

# Trends of incidence of colorectal cancer in Iran, 2003–2010

## Tendencias de la incidencia del cáncer colorrectal en Irán, 2003-2010

Seyedeh Leila Dehghani<sup>1</sup> <http://orcid.org/0000-0003-3740-3308>, Abbas Rezaianzadeh<sup>1,2\*</sup> <http://orcid.org/0000-0002-0067-0659>, Mozghan Safe<sup>1</sup> <https://orcid.org/0000-0001-6516-0855>, Hamidreza Tabatabaee<sup>1,2</sup> <http://orcid.org/0000-0003-2857-3698>  
<sup>1</sup>Department of Epidemiology, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran.  
<sup>2</sup>Research Center for Health Sciences, Shiraz University of Medical Sciences, Shiraz, Iran.  
 \*Corresponding Author: Abbas Rezaianzadeh, Department of Epidemiology, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran, Tel: +98 713256007, Fax: +98 7137260225. Corresponding Author EMAIL: rezaiana@sums.ac.ir

### Abstract

**Introduction and Background:** As the third leading reason of death, cancers have a special place in the Iranian health system. This study to investigate the incidence trends of colorectal cancer in Iran from 2003 to 2010.

**Methods:** The recorded data for colorectal cancer cases in National Cancer Registry System were obtained from the Center for Disease Control & Management of Ministry of Health. The codes from 18 to 21 among cancers were selected for colon and rectum cancers. The significance of incidence rate trends was tested through Poisson regression.

**Results:** In this study, 38,712 cases of colorectal cancer were observed for 8 years in Iran, which increased from 2882 cases in 2003 to 6,215 cases in 2010. Gender ratio of men to women was 1.26. Significant increasing trends of colorectal cancer were observed during the period of the study. The incidence rate increased from 6.22 per 100,000 persons in 2003 to 9.99 in 2010 in males ( $p < 0.001$ ), and it increased from 6.74 per 100,000 persons in 2003 to 8.69 in 2010 in females ( $p < 0.001$ ).

**Conclusion:** Colorectal cancer has an increasing trend in Iran. The rising trend of colorectal cancer as well as other types of cancers is partially due to improvement in cancer registry systems in the early years of registry. Furthermore, westernized lifestyle and an increase in environmental risks could explain this rising trend.

**Keywords:** Incidence, Trend, Colorectal cancer, Iran.

### Resumen

**Resumen:** Introducción y antecedentes: como la tercera causa principal de muerte, los cánceres ocupan un lugar especial en el sistema de salud iraní. Este estudio investiga las tendencias de incidencia del cáncer colorrectal en Irán de 2003 a 2010.

**Métodos:** Los datos registrados para casos de cáncer colorrectal en el Sistema Nacional de Registro de Cáncer se obtuvieron del Centro para el Control y Manejo de Enfermedades del Ministerio de Salud. Los códigos de 18 a 21 entre los cánceres fueron seleccionados para los cánceres de colon y recto. La importancia de las tendencias de la tasa de incidencia se probó mediante la regresión de Poisson.

**Resultados:** En este estudio, se observaron 38,712 casos de cáncer colorrectal durante 8 años en Irán, que aumentó de 2882 casos en 2003 a 6,215 casos en 2010. La proporción de hombres y mujeres fue de 1.26. Se observaron tendencias crecientes significativas de cáncer colorrectal durante el período del estudio. La tasa de incidencia aumentó de 6.22 por 100,000 personas en 2003 a 9.99 en 2010 en hombres ( $p < 0.001$ ), y aumentó de 6.74 por 100,000 personas en 2003 a 8.69 en 2010 en mujeres ( $p < 0.001$ ).

**Conclusión:** el cáncer colorrectal tiene una tendencia creciente en Irán. La tendencia al alza del cáncer colorrectal y otros tipos de cáncer se debe en parte a la mejora en los sistemas de registro de cáncer en los primeros años de registro. Además, el estilo de vida occidentalizado y el aumento de los riesgos ambientales podrían explicar esta tendencia al alza.

**Palabras clave:** Incidencia, tendencia, cáncer colorrectal, Irán.

**C**olorectal cancer (CRC) is a major health problem<sup>1,2</sup>. According to the global and international statistics, colorectal cancer is the third most common cancer and the third leading cause of cancer death in both genders worldwide<sup>3</sup>. Colorectal cancer, which is the third most common cancer in men and the second most common in women, represents approximately 10% of the annual worldwide cancer incidence<sup>4</sup>. Incidence rates of colorectal cancer appearance a strong positive gradient with an increasing level of economic progress<sup>5</sup>. Even so, the net 5-year rate of survival declines with lower levels of income, with rates reaching 60% in high-income countries but falling to 30% or less in low-income countries<sup>6</sup>. Colorectal cancer (CRC) is the fourth most common malignancy in Iran<sup>7</sup>. Around 6200 new CRC cases were registered by Iranian national cancer registry during 2009<sup>8</sup>. However, terrible rising trends of its incidence and mortality rates are reported from national and subnational studies for a period of 2000–2010<sup>9–11</sup>. CRC usually affects people after the age of 55<sup>12</sup>, but recent studies have revealed that 7% of patients diagnosed with CRC are younger than 40 in Iran<sup>13,14</sup>, and a half of the Iranian colorectal cancer patients are typically younger than 50 years of age<sup>15</sup>. Recognized risk factors for colorectal cancer include consumption of processed meats<sup>16</sup>, consumption of alcoholic drinks, tobacco smoking<sup>17</sup>, and excess body fat<sup>18</sup>, whereas consumption of dietary fiber and dairy foodstuffs and increased levels of physical activity decrease the risk<sup>19,20</sup>. In addition, certain subgroups of the population are at increased risk owing to genetic tendency (e.g., the Lynch syndrome), a family or personal history of colorectal neoplasia, or medical conditions (e.g., inflammatory bowel disease) that have been related with colorectal cancer. Colorectal cancer can be classified on the basis of the location in the large bowel, histologic characteristics, and molecular features. Advanced adenomas — in exact, those measuring more than 10 mm in diameter — are the most well-known precursor lesions of colorectal cancer<sup>21</sup>. The Iranian lifestyle has slowly changed to western lifestyle during last three decades<sup>22</sup>. Accordingly, a gentle increase of incidence of CRC is unavoidable, even for low-risk Regions<sup>23–26</sup>. Considering the fact that the CRC index varies in different countries and due to the lack of sufficient data on its incidence trends in Iran, this study was designed to investigate the incidence trend of colorectal cancer during 2003–2010 in Iran. The results of this study may help the National Health Planning Center to better control and manage this particular type of cancer.

**T**his was a cross-sectional population-based study that obtained data from Colorectal Cancer records for the period 2003–2010 from the Cancer Registry Office in Ministry of Health and Medical Education and the Center for Disease Control (CDC). Data were collected at all pathology centers throughout the country at the end of each year. After receiving the data, the CDC deletes the data in terms of proper programming, missing demographic information and duplicates. Meanwhile, cancers have been coded according to the International Classification of Disease (ICD-O)<sup>27</sup>.

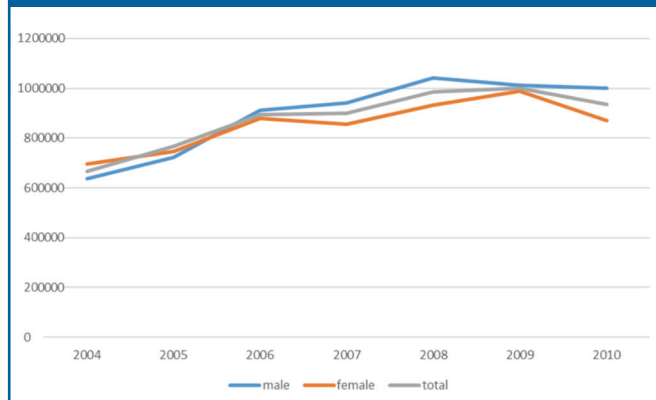
The C18–C21 codes were extracted for colon and rectum tumors. The results of national census data in 2006 were used to calculate the crude and age-specific incidence. By calculating the annual growth rate of 1.01% and based on the population census in 2006, the population of Iran was estimated for the years 2003, 2004, 2005, 2006, 2007, 2008, 2009 and 2010. In addition, Incidence rates for 2003–2010 were extracted from annual national cancer reports. Poisson regression model was used to evaluate the significance of the incidence trends. The significance level was set at  $p < 0.05$ . Then the 2010 version of the Excel software was used to draw the diagrams.

**D**uring the 8-year period in Iran, 38712 cases (21608, men (55.8%) and 17104 women (44.2%)) with colorectal cancer were recorded; this rate had increased from 2882 cases in 2003 to 6,215 cases in 2010. More than half of the cases were reported between 2006 and 2010. The mean  $\pm$  SD average age of all the cases was  $56.5 \pm 13.04$  yrs., which was  $56.5 \pm 13.5$  yrs. and  $57.6 \pm 15.39$  yrs., in females and males, respectively. The incidence rate was significantly increased from 6.48 in 2003 to 9.34 cases per 100,000 persons in 2010 in Iran (Table 1). This rate increased from 6.22 in 2003 to 9.99 in 2010 cases per 100,000 persons in males, and from 6.74 in 2003 to 8.69 cases per 100,000 persons per year in 2010 in females (Table 1). Similar changes were observed in the incidence rate in both genders, representative that the age incidence rate had declined in both genders in 2010. (Figure 1). Colorectal cancer incidence rate was higher in females than in males until 2006, and after this date, males experienced a higher incidence (Figure 1).

**Table 1. Colorectal cancer Incidence by sex in Iran, 2003–2010**

Year	2003	2004	2005	2006	2007	2008	2009	2010	P-Value
Male	6.22	6.38	7.23	9.11	9.42	10.41	10.11	9.99	<0.001
Female	6.74	6.96	7.45	8.79	8.56	9.31	9.87	8.69	<0.001
Total	6.48	6.67	7.68	8.95	8.99	9.86	9.99	9.34	<0.001

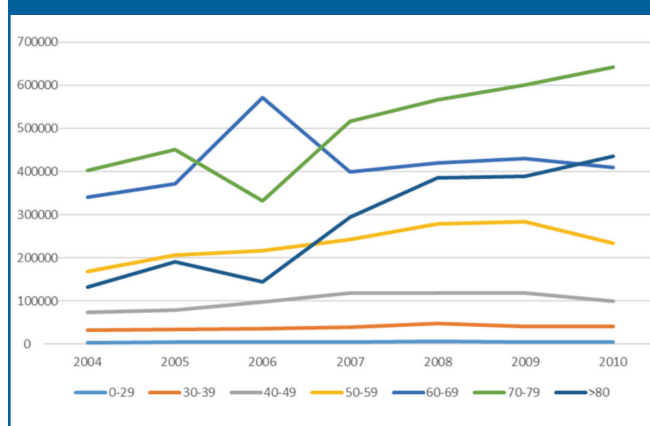
**Figure 1. Colorectal cancer Incidence by sex in Iran, 2003–2010**



Comparison of the incidence trend in different age groups showed that the incidence rate was the minimum in the younger age groups, but it increased in older age groups.

This increase was more obvious after the age of 40 and its maximum was observed in those over 70 years of age, as the age incidence rate in this group had increased from 36.74 in 2003 to 64.13 per 100,000 persons per year in 2010 (Table 2). The change was slight in younger age groups (younger than 29 yrs.) but it decreased slightly and then increased in the over 50-year-old groups (Figure 2). The incidence rate has increased from the young to the old age groups (Figure 2).

**Figure 2. Colorectal cancer Incidence by Age and sex in Iran, 2003–2010**



**Table 2. Colorectal cancer Incidence by Age and sex in Iran, 2003–2010**

Age group	Gender	2003	2004	2005	2006	2007	2008	2009	2010	P-Value
0-29	Male	0.26	0.31	0.40	0.49	0.59	0.44	0.31	0.37	<0.001
	Female	0.25	0.31	0.30	0.29	0.35	0.68	0.53	0.59	<0.001
	Total	0.25	0.31	0.35	0.39	0.47	0.56	0.42	0.48	<0.001
30-39	Male	2.9	3.03	2.49	3.80	3.93	3.97	3.99	3.78	<0.001
	Female	3	3.43	4.29	3.20	3.73	4.97	4.19	4.18	<0.001
	Total	2.95	3.23	3.39	3.50	3.83	4.72	4.09	3.98	<0.001
40-49	Male	7.02	6.10	6.99	9.91	12.79	12.79	10.93	8.99	<0.001
	Female	9.02	8.66	8.77	9.71	10.79	10.99	12.79	10.79	<0.001
	Total	8.02	7.38	7.88	9.81	11.79	11.89	11.86	9.89	<0.001
50-59	Male	15.11	14.66	17.57	25.32	26.49	30.91	26.41	21.24	<0.001
	Female	17.77	18.98	23.79	17.92	22.09	24.71	30.27	25.42	<0.001
	Total	16.44	16.82	20.68	21.62	24.29	27.81	28.34	23.33	<0.001
60-69	Male	23.72	34.99	38.95	47.31	35.99	38.01	46.93	42.97	<0.001
	Female	22.92	32.97	35.21	67.11	43.79	46.07	38.93	38.79	<0.001
	Total	23.32	33.98	37.20	57.21	39.89	42.04	42.93	40.88	<0.001
70-79	Male	38.95	41.11	50.03	38.04	55.73	60.89	68.09	69.11	<0.001
	Female	34.53	39.27	40.01	28.24	47.55	52.45	52.05	59.15	<0.001
	Total	36.74	40.19	45.02	33.14	51.64	56.67	60.07	64.13	<0.001
80<	Male	16.49	15.39	22.09	16.59	33.41	43.80	44.71	46.55	<0.001
	Female	14.29	11.03	16.09	12.37	25.27	33.40	32.95	40.51	<0.001
	Total	15.39	13.21	19.09	14.48	29.34	38.60	38.83	43.53	<0.001

The general results of this study showed that the incidence trend of colorectal cancer in Iran has been increasing and has increased about 1.6 times during 2003 to 2010. With respect to the increasing trend of colorectal cancer in Iran in a worldwide context, many studies have found that the incidence of colorectal cancer for both genders has increased in Eastern Europe and certain parts of South America as well as in many parts of Asia in the recent years. However, it declined in both genders in the United States, Canada and New Zealand<sup>28</sup>. In Asian nations, such as Japan<sup>29</sup>, Tunisia<sup>30</sup>, Singapore<sup>31</sup> and Saudi Arabia<sup>32</sup> this growing trend has also been reported. In Asia, a growth in the incidence of colorectal cancer has been observed due to the increase in the population or growth in the number of relative risk groups, better diagnosis and aging of the population and the growing population density of the area in the last two decades<sup>33</sup>. The most important risk factors for this cancer comprise change in lifestyle and personal habits, age over 50 and family history<sup>34</sup>. Change in personal habits comprise tendency to fast food eating and a régime low in fiber or high in fat, high eating of meat and meat products and tobacco as well as low consumption of fresh fruit and vegetables<sup>35,36</sup>. Of lifestyle-related factors, such causes as sedentary lifestyle and reduced physical activity and increased rates of obesity can be stated<sup>37</sup>. Increased exposure to such factors could comprise logical rationales for increasing the trend of colorectal cancer in Iranian society. The respect to the incidence according to gender, our study found that the incidence rate of colorectal cancer was higher in females than males up to 2006, but there was a higher incidence in males in later years of the study, and the rising trend has had similar changes in both genders. A study in China during 1993-1997 has reported higher incidence in females than in males<sup>38</sup>. In addition, a study in Cambodia during 2005-2010 found more incidence of colorectal cancer in females than in males<sup>39</sup>. However, most studies showed in Iran<sup>40,41</sup>, Bahrain<sup>42</sup>, Canada<sup>43</sup> and the United States<sup>34</sup> represent a lower incidence in women than in men and the cause might be better eating habits in females<sup>44</sup>. Such an inconsistency about the results of other countries may be due to the different prevalence of this cancer in the two genders, effects of environmental changes and other risk factors and different exposures in communities. The results revealed that the incidence rate increased with an increase in age, and this figure was lower in the younger than 29 age groups, but it increased in the older groups; consequently, it can be concluded that this disease becomes dominant after the age of 40 and reaches its maximum in 70-79 years of age. The trend in the changes was partial in the younger age groups and it was sharper in older age groups. Such a result was consistent with other studies in Canada, Sin-

gapore<sup>56-60</sup> and Iran<sup>45</sup>. The incidence of colorectal cancer is increasing at older ages in Asia due to overpopulation and growth in the population age<sup>61,62</sup>.

## Conclusions

The phenomenon of rising the mean age and the population aging may be considered as factors affecting the overall trend rising in the incidence of cancers and colorectal cancer in Iran, as the aging population is a main usual inclining factor of colorectal cancer<sup>46</sup>. As the colorectal cancer incidence rate reaches the highest in the older age groups, it clarifies a proportion of the increased trend in the incidence of this cancer in Iran. Among the reasons of high incidence in the older age groups, increased contact to high-risk lifestyle and diet in early life stages can be stated<sup>63</sup>. As such, a study in Japan proposes that contact to risk factors at younger ages, increases the incidence risk in the 6th and 7th decades of life<sup>47</sup>. It is predicted that by 2030, 70% of malignancies will occur in the age group over 65<sup>48</sup>. Other reasons to be stated include a decline in mobility in the older population, and low incidence in the younger age groups due to different effects of westernization on the youths compared to the elderly<sup>49</sup> and lower contact of the youths to risks from environmental changes<sup>64</sup>. High incidence of colorectal cancer in Iran can be usually attributed to two factors: 1. True change in the incidence of colorectal cancer, which can be caused by changes in the frequency of contact to the disease risk factors, most important of which are changes in lifestyle and individual habits<sup>34</sup>. 2. Some reasons for the change in the incidence of the disease can be due to the improved data collection approach related with cancer registration system. According to the Iranian cancer registration system, coverage of registry had a growing trend particularly from 2005 to 2009. A similar trend has been observed in the period on the skin<sup>50</sup> and digestive<sup>51,52</sup> cancers, which proposes that part of the increase is due to changes in the cancer registry system and developmental problems. Therefore, the cancer registration process<sup>65-69</sup> should be considered in the interpretation of the results in all cancer research in Iran.

**Conflict of interest statement:** The authors declare that there is no conflict of interest.

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