

RESEARCH ARTICLE

Colorectal Cancer Trends in Kerman Province, the Largest Province in Iran, with Forecasting until 2016

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Abstract

Colorectal cancer is one of the most common cancers. The aim of this study is determination its trends in Kerman province and individual cities separately until year 2016. This analytical and modeling study was based of cancer registry data of Kerman University of Medical Sciences, collected during 2001-2010. Among 20,351 cancer case, 792 were colorectal cancer cases in age group 18-93 years with a mean of 59.4 and standard deviation of 15.1. By applying time series and data trends, incidences were predicted until 2016 for the province and each city, with adjustment for population size. In colorectal cases, 413 (52%) were male, and 379 (48%) were female. The annual increasing rate in Kerman province overall was and can be expected to be 6%, and in the cities of the province Rafsanjan, Bardsir, Bam, Kerman, Baft, Sirjan, Jiroft, Kahnuj and Manujan had an increasing range from 5 to 14% by the year 2016. But in Ravar, Zarand and Shahrabak reduction in rates of at least 2% could be predicted. The time series showed that the trend of colorectal cancer in female will increase 15% and in male 7% by year 2016. Given the trend of this cancer is increasing so that resources will be consumed in the treatment of the patients, efforts should be focused on prevention and early diagnosis of the disease. Screening could have an important role leading to improved survival.

Keywords: Colorectal cancer - time series - forecasting - trend - Kerman Province, Iran

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Introduction

The colorectal cancer which is the cancer of large intestine can be prevented and managed if diagnosed early. In this disease most of changes occur in the internal lining of the colon and rectum. The prevalence of this cancer showed that the high risk areas are America, Europe and Australia and low risk are Africa, Central Asia and South America (Malila and Hakulinen, 2003). The parameters of the cancer can be industrialization and food habits. According to the research studies in 12 European countries showed that health promotion will head to increase the survival rate (Capocaccia et al., 1997). Colorectal cancer is the second most common cancer in England. Research has shown this country annually has 3,000 new cases and there are 19,000 deaths from this cancer per year.

It takes 5-15 months after treatment start seeing the first signs (Selvachandran et al., 2002). Another investing of cancer trends in England in 2004-2010 in persons 20 years and older with variable adjustment for age, showed that cancer mortality in England is one of the major causes and 25% of them who are involved in the disease will lead to death. The result of this study indicate lung cancer, colorectal cancer and breast cancer in women and

prostate cancer in men, respectively, are the most common. According to the data of colorectal cancer showed increasing in female 5% and in male 17% by the year 2010 (FAIRLE et al., 2003). In a report by NCI Office of Media Relations, American medical care costs associated with colorectal cancer is high and based on research conducted at the National Institute of Health (NIH) the trend will be increasing by the year 2020. Canada research shows that although the indices of the colorectal cancer reduce but the absolute number of new cases of colorectal cancer increases (Gao et al., 2008). It is also showed this disease can be extended to the liver even after surgery (Yu et al., 2012). A study by Capocaccia showed that the incidence rate for colorectal cancer in Italy during the years 1970-1990 had an increasing trends and it be continued until 2000 (Capocaccia et al., 1997).

According to a study in 2008 based on the data of Tehran Cancer Registry showed that this cancer is a disease with nonspecific symptoms and 35.1% of cases had a family history (Azadeh, Moghimi-Dehkordi et al. 2008). A study was also conducted in 2005 showed that the colorectal cancer ranks second to fourth among all cancers is and in Kerman province has the fourth place among the men and the second place in women (Azadeh et

al., 2008). In Australia there are 10,000 new cases which half of them lead to death approximately (Elsaleh et al., 2000). In Australia, Great Britain, United States is the most common cancer in women after breast cancer and in men after prostate and lung cancer (Bernie et al., 1998). In 2004, 288,600 new cases of cancer diagnosed in Europe and there were 1,711,000 deaths from cancer which 13.2% of them were colorectal cancer (Boyle and Ferlay, 2005). Colorectal cancer incidence over the past decades in Asian countries, including Japan, South Korea, and Singapore has increased about 2-4 times. In addition, changes in eating habits, lifestyle and genetic parameters it seems that colorectal neoplasm's without previous adenoma in Asia occurs more than any other population (Sung et al., 2005). Based on the previous consideration, determining the trend of this disease can help us in two ways. First, this document can help to manage the colorectal cancer better by preparing all tools specially medicine for future. Second it seems it can show the important of the disease and give enough knowledge to those people who are in risk visit the specialty and it may prevent of delay of treatment up to its moths.

Materials and Methods

Time series is a sequence of observations, which are ordered according to time. In other words, a time series is the observation of a set of data that is obtained from the observation of a phenomenon over time. One of the goals of time series is forecasting of future values. Predicting of future is based the previous data. The trend is one of the parts and components of time series. The trend is the long-term changes in the mean time series, In other words, the natural of time series trend is based on history of the long-term. The data of this study which is analytical and modeling are obtained from cancer registry of Kerman University of medical sciences which has the conditions of time series. Out of 20,351 cases of from 2001 to 2010, 792 cases were colorectal cancer. Patients with Cecum and Appendix, Transverse and Splenic of colon Descending colon, sigmoid colon, colon, Recto sigmoid junction, rectum, Anus and Anal canal were considered as colorectal cancer. In this study also the variables such as age, sex, site of cancer, site of tumor and morphology are recorded. After entering data in Minitab software for analyzing and charting, the distribution of patients with colorectal cancer during 2001-2010 in terms of location and time of diagnosis where determined. After adjusting the data by population in each year, the cancer trends of cancer overall and in each cities of the Kerman province separately. In addition the trends of colorectal cancer are showed for gender. To obtain the exact amount of increase or decrease in the disease process, the difference between the predicted value of each year and the previous year are divided by the projected and then calculated the average increase or decrease for each city.

Results

792 patient diagnosed with colorectal cancer in Kerman province were studied. 413 patients were male

Table 1. Information about the Model and the Trends of Cancer in Other Cities

Change /year (%)	Trend	The model fitted	City
6	Additive	$Y_t = 610 + 359t - 2.8t^2$	Kerman Province
7	Additive	$Y_t = 52 + 37.9t$	Rafsanjan
5	Additive	$Y_t = 22.3 + 3.05t$	Bardsir
8	Additive	$Y_t = 1.6 + 10t$	Bam
8	Decreasing	$Y_t = 18 - 80.9917t$	Zarand
10	Additive	$Y_t = 1053 + 160t + 17.7t^2$	Kerman
8	Additive	$Y_t = 36.4t$	Baft
2	Decreasing	$Y_t = 47.4 - 0.749743t$	Ravar
10	Additive	$Y_t = 108.433(1.0988^t)$	Sirjan
7	Additive	$Y_t = 34.3 + 17.4t$	Jiroft
19	Additive	$Y_t = 33.3 - 8.6t + 1.15t^2$	Manujan
14	Additive	$Y_t = 105 - 12.2t + 2.18t^2$	Kahnuj
34	Decreasing	$Y_t = -12.4 + 15.6t - 1.435t^2$	Shahrbabak
15	Additive	$Y_t = 478.469(1.1477^t)$	Women in Kerman Province
7	Additive	$Y_t = 320 + 161t + 1.1t^2$	Men in Kerman province

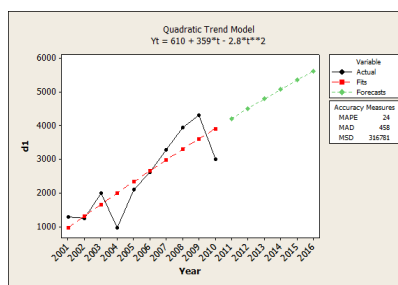


Figure 1. Trend Analysis Plot for Kerman Province

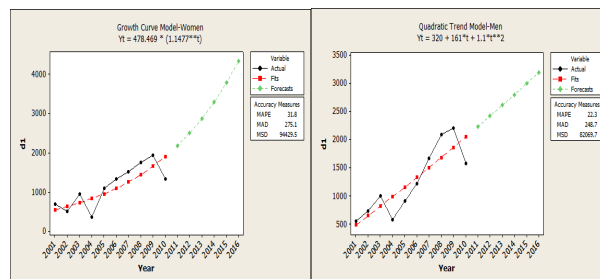


Figure 2. Trend Analysis for Women and Men Separately

(52%) and 379 female (48%). And trend the disease process and 2001-2010 were plotted by applying the software, MINITAB.

Given that the process may increase or decrease due to population growth or decline over the years, thus, the number of cancers were adjusted by the rate of population growth. To get this rate according to the last census was carried out every 10 years since 2006 so with possession of 1996-2006 census data this rate was calculated using the formula the below for each city in the whole province.

(Year Population 2006-Year Population 1996)/(10* Population 1996): Then the corrected data were analyzed. Kerman province includes the following 12 cities: 1) Baft, 2) Bardsir, 3) Bam, 4) Jiroft-Anbarabad (Jiroft), 5) Ravar-Kuhbanan (Ravar), 6) Rafsanjan, 7) Zarand, 8) Sirjan 9) Shahrbabak, 10) Kerman, 11) Kahnuj, and 12) Manujan-Rudbar (Manujan).

In each of these cities, and examine cancer trends were projected to the year 2016. Generally the process was carried out in Kerman province.

Kerman province: The model also which has a

quadratic form trend.

According to Figure 1 for the Kerman province the model is $Y_t = 610 + 359t - 2.8t^2$ which has a quadratic form trend.

Based on the model the colorectal cancer will have an increasing trend in Kerman Province and a quick look at the chart and value of the projected results will be achieved. In the Figure 1 is Frequency adjusted by the population size.

For all cities the model is additive and so the trend is increasing other than the cities Ravar, Zarand and Shahrabak which the model showed a decreasing trend (Table1).

General trend of colorectal cancer for men and women in Kerman province were studied (Figure 2). In men the model is $Y_t = 320 + 161t + 1.1t^2$ which has a quadratic form and shows an increasing trend of this cancer in men, whereas in women, the model has an exponential trend with equation $Y_t = 478.469(1.1477^t)$ which also has an increasing trend but because of exponentially growth the result will increase rapidly in women than men.

Discussion

A search conducted in America from 1973-1989 showed that deaths from colorectal cancer in blacks increased 5 percent in this period of time. England survey results in 2003 showed that 17 percent of women and 5 percent of colorectal cancer in men (FAIRLE et al., 2003). According to a record in 2005 of cancer, colorectal cancer within a 5-year period prevalence in women were more than men (Ansari et al., 2006). Given the results of this study generally Kerman province of colorectal cancer is increasing. If we assess each city individually, except counties Zarand, Ravar and Shahrabak other parts of the province will have increased trend. Overall, the average increase per year in the Kerman province 6 percent, in Rafsanjan 7%, Bardsir 5%, Bam 8%, the city of Kerman, about 10%, Baft 8%, Sirjan 10%, Jiroft 7%, Manujan 19% and in Kahnuj 14% until 2016 is predicted. The mean reductions were, in Ravar 2% Zarand 8% and Shahrabak 34%. In general men and women also addressed separately in the colorectal cancer in average 7% of men and 15% of women will increase until 2016. The average percentage is calculated from the following formula: *(The projected year-ahead of the previous year) / (number of years * Projected value of the previous year)*

Fortunately, in the pathogenesis of these cancers are preventable. In addition, further research on the causes and risk factors could help future cancer prevention strategies or adjustments.

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