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An alarming rise in colorectal cancer incidence in Sri Lanka from 2010-2022; analysis of the national cancer registery from a South Asian cohort

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List of Abbreviations:

Abbreviation	Definition
CRC	Colorectal Cancer
NCCP	National Cancer Control Programme
APC	Annual Percentage Change
AAPC	Average Annual Percentage Change
ASIR	Age-Specific Incidence Rate
ASR	Age-Standardized Incidence Rate
SD	Standard Deviation

Abstract

Objective - This study aims to analyze the national trends in colorectal cancer (CRC) incidence in Sri Lanka over the past 13 years and identify the high-risk population groups for interventions. Mann-Kendall Trend test and Annual Percentage Change (APC) of Joinpoint Regression were used for the assess the trends.

Results - Among 29,015 CRC cases (50.5% females), the percentage of CRC among all cancers increased from 6.38% (2010) to 8.59% (2022), maximum at 8.70% (2020). A significant increasing trend in CRC incidence was observed ($\tau = 0.82$, $p < 0.05$), with an average annual percent change (AAPC) of 8.55% and a mean age-standardized incidence rate (ASR) of 9.23 per 100,000 populations (95% CI: 7.77–10.70). Females showed a sharper rise (AAPC = 8.97, $p < 0.05$), particularly during 2010–2016 (APC = 17.33, $p < 0.05$). Age-specific incidence rate (ASIR) increased significantly in those ≥40 years (40–59: $\tau = 0.72$, APC = 10.33; ≥60: $\tau = 0.79$, APC = 5.71; $p < 0.05$). A moderate increase was seen in the 20–39 age group (APC = 5.37, $p < 0.05$), with male shows the highest trend as APC = 12.05; $p< 0.05$.

Conclusion - The incidence of CRC has rapidly risen in Sri Lanka, in all age groups above 40 years and in both sexes over the past 13 years. The APC is highest for the 40–59 year age group. These findings emphasize the need for age-stratified screening programs and targeted interventions beginning at age 40 for at-risk populations.

Keywords: colorectal cancer incidence, age-specific trend, age-gender specific trends, Mann-Kendall trend test, average annual percent change

Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the second leading cause of cancer death worldwide, with an estimated 2 million new cases and over 910,000 deaths in 2024 (1,2). Global incidence continues to rise across all Human Development Index strata, and CRC risk increases sharply after 40 years of age, underscoring the value of age-targeted screening (1). While CRC has traditionally been regarded as a disease of older adults, population-based registries worldwide have documented a divergent pattern, with incidence rising among younger adults (3,4).

Although colorectal cancer incidence remains lower in many low- and middle-income countries (LMICs) than in high-income nations, several LMICs are experiencing a rapid increase in disease burden associated with population ageing, urbanization, westernization of dietary patterns, increasing obesity, and reduced physical activity (5). In South Asia, these epidemiological transitions have been accompanied by a gradual rise in CRC incidence despite the absence of organized population-based screening programmes in most countries (6).

In Sri Lanka, CRC ranks among the leading malignancies, yet the country lacks an organized population-based screening programme, and risk-prediction tools developed elsewhere have limited applicability to the local population (7). Two previous national registry-based analyses covering 2001-2019 reported a modest rise in CRC incidence (8)(9), but whether this trend has since accelerated, and how it varies by age and sex, remains unclear. Updated evidence on the age- and gender-specific trajectory of CRC in Sri Lanka is therefore needed to inform screening policy. Therefore, this study aimed to evaluate national temporal trends in CRC incidence in Sri Lanka from 2010 to 2022, with particular emphasis on age- and sex-specific patterns, to identify

demographic groups experiencing the greatest increase in incidence which to be inform future screening and prevention strategies.

Methodology

Data Source

Annual aggregated data on newly diagnosed colorectal cancer (CRC) cases were obtained from the National Cancer Registry reports published by the National Cancer Control Programme (NCCP) of Sri Lanka for the period 2010–2022. The National Cancer Registry compiles information on newly diagnosed cancers reported through the country's national cancer surveillance system. This study included all newly diagnosed CRC cases reported between 1 January 2010 and 31 December 2022. CRC cases were identified according to the International Classification of Diseases, 10th Revision (ICD-10), including colon cancer (C18), rectosigmoid junction cancer (C19), and rectal cancer (C20).

Age-Group Classification

Age groups were categorized into four intervals to facilitate comparison across the lifespan. The groups were defined as follows:

- 0-19 years: Child & Teens
- 20 – 39 years: Young-Adults
- 40 – 59 years: Middles-Age Adults
- ≥ 60 years: Older Adults

Although the National Cancer Registry reports data in 5-year age intervals. This aggregation was undertaken because the study was based on annual registry data spanning only 13 years, providing a limited number of observations for temporal trend analyses. Retaining the original 5-year age

strata would have resulted in sparse annual case counts, particularly in younger age groups where colorectal cancer (CRC) is rare, leading to unstable incidence estimates and reduced statistical power for temporal trend analysis. Pooling adjacent age groups increased the number of cases within each category, thereby improving the precision, robustness, and interpretability of temporal trend estimates while reducing the influence of random year-to-year variation. The selected age categories also reflect clinically and epidemiologically distinct stages of CRC risk. Individuals aged <20 years represent a population in which CRC is exceptionally uncommon and is often associated with hereditary cancer syndromes rather than sporadic disease. The 20–39-year group captures early-onset CRC, an increasingly recognized global public health concern characterized by rising incidence (10) despite a relatively low absolute disease burden. The 40–59-year group (11) represents the transition to substantially increased CRC incidence and encompasses the age range in which risk begins to accelerate, making it particularly relevant for evaluating potential earlier screening strategies. Individuals aged ≥60 years constitute the traditional high-risk population (12), accounting for the greatest burden of CRC and serving as the principal target of most established screening programmes. Consequently, these broader age groups provide statistically reliable trend estimates while preserving clinically meaningful distinctions that facilitate interpretation and inform age-stratified prevention and screening policies.

Histopathological Classification

Histopathological classification data for colorectal cancer (CRC) cases were extracted also from the Sri Lanka National Cancer Registry reports for the study period. Histological diagnoses were recorded according to the morphology codes of the International Classification of Diseases for Oncology, Third Edition (ICD-O-3) and were grouped into major histopathological categories for descriptive analysis. These categories included adenocarcinoma and its variants, squamous cell

carcinoma, carcinoid tumour, melanoma, neoplasms not otherwise specified (NOS), and other rare histological subtypes. Histopathological information was available for all study years except 2012–2014, during which morphology data were not reported in the National Cancer Registry publications. Therefore, analyses of histopathological distribution were restricted to the years with available morphology data.

Incidence Rate Calculation

Following age-group classification, annual counts of newly diagnosed CRC cases and the corresponding population at risk were extracted from the National Cancer Registry for the overall population, gender-specific, age-specific, and age-gender specific groups for each calendar year from 2010 to 2022. Incidence rates were subsequently calculated for each group using the standard epidemiological formula (13) (Equation 1).

$$Incidence\ Rate = \frac{Number\ of\ new\ cases}{number\ of\ population\ at\ risk}\ in\ a\ period\ of\ time\ \times 100{,}000 \quad (1)$$

Incidence rates were expressed per 100,000 population and estimated for the overall ,by gender, age (age-specific incidence rate; ASIR), and by age-gender groups. Number of population for these four groups were also extracted by using the cancer registries. ASIR rates were subsequently used to calculate the age-standardized incidence rate (ASR), which enables comparisons of Overall CRC incidence rate across populations with different countries. ASRs were estimated using the direct standardization method based on the Segi World Standard Population according to the following equation (13) (2):

$$ASR = \sum_{i=1}^{4} ASIR_i W_i\,;\ \ i = 1,2,3,4 \quad (2)$$

where $ASIR_i$ is the age-specific incidence rate for the i^{th} age group, W_i is the corresponding weight of the Segi World Standard Population (14,15) for i^{th} age group , and i represents the four predefined age groups included in this study.

Descriptive and Temporal Trend Analysis

A retrospective population-based ecological time-trend analysis was conducted using colorectal cancer (CRC) incidence data obtained from the Sri Lanka National Cancer Registry for the period 2010–2022.

The calculated incidence rates were subsequently used to evaluate temporal trends in overall, gender-specific, age-specific, and age-gender specific CRC incidence during the study period. Monotonic trends were assessed using the Mann–Kendall trend test, a non-parametric method suitable for detecting temporal trends in epidemiological time-series data. Subsequently, temporal trends in colorectal cancer incidence from 2010 to 2022 were analysed using the Joinpoint Regression Program (Version 5.4.0; National Cancer Institute, Bethesda, MD, USA). A log-linear regression model was fitted with calendar year as the independent variable and the incidence rates as the dependent variable for each groups. For each candidate model, the Annual Percent Change (APC) was estimated for each linear segment. The optimal model was selected using the Monte Carlo Permutation Test (overall significance level = 0.05; 4,499 permutations). Confidence intervals for APC estimates were calculated using the Empirical Quantile Method with 5,001 resamples. This model fitting assuming constant variance and uncorrelated errors was fitted.

Results

A total of 29,015 CRC cases were recorded in Sri Lanka between 2010 and 2022, of which 14,654 (50.5%) occurred among females. The proportion of CRC among all reported cancers increased

from 6.38% in 2010 to 8.59% in 2022, reaching a peak of 8.70% in 2020. Across the study period, the mean overall CRC incidence rate was 10.45 ± 3.20 per 100,000 population. The corresponding mean incidence rates were 10.67 ± 3.30 per 100,000 among males and 10.23 ± 3.15 per 100,000 among females. Age-specific incidence rates increased markedly with age, with mean rates of 0.09 ± 0.06, 1.13 ± 0.50, 13.49 ± 5.05, and 55.01 ± 12.45 per 100,000 in the 0–19, 20–39, 40–59, and ≥60-year age groups, respectively. Among males, the corresponding mean incidence rates were 0.10 ± 0.08, 1.47 ± 0.65, 12.87 ± 5.16, and 65.80 ± 17.67 per 100,000, whereas among females they were 0.08 ± 0.06, 1.54 ± 0.63, 14.07 ± 5.09, and 47.22 ± 11.51 per 100,000, respectively.

The age-specific incidence rate (ASIR) of CRC increased significantly from 5.22 per 100,000 population in 2010 to 13.88 per 100,000 population in 2022 ($p < 0.05$) (Table 1). This corresponded to an annual percentage change (APC) of 8.64% (95% CI: 5.25–12.74, $p < 0.05$). Similar increasing trends were observed in both sexes. Among females, the ASIR increased from 4.91 to 13.25 per 100,000 population, representing a 2.7-fold increase, with an APC of 8.96% (95% CI: 6.80–11.35, $p < 0.05$). Among males, the ASIR increased from 5.55 to 14.53 per 100,000 population, corresponding to a 2.6-fold increase, with an APC of 8.64% (95% CI: 5.25–12.74, $p < 0.05$) over the study period.

Except for the years 2012–2014, during which histopathological classification data were unavailable. Among the 23,985 cases recorded during the remaining years of the study period, 1,622 (6.76%) were classified as neoplasms, not otherwise specified (NOS). Among the remaining 22,363 cases with available histological information, the majority (83.81%) were adenocarcinomas or their variants, comprising 93.24% conventional adenocarcinomas and 5.80% adenocarcinoma variants. Other histological subtypes included squamous cell carcinoma (1.86%), carcinoid tumour (0.22%), and melanoma (0.11%).

As illustrated in Fig. 1, the temporal trend among females closely resembled the overall CRC incidence trend, whereas the male trend demonstrated a slightly steeper increase. Mann–Kendall trend analysis (Table 2) revealed a strong and statistically significant upward trend in the overall CRC incidence ($\tau = 0.82$, $p< 0.05$) with an average annual percentage change (AAPC) of 8.55% (95% CI: 5.92–11.29, $p< 0.05$). Similarly, the female population exhibited a strong increasing trend ($\tau = 0.79$, $p < 0.0001$) with an AAPC of 8.97% (95% CI: 6.80–11.35, $p < 0.05$). Joinpoint regression further demonstrated a marked increase during the early study period. From 2010 to 2016, the overall CRC incidence increased with an APC of 14.64% (95% CI: 10.27–29.94, $p < 0.05$), while among females, the incidence increased more rapidly from 2010 to 2015, with an APC of 17.33% (95% CI: 11.67–32.19, $p < 0.05$). In addition, male showed statistically significantly upward trend with the $\tau = 0.72$ ($p < 0.05$) and APC as 8.64 (95% CI: 5.25 – 12.14, $p < 0.05$).

Table 1 Colorectal cancer incidence in Sri Lanka by gender and age-group with joinpoint analysis 2010–2022

Age group	**2010**		**2022**		**APC (2010-2022)**
(Male)	**n**	**AISR**	**n**	**AISR**	**(95% - CI)**
0-19	07	0.19	01	0.03	
20-39	23	0.70	62	1.91	8.64
40-59	151	6.67	478	18.59	(5.25-12.74)*
≥ 60	386	42.84	1022	84.34	
Age group	**2010**		**2022**		**APC (2010-2022)**
(Female)	**n**	**AISR**	**n**	**AISR**	**(95% - CI)**
0-19	02	0.05	05	0.14	
20-39	16	0.46	58	1.68	8.96
40-59	141	5.99	528	18.91	(6.80 – 11.35)*

≥ 60	357	35.38	926	60.76	
Overall Count (Male and Female)	1083	5.22	3080	13.88	8.55 (5.92 – 11.23)*

206

207 Age-specific trend analysis revealed distinct temporal patterns across the four age groups (Fig. 2
208 and Table 3). Among individuals aged 0–19 years, the CRC incidence remained relatively stable
209 throughout the study period (2010–2022), with no significant monotonic trend ($\tau = -0.03$, $p =$
210 0.96). Although Joinpoint regression estimated an APC of 3.02% (95% CI: −11.62 to 19.94) during
211 2010–2016, this increase was not statistically significant. Similarly, the 20–39 years age group
212 exhibited a moderate upward trend; however, monotonic trend ($\tau = 0.46$, $p < 0.5$) and the APC of
213 5.37% (95% CI: −2.04 to 13.21) during 2010–2016 reached statistical significance. In contrast, a
214 marked increase in CRC incidence was observed among individuals aged 40–59 years. This age
215 group demonstrated a strong and statistically significant positive monotonic trend ($\tau = 0.73$, $p <$
216 0.05), with a significant APC of 10.33% (95% CI: 6.51–14.32) over the entire study period (2010–
217 2022).
218 Likewise, the ≥60 years age group showed a strong and statistically significant increasing trend (τ
219 $= 0.79$, $p < 0.05$). Joinpoint regression further confirmed a significant annual increase, with an
220 APC of 5.71% (95% CI: 3.85–7.58) throughout the study period (2010–2022). Overall, these
221 findings suggest that the rising incidence of CRC in Sri Lanka was predominantly driven by the
222 40–59 years and ≥60 years age groups, while no significant temporal changes were observed
223 among child-teen category (0-19 years).
224 The age-specific trend analysis among males demonstrated increasing CRC incidence across all
225 age groups except those aged 0–19 years (Fig. 3 and Table 4). The 0–19 years age group exhibited

a stable incidence pattern throughout the study period, with no significant monotonic trend (τ = −0.20, p = 0.36), and Joinpoint regression did not identify any significant annual percentage change (APC). In contrast, males aged 20–39 years showed a significant moderate increasing trend (τ = 0.59, p < 0.05), with a significant APC of 12.05% (95% CI: 6.07–18.48) during 2010–2016. Similarly, the 40–59 years age group demonstrated a significant positive monotonic trend (τ = 0.67, p < 0.05), accompanied by a significant APC of 10.93% (95% CI: 6.84–15.17) over the entire study period (2010–2022). Among males aged ≥60 years, a significant increasing trend was also observed (τ = 0.64, p < 0.05), with an APC of 6.06% (95% CI: 4.28–7.87) per year during 2010–2022. Collectively, these findings indicate a significant increase in CRC incidence among males aged 20 years and above, with the most rapid annual increase occurring in the 20–39 years age group, while no significant temporal changes were observed among those aged <20 years.

The age-specific trend analysis among females also demonstrated increasing CRC incidence across all age groups except those aged 0–19 years (Fig. 4 and Table 5). The 0–19 years age group showed no significant temporal trend, with a weak positive but non-significant monotonic trend (τ = 0.23, p = 0.30), and Joinpoint regression did not identify any significant APC. In contrast, females aged 20–39 years exhibited a significant increasing trend (τ = 0.59, p < 0.05). Joinpoint regression revealed a rapid and significant increase during 2010–2016 (APC = 26.22%, 95% CI: 15.85–67.75), followed by a non-significant decline during 2016–2022 (APC = −1.86%, 95% CI: −24.29 to 7.11), resulting in a significant average annual percentage change (AAPC) of 11.23% (95% CI: 5.19–17.86) over the entire study period. Likewise, females aged 40–59 years demonstrated a significant positive monotonic trend (τ = 0.72, p< 0.05). Joinpoint regression identified a significant increase during 2010–2016 (APC = 18.76%, 95% CI: 13.05–31.84), followed by a non-significant increase during 2016–2022 (APC = 1.79%, 95% CI: −7.96 to 6.95), yielding a

significant AAPC of 9.95% (95% CI: 7.23–12.7). Among females aged ≥60 years, a significant upward trend was also observed ($\tau = 0.64$, $p < 0.05$), with a significant APC of 5.59% (95% CI: 2.88–8.35) throughout 2010–2022.

Overall, the findings demonstrated a highly significant increase in CRC incidence among the middle-aged population (40–59 years) ($\tau = 0.72$, APC = 10.33%). Among younger adult's (20–39 years), males exhibited the most pronounced increase throughout the study period (APC = 12.03%), whereas females in the same age group experienced the greatest increase during the early study period (2010–2016). In contrast, no significant temporal changes in CRC incidence were observed among female aged 0–19 years.

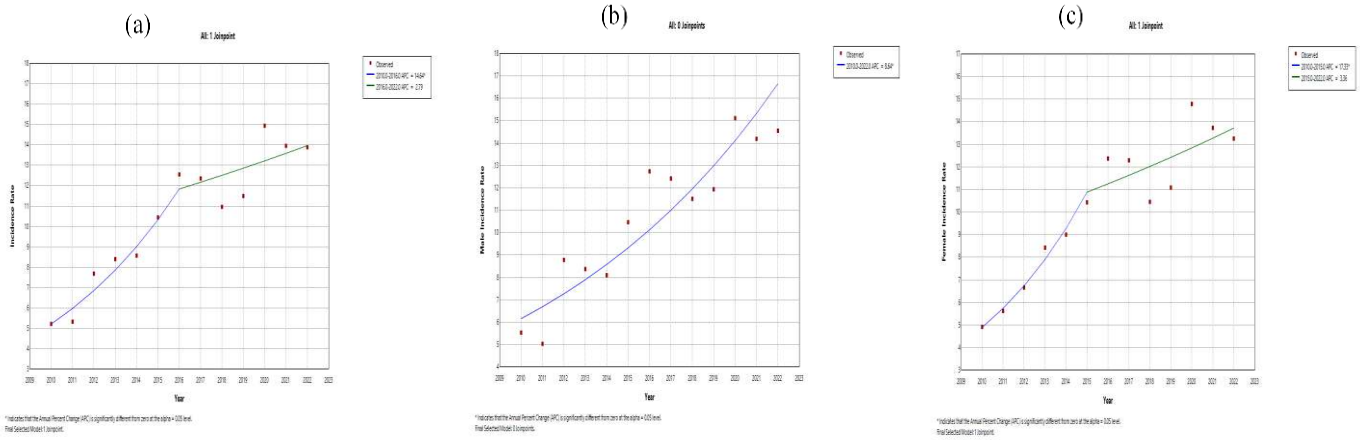


Fig. 1 Jointpoint regression analysis of overall (a), Male (b) and Female (c) for all histology types

Table 2: Overall and gender-specific trend values

Trend Statistic	Overall	Male	Female
τ	0.82**	0.72**	0.79**
APC	2010 – 2016: 14.64* 2016 – 2022: 2.79 AAPC: 8.55*	2010 – 2022 : 8.64*	2010 – 2015: 17.33* 2015 – 2022: 3.36 AAPC: 8.97*

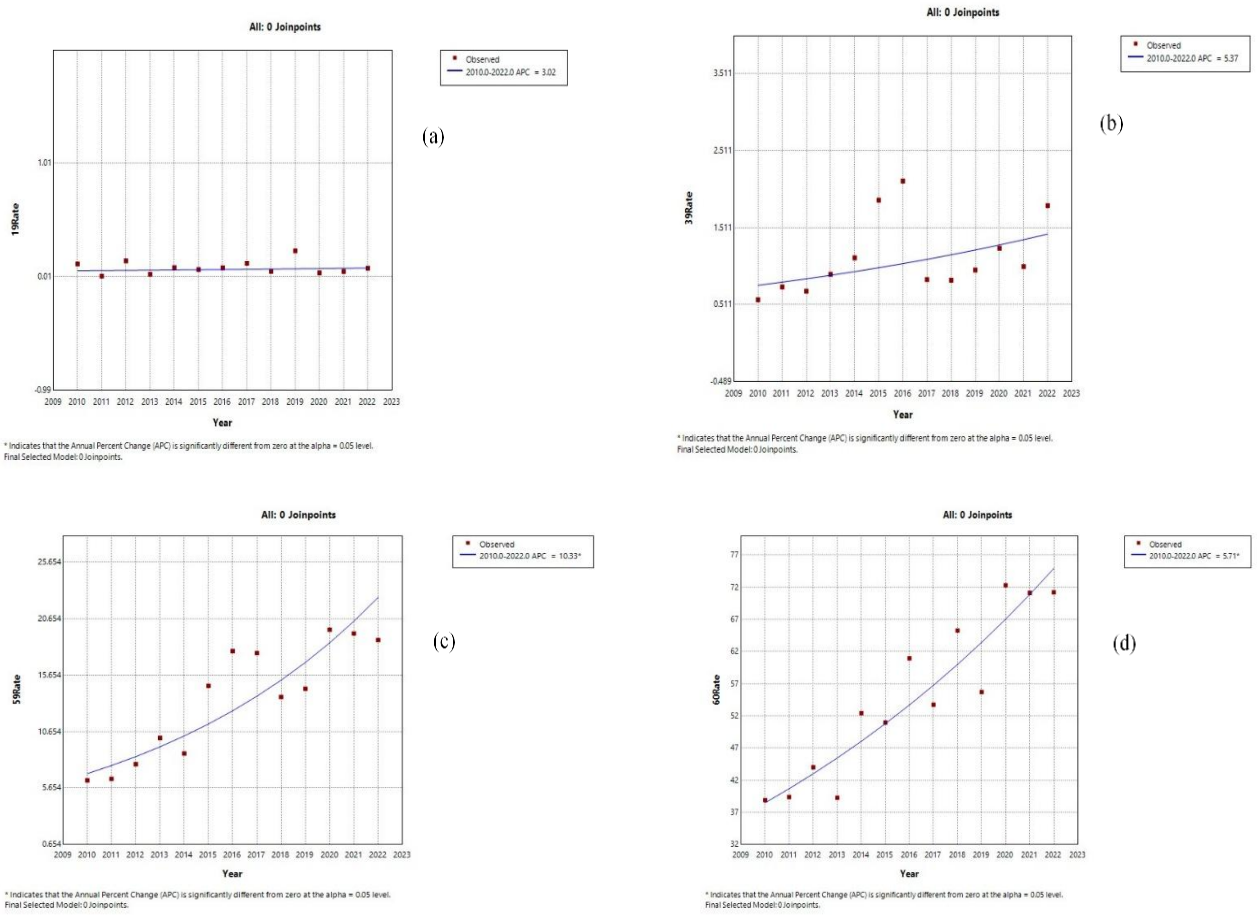


Fig. 2 Jointpoint regression analysis of age-specific trends in incidence of colorectal cancer for (a) 0-19 years, (b) 20-39 years, (c) 40-59 years and (d) ≥ 60 years age groups.

Table 3: Overall age-specific trend values for age groups

Trend Statistic	**0-19**	**20-39**	**40-59**	**≥ 60**
τ	-0.03	0.46**	0.72**	0.79**
APC	2010 – 2022: 3.02	2010 – 2022: 5.37	2010 – 2022 : 10.33*	2010 – 2022 : 5.71*

**’ corresponding p-value means : p-values < 0.05 so the H_0 is rejected, there is no monotonic trend in this time series data.

*’ indicates the APC significantly different form zero at alpha=0.05 level

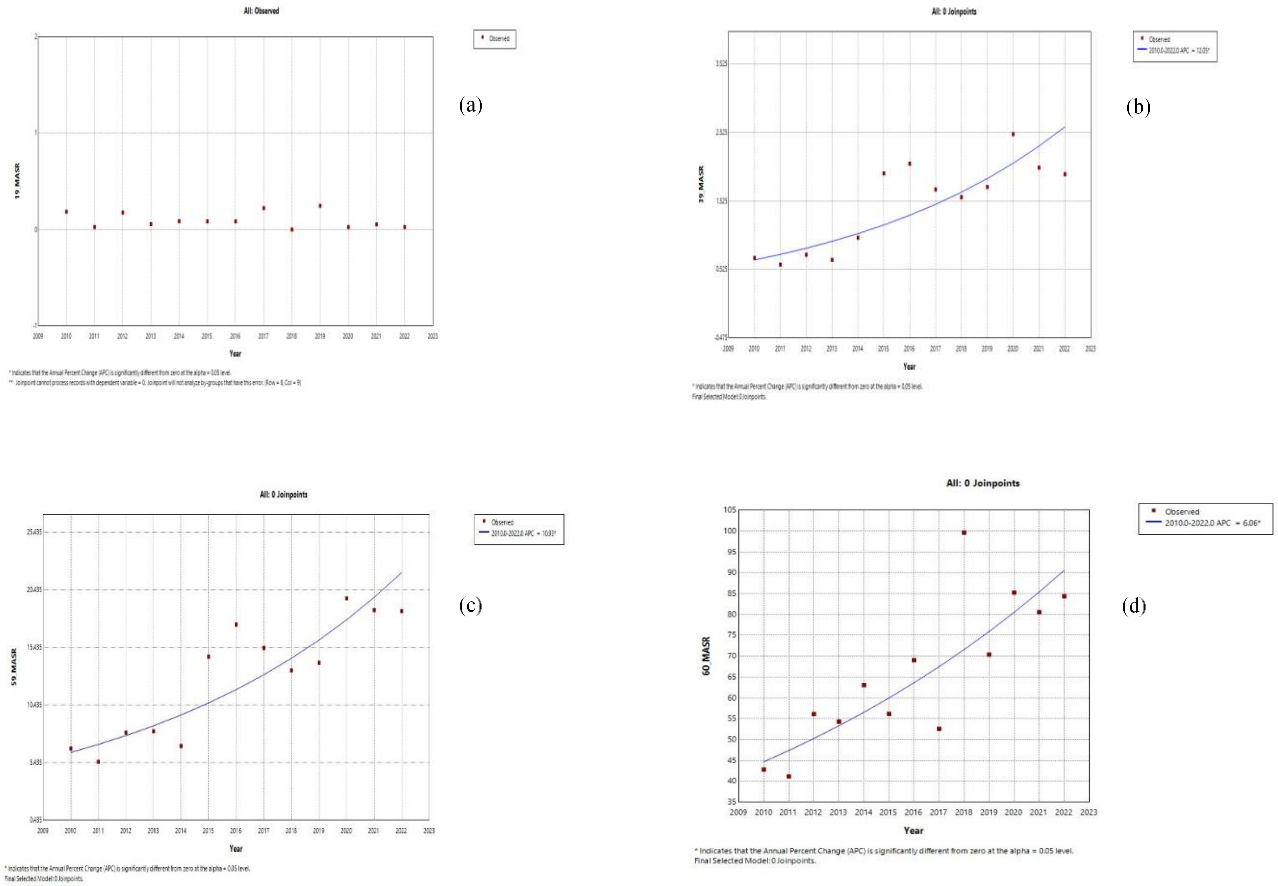


Fig. 3 Jointpoint regression analysis of age-categorised trends in incidence of colorectal cancer in males for (a) 0-19 years, (b) 20-39 years, (c) 40-59 years and (d) ≥ 60 years age groups.

Table 4: Males age-specific trend values

Trend Statistic	0-19	20-39	40-59	≥ 60
τ	-0.20	0.59**	0.67**	0.64**

APC	-	2010 – 2022: 12.05*	2010 – 2022 : 10.93*	2010 – 2022 : 6.06*

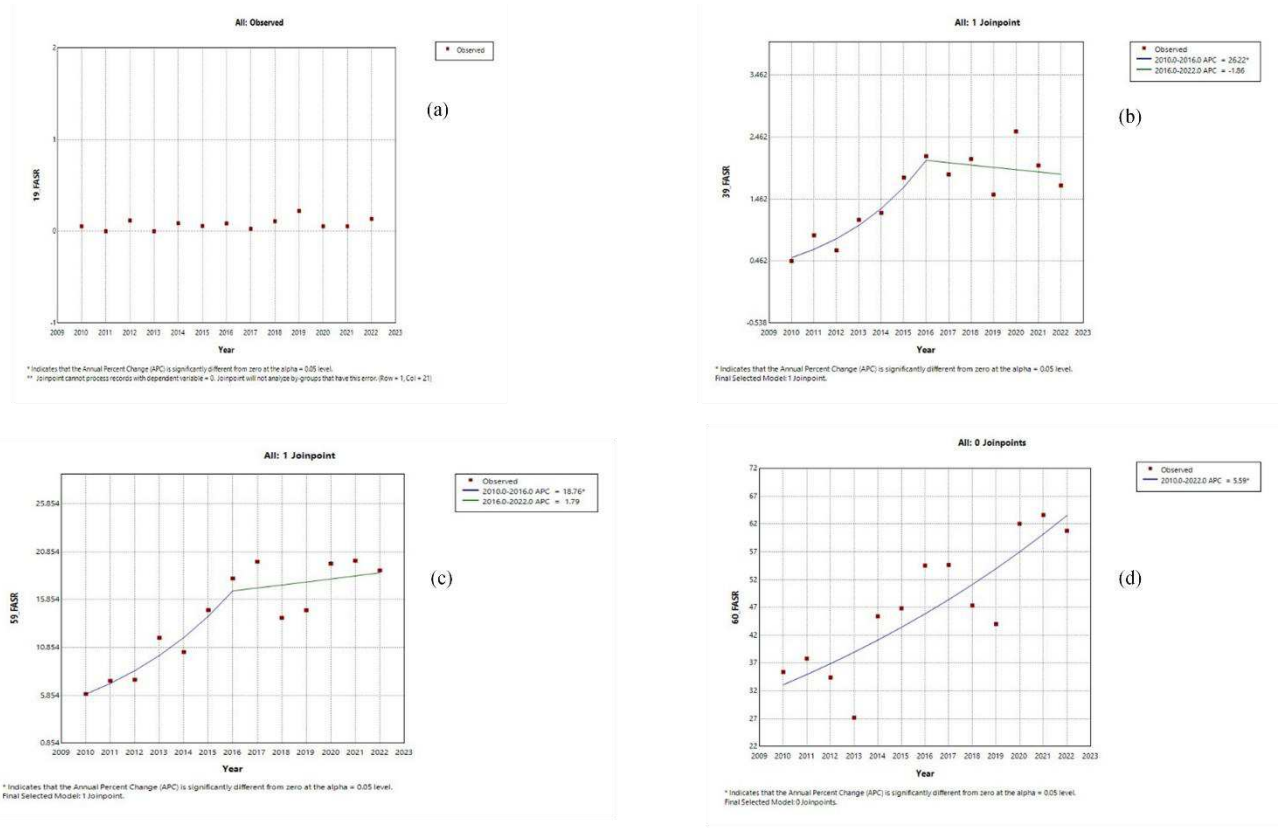


Fig. 4 Jointpoint regression analysis of age-categorised trends in incidence of colorectal cancer in females for (a) 0-19 years, (b) 20-39 years, (c) 40-59 years and (d) ≥ 60 years age groups.

Table 5: Females age-specific trend values

Trend Statistic	**0-19**	**20-39**	**40-59**	**≥ 60**
τ	0.25	0.59**	0.72**	0.64**
APC	-	2010 – 2016: 26.22* 2016 – 2022: 1.86 AAPC: 11.23*	2010 – 2016: 18.76* 2016 – 2022: 1.79 AAPC: 9.95*	2010 – 2022 : 5.59*

Discussion

This national population-based time-trend analysis demonstrates a substantial increase in CRC incidence in Sri Lanka between 2010 and 2022, with important variation across age and sex groups. The overall incidence increased significantly during the study period, with the most pronounced relative increase observed among adults aged 40–59 years, while individuals aged ≥60 years continued to experience the highest absolute incidence. Increasing trends were also observed in both males and females, although the temporal patterns differed across sex-specific age groups. Of particular note, selected younger adult subgroups demonstrated substantial relative increases despite comparatively low absolute incidence. Taken together, these findings indicate a changing age-specific pattern of CRC burden in Sri Lanka and extend previous national registry observations beyond 2010 (5,8).

Although the absolute incidence of CRC in Sri Lanka remains lower than that reported in many high-income countries and several East Asian populations (6)**,** the magnitude of the increase observed during the present study period is notable. CRC incidence has historically been lower in South Asian populations compared with Western and high-incidence East Asian countries; however, increasing trends have been reported across several low- and middle-income settings undergoing demographic and socioeconomic transition. (2,6) The present findings therefore suggest that Sri Lanka may be experiencing a similar epidemiological transition. Nevertheless, direct comparisons of incidence rates between countries should be interpreted cautiously because cancer registration completeness, diagnostic access, population structures, and methods used to generate national incidence estimates differ across settings. (2) The continuation of the upward trend beyond the period examined in the previous Sri Lankan registry analysis highlights the need for continued surveillance of CRC incidence and age-specific disease patterns.

The age-specific findings are particularly important. Although CRC incidence remained substantially highest among adults aged ≥60 years, the annual relative increase was greater among those aged 40–59 years, with an APC of 10.33% compared with 5.71% among individuals aged ≥60 years. This distinction between absolute disease burden and relative rate of increase is epidemiologically important, suggesting that the age distribution of CRC in Sri Lanka may be changing over time. Similar age-related shifts, particularly increasing CRC incidence among younger adults, have been reported internationally and across several Asian populations (3)**.** The relevance of this pattern to South Asia is further supported by our recent systematic review and meta-analysis, which demonstrated a substantial burden of young-onset colorectal cancer across the region(16). Previous Sri Lankan studies have likewise highlighted a considerable burden of CRC among younger adults, with more than one-quarter of cases in one tertiary-care cohort occurring before 50 years of age, while subsequent local work specifically examined trends in early-onset CRC (17)**.** The present national-level findings extend these earlier observations by demonstrating, using population-based registry data, that the magnitude of temporal change in CRC incidence differs across age and sex groups. However, because the available registry categories did not permit separate analysis of individuals aged 40–49 years, the increase observed among adults aged 40–59 years should not be interpreted as a direct estimate of conventional early-onset CRC.

The increasing incidence among younger adults also warrants attention. In the overall 20–39-year group, the estimated APC was positive but imprecise and did not clearly demonstrate a statistically significant overall increase; however, sex-stratified analyses revealed more pronounced patterns. Among males aged 20–39 years, CRC incidence increased significantly during the study period, while females in the same age group showed a rapid increase during the earlier years followed by

attenuation in the later period. These observations are noteworthy in the context of the internationally reported increase in early-onset colorectal cancer (EOCRC) (3,18). Nevertheless, conventional EOCRC is generally defined as CRC diagnosed before 50 years of age (19), whereas the youngest adult category available in the present study was 20–39 years. Accordingly, the current findings should not be interpreted as a direct estimate of EOCRC incidence in Sri Lanka, because individuals aged 40–49 years could not be analysed separately. Furthermore, large percentage changes in younger age groups should be interpreted in the context of low baseline incidence and relatively small absolute numbers of cases.

Several factors may plausibly contribute to the increasing CRC incidence observed in Sri Lanka, although the present ecological analysis cannot determine their relative importance. Population ageing, urbanization, changes in dietary patterns, increasing obesity, physical inactivity, metabolic disease, smoking, and alcohol consumption have all been associated with CRC risk and have accompanied socioeconomic transition in many Asian countries. (20,21) These exposures may therefore have contributed to the observed trends. At the same time, the increase in recorded incidence should not necessarily be attributed solely to a true increase in underlying disease occurrence. Improvements in access to colonoscopy, histopathological services, cancer awareness, referral pathways, diagnostic intensity, and completeness of national cancer registration may also have increased case ascertainment over time. Because the registry data used in this study did not include individual-level risk factors, diagnostic pathway information, or measures of registry completeness, the relative contributions of changing population risk and improved detection cannot be disentangled. The apparent attenuation in the rate of increase during the later part of the study period should therefore also be interpreted cautiously, particularly because diagnostic activity and cancer reporting may have been affected during the COVID-19 pandemic (22,23).

These findings have several potential public-health implications. Sri Lanka does not currently have an organized population-based CRC screening programme, and the substantial increase in incidence, particularly among middle-aged adults, supports the need to re-evaluate national approaches to CRC prevention and early detection. However, the present study alone cannot establish the optimal age at which population screening should begin. Decisions regarding screening initiation, modality, interval, cost-effectiveness, colonoscopy capacity, and target population require dedicated health-economic and implementation studies using locally generated data. (24) In resource-constrained settings, locally validated risk-stratification approaches may also be worth evaluating as a means of identifying individuals who would benefit most from further investigation. (7) In addition, the observed increases among younger adults reinforce the importance of clinician awareness and timely investigation of persistent colorectal symptoms irrespective of age, while further research is required to determine whether the epidemiology, tumour characteristics, and risk factors of CRC among younger Sri Lankan patients differ from those of older adults (17).

Limitations

Several limitations should be considered. Changes in registry completeness, diagnostic access, or cancer-reporting practices over time may have influenced the apparent incidence trends. Individual-level information on established CRC risk factors, tumour stage, anatomical subsite, family history, and screening or diagnostic pathways was unavailable, preventing causal interpretation of the observed trends. The broad age categories limited assessment of conventional EOCRC and prevented identification of more precise age thresholds at which incidence began to rise. In addition, the 13-year time series provides a relatively small number of annual observations for Joinpoint analysis, and estimates in younger age groups may be unstable because of small case numbers. Histological classification was unavailable for some years, limiting evaluation of

morphology-specific trends. Finally, potential disruptions in diagnosis and cancer registration during the COVID-19 period may have affected incidence estimates in the latter years of the study

Conclusion

Colorectal cancer incidence in Sri Lanka increased substantially between 2010 and 2022, with significant upward trends in both sexes and the greatest relative increase observed among adults aged 40–59 years, while the highest absolute incidence remained among those aged ≥60 years. Increasing trends in selected younger adult subgroups further suggest a changing age-specific pattern of disease burden. Although these findings cannot determine the underlying causes or define the optimal age for population screening, they highlight the need for continued national surveillance, improved characterization of age- and sex-specific CRC patterns, and evaluation of locally appropriate, resource-sensitive strategies for prevention, early detection, and risk-based screening in Sri Lanka.

Consent statement

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

PN and PC conceived and designed the study. PN collected and curated the data and prepared the initial manuscript. SN and TM performed the statistical analyses. PN, SN, TM, SK, SP and PC contributed to interpretation of the findings. PN drafted the manuscript. SK, SP and PC critically reviewed and revised the manuscript for important intellectual content. PC supervised the study. All authors reviewed and approved the final manuscript.

Authors' information

Not applicable.

Availability of data and materials

The datasets analysed during the current study are available in the publicly available cancer registries in the National Cancer Control Programme (https://www.nccp.health.gov.lk/en/incedenceData).

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