available at: http://www.who.int/whosis/en/ (Accessed: 3 September 2015).
9. Family Health bureau (2015). Annual Report on Family Health 2013, Colombo, Sri Lanka, Family Health Bureau.
10. Vithana PVSC, Hemachandra NN, Ariyaratne Y, Jayawardana PL. Qualitative Assessment of Breast Cancer Early Detection Services Provided through Well Woman Clinics in the District of Gampaha in Sri Lanka. Asian Pacific Journal of Cancer Prevention. 2013 Dec 31;14(12):7639-7644. https://doi.org/10.7314/apjcp.2013.14.12.7639
11. Vithana PVSC, Ariyaratne M, Jayawardana P. Quality of Breast Cancer Early Detection Services Conducted by Well Woman Clinics in the District of Gampaha, Sri Lanka. Asian Pacific Journal of Cancer Prevention. 2013 01 31;14(1):75-80. https://doi.org/10.7314/apjcp.2013.14.1.75
12. National Cancer Control Programme Sri Lanka (2002) Cancer incidence data: Sri Lanka 1995. Sri Lanka.
13. National Cancer Control Programme Sri Lanka (2009b) Cancer incidence data: Sri Lanka year 2000. Sri Lanka.
14. National Cancer Control Programme Sri Lanka (2009a) Cancer incidence data: Sri Lanka 2005. Sri Lanka. Colombo.
15. National Cancer Control Programme Sri Lanka (2012a) Cancer incidence data: Sri Lanka 2006. Sri Lanka.
16. National Cancer Control Programme Sri Lanka (2013) Cancer incidence data: Sri Lanka 2007. Sri Lanka.
17. National Cancer Control Programme Sri Lanka (2014) Cancer incidence data: Sri Lanka 2008. Sri Lanka.
18. National Cancer Control Programme Sri Lanka (2015) Cancer incidence data: Sri Lanka 2009. Sri Lanka.
19. Department of Census and Statistics Sri Lanka (2015b). Population and Housing: Vital statistics. [Online]. Available: http://www.statistics.gov.lk/page.asp?page=Population and Housing [Accessed 29 August 2015].
20. Segi M. Cancer mortality for selected sites in 24 countries(1950-57), Cancer mortality for selected sites in twenty four countries. Sendai, Japan: Department of Public Health, Tohoku University of Medicine. 1960.
21. Doll R, Payne P, Waterhouse J. Cancer incidence in five continents. vol. I. Geneva. 1996.
22. Ferlay J, Soerjomataram I, Ervik M, et al. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC Cancer Base No. 11. Lyon, France: International Agency for Research on Cancer. 2013;:Available at: available: http://globocan.iarc.fr (Accessed: 30 August 2015).
23. Vithana PC, Ariyaratne M, Jayawardana P. Educational Intervention on Breast Cancer Early Detection: Effectiveness among Target Group Women in the District of Gampaha, Sri Lanka. Asian Pacific Journal of Cancer Prevention. 2015 04 03;16(6):2547-2553. https://doi.org/10.7314/apjcp.2015.16.6.2547
24. Vithana PC, Ariyaratne M, Jayawardana P. Effectiveness of an Educational Intervention among Public Health Midwives on Breast Cancer Early Detection in the District of Gampaha, Sri Lanka. Asian Pacific Journal of Cancer Prevention. 2015 02 04;16(1):227-232. https://doi.org/10.7314/apjcp.2015.16.1.227
25. World Health Organization (2015b) Status of mortality statistics of the country: Sri Lanka. Available at: http://s3.amazonaws.com/zanran_storage/www.searo.who.int/ContentPages/6493086.pdf (Accessed: 5 September 2015).
26. Rampatige R, Gamage S, Peiris S, Lopez AD. Assessing the Reliability of Causes of Death Reported by the Vital Registration System in Sri Lanka: Medical Records Review in Colombo. Health Information Management Journal. 2013 Oct;42(3):20-28. https://doi.org/10.1177/183335831304200302