The Burden of Cancer in a Sample of Iranian Population

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Introduction

As the current main cause of global mortality, non-communicable diseases (NCDs) are expected to remain a major cause of death in the world. In 2018, 18.1 million new cancer cases and 9.6 million deaths from cancer were globally reported (1). The prevalence of cancer is expected to rise to 45% in developed countries by 2025 (2). Increasing life expectancy, the growing population of older adults and the middle-aged and socioeconomic conditions are among the complicated causes of an increase in the prevalence of cancer (3, 4). In 2018, the top five cancers by incidence in both genders were reported as: lung cancer (11.6%), with a slight difference breast
cancer (11.6%), colorectal cancer (10.2%), prostate cancer (7.1%), and stomach cancer (7.1%) (1). In 2008, WHO reported NCDs, especially cancers, as a crisis that requires serious global interventions (5).

In Iran, the age-standardised rate (ASR) of cancers was reported as 107.3 in 2008, 127.7 in 2012 and 141.6 in 2018 (6). Different regional reports in Iran suggest the growing incidence of certain types of cancer, especially breast and colorectal cancers (7, 8). In 2018, approximately 110115 new cancer cases and 55785 deaths from cancer were reported in Iran (6). Modirian et al. reported the disability-adjusted life year (DALY) of cancer as 1025443 in Iran, with gastric cancer contributed the most to DALYs (9). Rahmani et al. reported the burden of oesophageal cancer in Iran during 1995-2015 was 74399 DALYs (10). Cancer is the third leading cause of mortality after cardiovascular diseases and accidents in Iran (11). Developing cancer control programs is therefore considered a major objective of controlling NCDs in Iran (12). Successfully taking preventive measures such as early diagnosis, screening and treatment in recent decades has reduced the incidence of and mortality from some cancers. (13, 14). The ultimate goal of estimating the burden of diseases is designing, implementing and evaluating cost-effective interventions for prevention, treatment and rehabilitation (15).

The present study calculated the burden of 37 types of cancer in 2011-2017 in patients in Kurdistan Province, Iran as a sample of the Iranian population.

Methods

The present cross-sectional study was conducted in all age groups in Kurdistan Province in 2019 based on the data of this population obtained in 2011-2017. The burden of cancer was calculated as the global burden of disease (GBD) expressed with DALY as the sum of the years of life lost (YLL) due to premature deaths and the years lost due to disability (YLD). The standard population proposed by Segi–Doll was used to calculate the ASR (16). The YLD was calculated by multiplying the incident of cancer (I) by the disability weight (DW) and the average duration of the disease until remission or death (D). The YLL due to premature deaths was calculated as the number of deaths from cancer (N) multiplied by the life expectancy of the age group (L). The present study calculated DALYs by gender and the incidence year of cancer in eight age groups. The incidence of cancer and the associated mortality were calculated for 37 types of cancer according to the codes of the International Classification of Diseases-10th Revision (ICD-10): lip, oral cavity (C00-C06); salivary glands (C07-C08); oropharynx (C09-C10); nasopharynx (C11); hypopharynx (C12-C13); esophagus (C15); stomach (C16); colon (C18); rectum (C19-C21); liver (C22); gallbladder (C23-C24); pancreas (C25); other and ill-defined digestive (C26); larynx (C32); lung (C33-C34); heart, mediastinum and pleura (C38); bone (C40); hematopoietic (C42); other malignant neoplasms of skin (C44); breast (C50); vagina (C52); cervix uteri (C53); corpus uteri (C54); uterus (C55); ovary (C56); prostate and testis (C60-C62); kidney (C64-C66); bladder (C67); brain, central nervous system (C70-C72); thyroid (C73); other and ill-defined sites (C76); lymph nodes (C77); and without specification of site (C80).

The DW used in the present study was obtained from the results of research on the GBD reported by the WHO and the disability weights used in South Korea (17). The life expectancy used in the present study was extracted from a study conducted in Kurdistan Province in 2016 (18). The incidence of cancer from the data of Kurdistan Cancer Registry. The province population was also extracted by year from the website of the Statistical Center of Iran. Recording the incidence of cancers in a population-based manner from 2013 onwards in Iran is a cause of the increase observed in the incidence in Kurdistan Province, as the number of cases diagnosed in the other provinces were added to the records of this province. Furthermore, the mortality data were extracted from the system of registration and classification of causes of death.
DALYs was calculated as follows: 
\[ \text{DALYs} = \text{YLL} + \text{YLD}, \]
\[ \text{in which } \text{YLL} = N \times L \] 
\[ \text{and } \text{YLD} = I \times DW \times D. \]
All the data were analyzed in Microsoft Excel 2016.

**Results**

The burden of cancer increased from 12309 DALYs in 2011 to 13969 DALYs in 2017, the YLL from 11644 in 2011 to 12951 in 2017 and the YLD from 665 in 2011 to 1018 in 2017. The burden, incidence of, and deaths from cancer were found to be higher in the men than the women were in all the study years. The highest YLL and YLD were observed in the men in 2015 (Table 1). As the cancer with the heaviest burden, stomach cancer was found to contribute to over 25% of the burden of cancer in both genders, i.e. a DALYs of 22152 versus an overall DALYs of 87731. Lung cancer with a DALYs of 12209, liver cancer with a DALYs of 7911, esophagus cancer with a DALYS of 6242 and colon cancer with a DALYS of 5273 were respectively the second to fifth cancers by burden (Table 2). According to Fig. 1, the highest DALYS (54%) obtained was associated with gastrointestinal cancers. The burden of all cancer cite increased during 2011-2017 (Fig. 2). The maximum DALYs of the first four prevalent cancers in both genders was observed in the 60-69 yr old and the maximum DALYS of colon cancer in both genders was observed in the 40-49 yr olds (Fig. 3).

| Table 1: New cases, deaths and burden of cancer 2011-2017 |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                | **FEMALE**      |                 |                 |                 |                 |                 |                 |
|                | YLL             | 4067            | 4453            | 4597            | 3801            | 3901            | 4426            | 5468            |
|                | YLD             | 256             | 294             | 280             | 355             | 425             | 388             | 424             |
|                | DALY            | 4322            | 4750            | 4876            | 4156            | 4326            | 4814            | 5893            |
|                | DEATH           | 262             | 298             | 299             | 251             | 250             | 274             | 356             |
|                | NEW CASE        | 507             | 586             | 579             | 720             | 880             | 790             | 886             |
|                | **MALE**        |                 |                 |                 |                 |                 |                 |                 |
|                | YLL             | 7577            | 7624            | 7103            | 6265            | 7959            | 6950            | 7483            |
|                | YLD             | 409             | 474             | 422             | 577             | 609             | 548             | 594             |
|                | DALY            | 7988            | 8099            | 7525            | 6842            | 8568            | 7497            | 8076            |
|                | DEATH           | 553             | 551             | 512             | 451             | 537             | 452             | 549             |
|                | NEW CASE        | 724             | 841             | 790             | 1076            | 1067            | 1080            | 1045            |
|                | **BOTH SEX**    |                 |                 |                 |                 |                 |                 |                 |
|                | YLL             | 11644           | 12079           | 11700           | 10066           | 11860           | 11376           | 12951           |
|                | YLD             | 665             | 770             | 701             | 932             | 1034            | 935             | 1018            |
|                | DALY            | 12309           | 12849           | 12401           | 10998           | 12894           | 12311           | 13969           |
|                | DEATH           | 815             | 849             | 811             | 702             | 787             | 726             | 905             |
|                | NEW CASE        | 1231            | 1427            | 1369            | 1796            | 1956            | 1870            | 1931            |
|                | YEAR            | 2011            | 2012            | 2013            | 2014            | 2015            | 2016            | 2107            |
### Table 2: New Cases, DALYs, YLL, YLD for 37 Cancers 2011-2017

| CANCER SITE | ICD | BOTH SEX | MALE | FEMALE |
|-------------|-----|---------|------|--------|
| Stomach     | C16 | 155     | 2215 | 2104   |
|             |     | 1110    | 14.  | 9      |
|             |     | 1546    | 5     | 4      |
|             |     | 794     | 21.  | 6      |
|             |     | 443     | 2     | 6      |
|             |     | 669     | 315. | 5      |
|             |     | 6376    | 315. | 5      |
|             |     | 8.5     | 8.5  |        |
| Lung        | C33- | 630     | 1220 | 1211   |
|             | C34 | 9       | 7    | 6.6    |
|             |     | 5.6     | 119  | 9      |
|             |     | 8489    | 34.  | 4      |
|             |     | 107     | 7.6  | 8      |
|             |     | 338     | 25.  | 9      |
|             |     | 23.    | 23.  | 8      |
|             |     | 2.5    | 2.5  |        |
| Oesophagus  | C15 | 861     | 6242 | 5499   |
|             |     | .9      | 742  | 8.7    |
|             |     | 478     | 3427 | 3015   |
|             |     | 412     | 10.  | 5      |
|             |     | 383     | 281  | 310    |
|             |     | 2484    | 330  | 23.   |
|             |     | 69      | 69   | 2      |
| Colon       | C18 | 556     | 5273 | 5154   |
|             |     | 118.   | 8    | 6.9    |
|             |     | 308     | 3206 | 3140   |
|             |     | 65.    | 65   | 2      |
|             |     | 248    | 206  | 2      |
|             |     | 21.    | 21   | 4      |
| Brain       | C70- | 469     | 4930 | 4525   |
|             | C72 | 404.   | 6    | 5      |
|             |     | 270     | 2619 | 2385   |
|             |     | 233    | 6    | 2      |
|             |     | 199    | 231  | 1      |
|             |     | 15.    | 15   | 4      |
| Prostate    | C60- | 519     | 4678 | 4609   |
|             | C62 | 68.6   | .5   | 6      |
|             |     | 519     | 4678 | 4609   |
|             |     | 10.    | 10   | 4      |
| Breast      | C50 | 957     | 4256 | 4175   |
|             |     | 81    | 81   | 2      |
|             |     | 211    | 208. | 2.5    |
|             |     | 927    | 927  | 2.5    |
|             |     | 39.    | 39   | 2.5    |
| Larynx      | C32 | 161    | 2496 | 2358   |
|             |     | 138.   | 8    | 6.9    |
|             |     | 308    | 3206 | 3140   |
|             |     | 65.    | 65   | 2      |
|             |     | 248    | 206  | 2      |
|             |     | 21.    | 21   | 4      |
| Skin(non    | C44 | 151    | 2374 | 1191   |
| melanoma)  |     | 1182  | 18.  | 8      |
|             |     | 927    | 927  | 18.    |
|             |     | 714.   | 714  | 18.    |
| Small intestine | C17 | 90    | 1889 | 1824   |
|             |     | 65    | 65   | 2      |
|             |     | 36     | 36   | 2      |
|             |     | 8      | 8    | 2      |
| Bone        | C40 | 49     | 1745 | 1701   |
|             |     | 43.4   | 2.2  | 0.5    |
|             |     | 28     | 28   | 0.5    |
|             |     | 1090   | 1090 | 0.5    |
|             |     | 69.    | 69   | 1.9    |
| Pancreas    | C25 | 124    | 1563 | 1534   |
|             |     | 28.8   | 1.9  | 2      |
|             |     | 78     | 78   | 2      |
|             |     | 1116   | 1116 | 2      |
| Bladder     | C67 | 692    | 1552 | 1493   |
|             |     | 58.3   | 3.3  | 3.3    |
|             |     | 315    | 315  | 3.3    |
| Other Digestive Organ | C26 | 32    | 1410 | 1386   |
|             | Ovary | 23.5  | 0.5  | 0.5    |
|             |     | 20     | 20   | 0.5    |
|             |     | 965    | 965  | 0.5    |
|             |     | 949.   | 949  | 0.5    |
|             |     | 6.2    | 6.2  | 0.5    |
| Kidney      | C64- | 140    | 751  | 643.   |
|             | C66 | .2     | 107  | 1.7    |
|             |     | 1.9    | 1.9  | 1.7    |
| Rectum      | C19- | 302    | 677  | 612    |
|             | C21 | 64.2   | 64.2 | 64.2   |
|             |     | 2.9    | 2.9  | 2.9    |
| Hematopoietic | C42 | 687    | 508  | 0      |
|             |     | 8.2    | 8.2  | 8.2    |
|             |     | 423    | 423  | 423    |
|             |     | 313    | 313  | 313    |
| Thyroid     | C73 | 206    | 503  | 408.   |
|             |     | 94.9   | 2.7  | 4.3    |
|             |     | 43     | 43   | 2.7    |
|             |     | 195    | 195  | 2.7    |
| Cervix Uteri | C53 | 59    | 443  | 411.   |
|             |     | 31.3   | 31.3 | 31.3   |
| Uterus      | C55 | 34    | 432  | 428.   |
|             |     | 2.9    | 2.9  | 2.9    |
| Connective and soft tissue | C49 | 119  | 428  | 339    |
|             |     | 87.8   | 1    | 73     |
|             |     | 294    | 294  | 195    |
| Without     | C80 | 250    | 401  | 216.   |
|             |     | 184.   | 184  | 184    |

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| Specification       | Year 2011 | Year 2012 | Year 2013 | Year 2014 | Year 2015 | Year 2016 | Year 2017 |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Corpus uteri        | 67        | 68        | 71        | 75        | 80        | 85        | 89        |
| Lymph nodes         | 214       | 216       | 218       | 220       | 222       | 224       | 226       |
| Gallbladder         | 118       | 119       | 120       | 121       | 122       | 123       | 124       |
| Lip                 | 150       | 151       | 152       | 153       | 154       | 155       | 156       |
| Pleura              | 88        | 89        | 90        | 91        | 92        | 93        | 94        |
| Nasopharynx         | 34        | 35        | 36        | 37        | 38        | 39        | 40        |
| Hypopharynx         | 32        | 33        | 34        | 35        | 36        | 37        | 38        |
| Peritoneum          | 124       | 125       | 126       | 127       | 128       | 129       | 130       |
| Parotid gland       | 27        | 28        | 29        | 30        | 31        | 32        | 33        |
| Autonomic Nerves    | 15        | 16        | 17        | 18        | 19        | 20        | 21        |
| Vagina              | 4         | 5         | 6         | 7         | 8         | 9         | 10        |
| Oropharynx          | 18        | 19        | 20        | 21        | 22        | 23        | 24        |

Fig. 1: Compare gastrointestinal tract DALYs with Other Organs DALYs
| CANCER SITE                | 1390     | 1391     | 1392     | 1393     | 1394     | 1395     | 1396     |
|---------------------------|----------|----------|----------|----------|----------|----------|----------|
| Stomach                   | 3149.6   | 3415.9   | 2906.8   | 3302.5   | 3462.9   | 2870.7   | 3044.0   |
| Lung                      | 1798.5   | 2262.6   | 1724.9   | 1767.7   | 1484.7   | 1542.9   | 1628.0   |
| Liver                     | 1517.6   | 1331.5   | 1142.1   | 1228.5   | 815.0    | 823.5    | 1053.0   |
| Oesophagus                | 998.0    | 905.2    | 936.0    | 474.2    | 849.4    | 1180.9   | 898.3    |
| Colon                     | 715.5    | 691.9    | 810.9    | 245.3    | 965.4    | 738.3    | 1105.8   |
| Prostate                  | 651.9    | 651.7    | 762.7    | 575.3    | 635.2    | 657.1    | 744.3    |
| Breast                    | 531.5    | 521.6    | 378.6    | 504.7    | 680.6    | 593.4    | 1044.0   |
| Small intestine           | 515.2    | 449.9    | 30.8     | 121.6    | 348.7    | 300.5    | 102.4    |
| Skin                      | 407.0    | 299.4    | 263.0    | 189.0    | 343.3    | 357.8    | 512.1    |
| Bone                      | 326.7    | 481.8    | 165.7    | 74.3     | 199.0    | 207.3    | 289.8    |
| Larynx                    | 298.8    | 386.7    | 303.9    | 484.4    | 393.3    | 236.4    | 302.9    |
| Other digestive system    | 218.9    | 245.2    | 541.8    | 57.8     | 173.4    | 80.4     | 92.2     |
| Bladder                   | 219.0    | 200.9    | 161.6    | 110.3    | 420.7    | 170.5    | 268.8    |
| Pancreas                  | 208.2    | 46.6     | 213.1    | 49.1     | 249.7    | 377.3    | 416.9    |
| Kidney                    | 147.0    | 207.3    | 41.7     | 45.5     | 101.7    | 91.0     | 117.0    |
| Cervix uteri              | 108.0    | 127.9    | 26.9     | 28.1     | 53.9     | 9.3      | 88.7     |
| Ovary                     | 90.5     | 210.2    | 83.1     | 213.3    | 76.0     | 195.0    | 217.6    |
| Thyroid                   | 87.1     | 177.9    | 32.3     | 20.1     | 96.3     | 45.4     | 44.0     |
| Rectum                    | 72.2     | 7.7      | 156.4    | 66.9     | 195.0    | 82.5     | 96.2     |
| Hematopoietic             | 69.5     | 61.3     | 61.3     | 70.9     | 68.7     | 86.4     | 89.4     |
| Uterus                    | 33.1     | 0.4      | 77.6     | 84.7     | 83.5     | 49.5     | 102.9    |
| Brain                     | 32.7     | 56.8     | 1139.2   | 988.1    | 785.6    | 954.9    | 972.5    |
| Lymph nodes               | 28.1     | 33.2     | 21.4     | 36.9     | 38.4     | 75.4     | 46.6     |
| Without specification     | 24.4     | 13.3     | 92.6     | 64.5     | 125.2    | 34.7     | 46.7     |
| Gallbladder               | 9.0      | 4.9      | 5.7      | 11.4     | 19.6     | 99.1     | 111.5    |
| Peritoneum                | 8.9      | 6.6      | 8.1      | 27.3     | 3.0      | 28.1     | 9.6      |
| Pleura                    | 9.6      | 8.9      | 7.4      | 7.4      | 52.9     | 50.9     | 22.9     |
| Connective and soft tissue| 9.6      | 14.0     | 112.0    | 18.8     | 48.2     | 69.3     | 155.7    |
| Other                     | 12.6     | 19.2     | 34.0     | 37.9     | 81.9     | 33.3     | 51.0     |
| Nasopharynx               | 3.2      | 1.6      | 2.4      | 4.0      | 6.4      | 21.2     | 67.3     |
| Hypopharynx               | 4.4      | 1.8      | 0.0      | 4.4      | 1.8      | 44.8     | 38.3     |
| Autonomic Nerves system   | 0.0      | 0.0      | 0.0      | 4.4      | 2.2      | 3.0      | 1.5      |
| Lip                       | 1.9      | 1.5      | 10.6     | 1.8      | 2.2      | 160.0    | 37.3     |
| Parotid gland             | 1.3      | 1.5      | 3.0      | 2.2      | 6.6      | 1.5      | 3.7      |
| Oropharynx                | 0.1      | 0.4      | 0.1      | 0.4      | 0.1      | 0.9      | 0.4      |
| Vagina                    | 0        | 0        | 0.0      | 0.7      | 1.5      | 0.7      | 0.0      |
| Corpus uteri              | 0.4      | 1.0      | 3.0      | 74.2     | 22.7     | 35.1     | 146.5    |

**Fig. 2:** DALYs based on cancer site (The red and green colors indicate the highest and the lowest DALYs, respectively)
Discussion

In this study, we estimated the burden of 37 cancers in Kurdistan Province during 2011-2017 based on the DALY index and WHO guidelines. Accordingly, 54% of DALY cancers pertained to digestive organ cancers, making the top 5 cancers as follows: stomach, lung, liver, esophagus, and colon. With increasing age, YLLs from cancers is caused by late diagnosis of cancer, which can be due to people's ignoring risk factors of cancer, especially among men or it may also be due to late detection, diagnostic problems or lack of access to appropriate treatment.

Burden of cancer was compared between Kurdistan and 6 other provinces per 100,000 in Great Khorasan (663 DALY), Yazd (797 DALY), Hormozgan (364 DALY), Bushehr (545 DALY), Chaharmahal-Bakhtiari (1275 DALY) (15). The burden of cancer in East Azerbaijan was reported as 1275 DALY (19), which was 891 DALY in Kurdistan Province in 2017. DALY was lower than that in East Azerbaijan Province, which can be attributed to differences in population, years of study, eating habits, lifestyles, genetics, or climate. More than half of the estimated incidence and mortality rates attributed to 7 cancers as follows: prostate, lung, lip and mouth, liver, breast and cervix (20). This finding is in contrast with the results of our study that attribute more than half of the burden of cancer to gastrointestinal cancers. Different reasons may account for this difference such as climate in different parts of the world, income levels, education, increasing life expectancy, culture and customs, eating habits and genetics.

In our study stomach cancer is accounted 25% DALY of the total cancer DALYs Kurdistan Province that is almost similar with another study that revealed DALY of stomach is accounted 20% of the total cancer DALYs worldwide (21). Stomach cancer is accounted 6.5% DALY of the total cancer DALYs in Eastern Mediterranean Region (22). This finding is in contrast with the result of our study. Different reasons may account for this difference such as different lifestyles, education levels, genetics, income levels, age, sex and place of living which may be due to failure to treat Helicobacter pylori or lack of awareness of the infection status in Kurdistan Province (23, 24). Other risk factors for this cancer include low intake of fresh fruits and vegetables, consumption of different doses of alcohol in various provinces of Iran, different types and methods of smoking (1, 25), or unchangeable factors such as gender, age, blood group types and genetics. The highest DALY was reported of
232.7 per 100,000 for stomach cancer, which is consistent with our findings (9).

In our study lung cancer is accounted 13.9% DALY of the total DALYs Kurdistan Province that is in contrast with Soerjomataram et al that revealed DALY of lung cancer is accounted 23% of total DALYs worldwide (21). Lung cancer was accounted 11% DALY of the total cancer DALYs in Eastern Mediterranean Region (22). This finding is in contrast with the result of our study. In addition different doses of tobacco (26, 27), genetic causes and some specific genes, such as p53 on chromosome 17 (28), or exposure to solid fuel smoke during cooking may cause differences among provinces. Men in Kurdistan Province have a lower age-standardized incidence rate of lung cancer as compared to the world, with the exception of four regions: Central America (7.2), Central Africa (3.8), East Africa (3.4), and West Africa (2.4) (with higher rates of age-standardized lung cancer rate). The same is true for women in Kurdistan Province, that is, women in Kurdistan Province have lower rates of cancer than most parts of the world except 5 regions: North Africa (3.4), South Central Asia (3.4), Central Africa (2.3), East Africa (2.2), West Africa (1.2)(1). Lung cancer with 149.6 DALY per 100,000 was the second most common cancer in Iran, which is consistent with the findings of our study (8).

In our study, liver cancer was accounted 9% DALYs of the total DALYs Kurdistan Province that is in contrast with a study that revealed DALYs of liver cancer is accounted 28% of total DALYs worldwide (21). Liver cancer was accounted 6.3% DALYs of the total cancer DALYs in EMR (22). This finding is in contrast with the result of our study. This difference may be due to the prevalence of liver diseases in Kurdistan Province, including non-alcoholic fatty liver due to vitamin D deficiency (29), unidentified viral hepatitis or higher dose of alcohol consumed. According to the STEPs 2016 studies, Kurdistan Province has higher alcohol consumption than 27 other provinces in Iran. Another possible reason is obesity (BMI > 30), which is higher among men in Kurdistan than that in 22 other provinces and higher among women than that in 18 other provinces. The age-standardised incidence rate of oesophageal cancer in Kurdistan Province is 10.7% and 6.9% among males and females, respectively, which is higher in both sexes than that of 20 other provinces mentioned in another study (30). Different diets in Kurdistan Province had no association with oesophageal cancer, but obesity had a significant relationship with it (31). Fruit and vegetable consumption had a preventive effect (32). However, according to the results of STEPs 2016 in Iran, fruit and vegetable consumption between both genders is lower in Kurdistan Province than that in other provinces. In a global comparison about esophageal cancer, the age-standardized incidence rate of female in Kurdistan Province is higher than that of the other regions in 5 continents except for Malawi (7.1), and this index is higher among men than the other five continents, except for East Asia (17.1) and South Africa (11.1). The age-standardised incidence rate of colon cancer is 7.6 in males and 6.4 in females, which is higher than males in only 2 provinces of Hormozgan (7.1) and Kohkiluyeh-Boyer Ahmad (6.3). As compared to the rest of the provinces, men in Kurdistan Province have a lower incidence. Furthermore, women in Kurdistan Province have a lower incidence rate except for the four provinces of Sistan-Baluchestan (6.2), Hormozgan (6.16), Bushehr (5.7), and Lorestan (5.6). Low physical activity, obesity, fecal occult blood are factors that can cause colon cancer (33). These may be due to presence of differences in various provinces. Age-standardized incidence rate of this cancer in Kurdistan’s men is lower than other parts of the world, except for six regions of Oceania (7.3), North Africa (5.7), East Africa (3.4), West Africa (3.3), Central Africa (3), and Central Asia (3). In addition, women in Kurdistan Province have a lower age-standardized incidence rate in other parts of the world except for seven regions of the world: Southeast Asia (6.3), North Africa (5.1) Melanesia (3.8), East Africa (3.8), West Africa (3), Central Africa (2.5), and South Central Asia (2). Underestimating the incidence of cancer was a major limitation of the present study. This problem has
been alleviated since 2013 through recoding the data in a population based manner.

Conclusion

The increasing DALYs of cancer in Kurdistan Province is one of the major public health concerns as in most developed countries. More than half of the burden of cancer in the Kurdistan province is related to digestive organs. Stomach cancer, accounting for more than 25% of the burden in both genders. Urgent policy, management and public health measures such as general education, screening, early detection and effective treatment are recommended to reduce the burden of cancers and especially gastrointestinal tract cancer.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that they have no conflict of interest

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