

Original Research



Trends in lung cancer incidence in Sri Lanka from 2005-2019

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Abstract

Introduction: Studies carried out on the incidence of lung cancer in the world and Southeast Asia region have shown varying trends. This is the first study in Sri Lanka after 2010 on trends of lung cancer.

Objectives: To describe the trends in lung cancer incidence and patterns in Sri Lanka

Methods: All newly diagnosed 'trachea bronchus and lung' cancer patients in Sri Lanka during 2005–2019 included in the National Cancer Registry, Sri Lanka (NCR-SL) were analysed. Crude incidence rates (CR) and age standardized incidence rates (ASR) were compared using the Joinpoint regression program.

Results: Data of 19 815 trachea bronchus and lung cancer patients (males=15292; 77.17%) were analysed. The joinpoint regression analysis observed a linear increasing trend of CR and ASR of lung cancer from 2005-2019. The proportional increase was higher for females (average annual percentage change (AAPC) of CR=8.5 and ASR=6.16) than males (AAPC of CR=5.4 and ASR=3.48) and the increase was statistically significant for both sexes.

Conclusions & Recommendations: In Sri Lanka, the incidence of lung cancer has shown an increasing trend with a greater proportional rise in females. Although the increase could be partially explained by indoor air pollution, the rise could be due to other unknown factors, which warrants detailed studies on lung cancer in Sri Lanka.

Key words: lung cancer, Sri Lanka, Joinpoint, age standardize rate, crude incidence rate

Introduction

Cancer is a common, most catastrophic, devastating non-communicable disease affecting mankind all over the world. Cancer is the first or second leading cause of death in many countries before the age of 70s (1). In 2020, with an estimated 2.2 million new cases and 1.8 million deaths, lung cancer became the second-highest diagnosed cancer and the leading cause of cancer death in the world. Lung cancer is the highest among all cancers in males, in all ages, accounting for 1.4 million worldwide cases in 2020. In females, lung cancer is the third common diagnosed cancer only after breast and colorectum with 0.7 million annual cases (2). Although the male to female ratio varies widely across regions, ranging from 1.2 in Northern America to 5.6 in Northern Africa, overall lung cancer incidence and mortality rates are roughly double in men than in women (2). The incidence of lung cancer is increasing with age and common after 50 years. In Southeast Asia, although the age standardized incidence rate for lung cancer (male 26.4, female 9.4) is not much higher than the world average (male 31.5, female 14.6) the burden on health services will be much higher due to late presentations (2).

The overwhelming cause of lung cancer is tobacco smoking. Smoking of tobacco products, especially cigarettes, is responsible for most cases of lung cancer in the world. In developed countries, the risk of lung cancer is 10 times higher among smokers compared to non-smokers and more than 90% of lung cancers have been attributed to smoking (3-6). The causal relationship between cigarette smoking and lung cancer was first established in the 1950s (7). Duration, dose response and early initiation of smoking were proven to have a causal relationship in about 70 % of lung cancers (8). Change in tobacco smoking patterns is an important factor that changes the ASRs in several countries (9,10). In Sri Lanka, a recent study conducted in Colombo, the risk of having lung cancer among ever smokers was reported to be 10-fold higher than that of non-smokers (10). Non-communicable Disease Risk Factor Survey Sri Lanka 2015 (STEPS Survey), a multistage cluster survey among 7200 participants observed that prevalence of current smoking was

29.4% in males and 0.1% in females. Among current male smokers, 67.6% were daily smokers and mean age of initiation of smoking was 20.5 years. Second-hand smoking at home was experienced by 25.2% of the males and 21.6% of the females during the past 30 days and second-hand smoking at their workplace was reported by 36.1% of the males and 11.1% of females in the past 30 days (11).

Realizing its dangers, successive governments of Sri Lanka has taken firm action to reduce the use of tobacco in the country. Sri Lanka was the first in the South Asian region and the fourth in the world to ratify the WHO Framework Convention on Tobacco Control (FCTC) in 2003. Following this, Sri Lanka has taken several measures to control tobacco use including banning smoking in public places, barring the sale and promotion of tobacco for youth under 21 years of age, banning tobacco advertising, promotion and sponsorships, prohibiting tobacco vending machines, and implementing a mandatory health warning covering 80% of cigarette packs (12). Sri Lanka's strong commitment to combat tobacco use has resulted in a significant decline in smoking rates, from 43.1% in 2005 to 28.4% among males in 2018 (10).

Apart from tobacco smoking, the variation in lung cancer and its occurrence among females and males has been also postulated concerning exposure to passive smoking, asbestos, radon, wood smoke, air pollution, diesel exhaust or other chemicals, genetic variations and biological indicators (4, 13-15). According to the 2012, Census of Population and Housing, more than three fourth (78.4%) of the households in Sri Lanka, use firewood as the fuel for cooking which is a main cause for indoor air pollution (16).

There are two major histological types of lung cancers: small cell carcinoma and non-small cell carcinoma. Non-small cells are further divided into adeno, squamous, and large cell carcinoma. Cigarette smoking has been linked with all histological subtypes of lung cancers but, squamous cell carcinoma and small cell carcinoma are strongly linked with smoking (9). A retrospective study using bronchoscopy database from 2011 to 2012 conducted

in Kandy district, Sri Lanka, found none of the female lung cancer patients to be smokers. Out of 34 primary lung cancers among females, 10 were squamous and two were 2 small cell lung cancer, which are commonly seen among smokers. The balance were classified as adeno carcinoma (n=6), undifferentiated (n=12) and two were poorly differentiated lung cancer (17).

In Sri Lanka, NCCP, Ministry of Health is responsible for the collection of national cancer-related data. The NCR-SL, a hospital and lab bases registry, was initiated in 1985 by NCCP and continuously collect cancer related data from various institutions including National Cancer Institute, all government and private hospitals and laboratories. The coverage of the NCR-SL has gradually increased over the period and more than 95% of the cancer patients are registered (2019 data). The systemic therapy for lung cancer is only provided at major hospitals in Sri Lanka and therefore, all the diagnosed lung cancer patients are expected to visit a major hospital. Due to this, the coverage of data related to lung cancer could be considered as high. Further, the NCCP database is the only nationwide cancer database in the country, and it has a strict quality assurance process that is monitored at many different levels. Quality checks were done at hospital level, district level and national level including duplicate checks (18). According to NCR-SL data 2005-2019, in Sri Lankan males, trachea, bronchus and lung cancer is the second most reported cancer, only second to lip, oral cavity and pharynx cancers. When considering both sex, trachea, bronchus and lungs cancer is one of the top 10 reported cancer in the country (18). Analysing and presenting the lung cancer data is most important in planning of lung cancer care services including providing screening, treatment and palliative care facilities. This includes early detection programs for targeted groups and providing priority diagnostic services and treatments in cancer treatment centers.

Methods

Data source

The study is performed by compiling and analysing

secondary lung cancer data of NCR-SL obtained from National Cancer Control Programme (NCCP), Sri Lanka (18). The International Classification of Diseases for Oncology (ICD-O) and 'International Statistical Classification of Diseases and Related Health Problems-10th Revision' (ICD-10) is used in its database (18).

Data extraction

Cancer registry data of NCCP, Sri Lanka (18) was downloaded from the website. Printed copies of cancer registry data were obtained from the NCCP office. Relevant data for the study was extracted from the cancer registry to a Microsoft excel data sheet by the principal investigator. The extracted and compiled data was crosschecked by co investigators before the analysis.

Data analysis

SLCR data, from 2005 to 2019 was compiled and trachea bronchus and lung cancer incidence were compared for the study period. In this study C33 (Malignant neoplasm of trachea) and C44 (Malignant neoplasm of bronchus and lung) of ICD-10 is added to calculate the 'trachea bronchus and lung cancer' incidence. Male and female 'trachea bronchus and lung cancer' CR and ASR in Sri Lanka were obtained from secondary data and compared from 2005-2019. The CR and ASRs of 2005-2019 was analysed using Joinpoint Trend Analysis Software (version 4.9.0.0) (25 March 2021) (19). The permutation method was used for significance tests. Changes in annual incidence rates from lung cancer were calculated as annual percentage change (APC) and AAPC for males and females with 95% confidence interval (CI) and significance at p value <0.05.

Results

A total of 19 815 'trachea bronchus and lung' cancer patients were analysed from NCR-SL. Throughout the span of 2005 to 2019, in Sri Lanka 'trachea bronchus and lung cancer' incidence is higher among males (n=15 292; 77.17%) than females. In both sexes, a gradual increase in incidence was observed throughout the period with minor fluctuations.

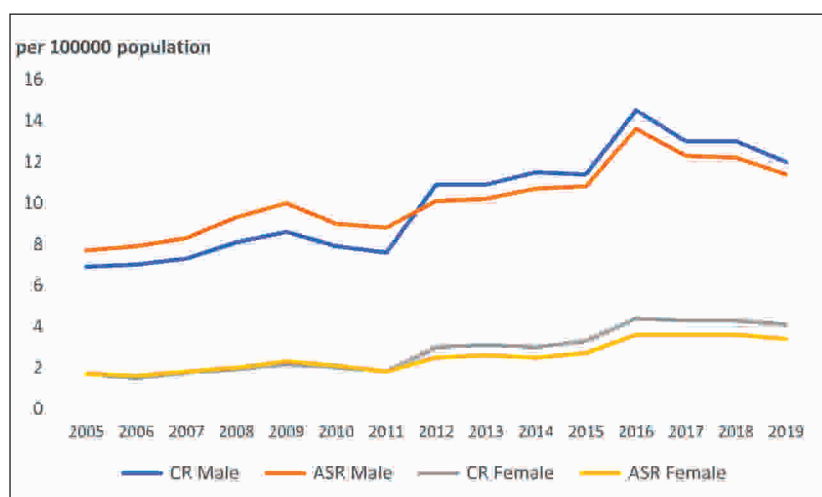
Among males, the lowest number of 'trachea bronchus and lung cancer' incidents were observed in 2005 (n=666) while the highest number is reported in 2016 (n=1484). In females, the lowest reported cases were seen in 2006 (n=152) while the highest incidence was observed in 2018 (n=1361). CR and the WHO ASR for male and female 'trachea bronchus and lung' cancer in Sri Lanka is shown in figure 1. In males, similar to 'trachea bronchus and lung' cancer incidence, the highest CR of 14.5 per 100 000 and ASR of 13.6 per 100 000 was observed in the year 2016. Apart from this, both the CR and ASR followed a similar pattern throughout the study period.

In females, a much similar pattern to male trends was

observed but, the increasing trend was of a lesser magnitude. The highest CR of 4.4 per 100 000 population was observed in 2016, while peak ASR of 3.6 per 100 000 was seen in the year 2016 to 2018.

In the current study, joinpoint regression analysis showed a linear and statistically significant increasing trend of both CR and ASR for both sexes from 2005-2019 (Figure 2). However, the AAPC for CR was 8.5 (95% CI: 6.7, 10.3) for females, which was higher than for males (AAPC=5.4; 95% CI: 4.0, 6.8). Likewise, the proportional increase in ASR from 2005 to 2019 was higher for females (AAPC=6.16; 95% CI: 4.8, 7.6) than males (AAPC=3.48; 95% CI: 2.5, 4.5).

Figure 1: Crude rate (CR) and age standardized rate (ASR) of males and females with trachea bronchus and lung cancer in Sri Lanka, 2005-2019



Discussion

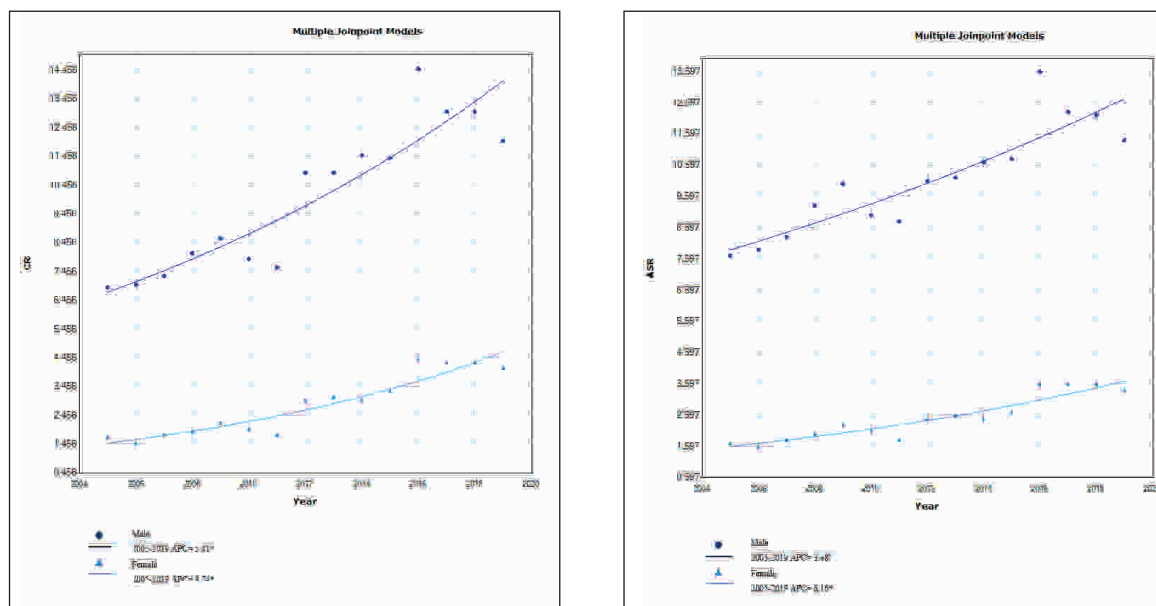
This is the first time, the lung cancer incidence in Sri Lanka is analysed for a period of 15 years from 2010-2019. It is evident from the calculated AAPC and the crude and adjusted rates, that lung cancer incidence is increasing in Sri Lanka in both sexes. However, the increase in females (AAPC CR=8.47; AAPC ASR=6.16) is much higher than the males. (AAPC CR=5.41; AAPC ASR=3.48).

Lung cancer trends all over the world are mainly dependent on the tobacco epidemic, the single most important risk and causative factor. In the Americas,

Europe and Oceania regions a slight decrease in male ASR is observed with an increase in female ASR. In Asian populations, although there are variations, an overall increasing trend is observed by researchers (2, 9, 20). Almost all these changes of decrease in male ASR and an increase in female ASR in many countries is largely explained by the patterns of smoking habits in the respective countries where there is a reduction in male smokers and an increase in female smokers.

Sri Lanka being one of the pioneers to adopt WHO Framework Convention on Tobacco Control (FCTC) in 2003 and implementing several strict tobacco

Figure 2: Joinpoint analysis of crude rate (CR) and age standardized rate (ASR) of males and females with trachea bronchus and lung cancers in Sri Lanka, 2005-2019



prevention measures, fails to show a significant reduction in lung cancer incidence although the prevalence of tobacco smoking is decreasing. The possible explanations are, the magnitude of reduction in smoking is not large and the duration is not long enough to make an impact, and the existence of alternative forms of locally produced cigarettes called 'beedi' and 'suruttu' which are less expensive and easily available in the market (10, 21). A previous analysis of lung cancer data in Sri Lanka using the secondary data from NCR-SL from 2001-2010, has found similar results supporting the current findings (21). Although the increase in male AAPC is similar to regional countries, the unexplained, unacceptable increase in female AAPC is an unusual finding which needs attention.

Sri Lanka is a lower-middle-income country in the Asian region, developing in nature with strict social and cultural norms where female smokers are hardly found, the current trend of increasing 'trachea bronchus and lung' cancer incidents among females cannot be justified. The only possible explanation is that this could be due to exposure to other smoke and carcinogens from the environment. The effect of indoor air pollution driven by the use of firwoods could not be excluded (10). A similar increase in female lung cancer trends is seen in many European

and American countries (1). but in contrast, the rise in Sri Lanka cannot be linked to smoking as females rarely smoke (10). As there is no such clear explanation for the increasing trend among the female lung cancer in in current study, detailed further studies should be carried out to explain this phenomenon and the strategies identified in the National Strategic Plan on Prevention and Control of Cancer in Sri Lanka: 2020-2024 to reduce the prevalence of tobacco smoking and exposure to environmental risk factors associated with cancer should be implemented an urgent matter.

Conclusions & Recommendations

In Sri Lanka, the incidence of 'trachea bronchus and lung' cancer from 2005 to 2019 has shown an increasing trend with a greater proportional rise in females. Since tobacco smoking among females is extremely low (10), indoor air pollution partially explains the increase in lung cancer among females. However, the rise could be due to other unknown factors. Therefore, detailed studies on lung cancer are warranted as an urgent need to highlight the rising incidence of lung cancer among women in Sri Lanka.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: This study was conducted using secondary data of population-based cancer registry (PBCR) of NCCP. For PBCR, Ethics clearance was granted by the Ethics Review Committee of the Faculty of Medicine, University of Colombo on 22.11.2010 (EC-10-106).

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Author contributions: MM, MF, SD and SN planned the study; MM and MF extracted the data; MM, SD and SN compiled and analysed the data; MM and SN graphically presented the data; and MM wrote the article. All authors proofread the article.

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