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The Prediction Number of New Cases and Death of Gastric Cancer Among Iranian Military Community During 2007-2019

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Abstract

Introduction: Although the trend of incidence and mortality of gastric cancer is decreasing in globally, this cancer is a problem in some areas of Iran. The purpose of the current study was the prediction of the future trend of incident cases and mortality of gastric cancer information in the military community (MC) by using time series method.

Methods: In This cross-sectional aggregate based study, the required information was obtained from insurance organization of Iranian military community. For selecting the best model, autocorrelation function (ACF), partial autocorrelation function (PACF), and Akaike information criterion (AIC) statistics were used. Moreover, for identifying and fitting selected models, Tests of randomness on residuals and the schematic Checking of the residual graph were used. All analysis was performed by using Interactive Time Series Modeling Package (ITSM), stata14, and Excel software. All analysis was carried out by considering 0.05 for significance level.

Results: 70.42% of cases were males and 29.58% were females. The mean age of patients was 69.51±11.52. The mean age of males and females were 70.15±11.08 and 67.98±12.36, respectively. The trend of overall incident cases of gastric cancer was increasing but mortality of this cancer had a constant trend. The trend of incident cases in males was increasing but the mortality had a constant trend. The trend of new cases and mortality in females was constant.

Conclusions: the number of new cases of gastric cancer among Iranian MC males will increase in coming years, therefore programs to decrease main risk factors should be taken into account.

INTRODUCTION

In the recent years , gastric cancer was the most prevalent cancer in the world [1, 2]. The incidence and mortality rate of gastric cancer in recent years have had a decreasing trend in many countries around the world [3]. Despite a decline in incidence and mortality of stomach cancer, this cancer still is one major cause of cancer death in the world [4]. Gastric cancer is the fourth most common cancer and is the second leading cause of cancer deaths in the world [5]. The peak age of this cancer in western countries is 60 to 80 years [6]. Although many different studies have shown that the trend of incidence and mortality of this cancer is decreasing [7, 8], one study showed reverse results [9]. However, unlike other countries, the incidence of gastric cancer has increased in Iran in recent years (2005) [10]. According to studies gastric cancer, Gastric cancer has a high prevalence among Iranian population and this cancer is the first common cancer in men and the third most common cancer in Iranian women [11]. And stomach cancer is the first cause of cancer related deaths in both sexes [12]. Gastric cancer is the most prevalent cancer in

the north and northwest of Iran [13]. The causes of the increase in stomach cancer in recent years have been an increase in the prevalence of Helicobacter pylori, change in lifestyle, diet changes such as high intake of salt and nitrate-rich foods and low intake of fruit and vegetables [14]. Considering the prominence of this cancer in Iran, predicting the number of future cases can play an important role in designing prevention program. Iranian military community can be a representative sample of Iranian community, thus determining the trend of stomach cancer in this community can give us a picture of the trend of this cancer among the Iranian population. The purpose of current study was to predict the number of incident cases and mortality of stomach cancer in the Iranian military community (active, retired, family, veterans) = MC by using time series method.

METHODS

Data Collection

In This cross-sectional aggregate based study the required data was extracted from cancer registering system of insurance organization of Iranian military community.

Inclusion Criteria

The information related to all new patients in the military community who were diagnosed and their cancers were registered during March 2007 to March 2017, was utilized in this study. The total number of gastric cancer during these years was about 1741 cases.

Removing of Non-stationary

After data cleaning by using Excel 2010, and removing of Non-stationary of variance by using Box-Cox transformation and Non-stationary of the mean by using differencing, data was provided to select the model for prediction.

Selection of Models

To select the best model for prediction, the researcher used time series graphs such as partial autocorrelation function (PACF) and autocorrelation function (ACF) ones to determine the amount of auto regressive (AR) (p) and moving average (MA) (q). So PACF and ACF graphs with minimum akaike information criterion (AIC) were used for the selection of the best prediction model. The AIC is an estimator of the relative quality and fitness of statistical models for a given set of data, whereas, smaller values indicating, fit better to the model.

Assessing the Fitness of the Selected Models

To assess the fitness of the selected models, Tests of randomness on residuals such as Ljung-Box statistic, McLeod-Li statistic, Turning points, Diff sign points, Rank test statistic, Jarque-Bera test statistic (for normality), and the schematic Checking of the residual graph were used.

Prediction

All data was analyzed by using ARIMA (p,d,q) model. This model has three parts including AR and MA extracted from PACF and ACF diagram and difference part (d) that shows the order of difference for setting the stationary in the mean. The purpose of each of these features is to make the model fit the data as much as possible. The unit of current study was according to months and collected data was for a period of 120 months from 21 March 2007 to 20 March 2017 and the duration of the forecast was 30 months from March 21, 2017 to August 20, 2019. All analysis was done using the ITSM (Interactive Time Series Modelling) software version 7.1 (student) 2010, STATA14 (StataCorp LLC, TX, USA) and Microsoft Excel (Microsoft Co., WA, the USA with regard to 0.05 for significance level.

RESULTS

In the total of 1741 gastric cancer patients 70.42% of cases were males and 29.58% were females. The mean age of patients was 69.51±11.52. The mean age of males was 70.15±11.08 and the mean age of females was 67.98±12.36. The time series analysis results showed the trend of incident gastric cancer among Iranian MC is increasing with a mild trend. For prediction of this variables, the ARIMA model with AR: 13, MA: 2 and AIC: 353 was used (13, 1, 2). But the trend of mortality related to this cancer will be constant for coming years. For prediction of this variables the ARIMA model with AR: 12, MA: 5 and AIC: 375 was used (12, 1, 5) (figure1). In assessing the trend of incident cases and mortality of gastric cancer with regard to sex, the number of new gastric cancer among males had an increasing trend. For prediction of this variables the ARIMA model with AR: 3, MA: 2 and AIC: 350 was used (3, 1, 2). The ARIMA model with AR: 3, MA: 1 and AIC: 228 (3, 1, 1) showed that the trend of mortality among males was constant (figure2). The ARIMA models with AR: 12, MA: 1 and AIC: 367 (12,1,1) and AR: 14, MA: 1 and AIC: 441(14,1,1) for occurrence and mortality of gastric cancer respectively showed that the trend of incident cases and mortality due to this cancer in females will be having a constant trend for coming years (figure3). The related coefficient for the prediction occurrence of gastric cancer among Iranian MC is shown in table 1.

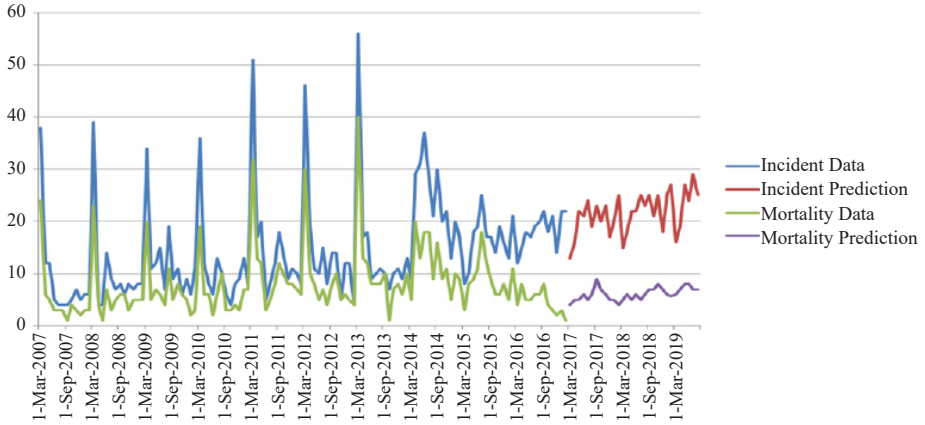

Figure 1: The Prediction of Incident Cases and Mortality of Gastric Cancer Among Iranian MC During 2007-2019.

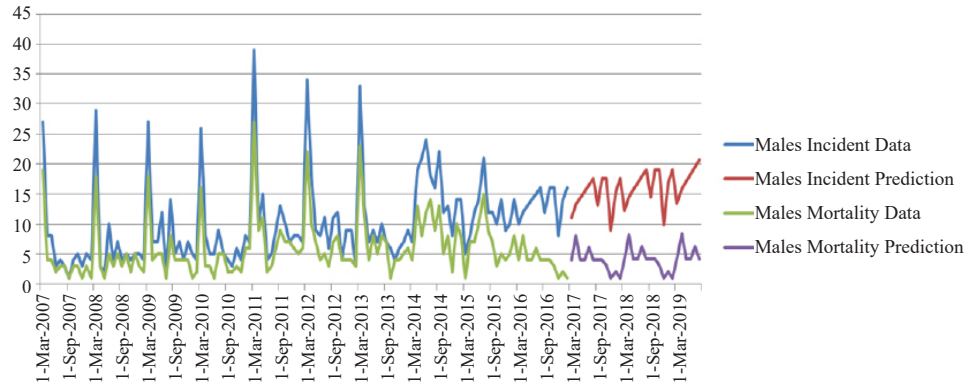

Figure 2: The Prediction of Incident Cases and Mortality of Gastric Cancer Among Males of Iranian MC During 2007-2019.

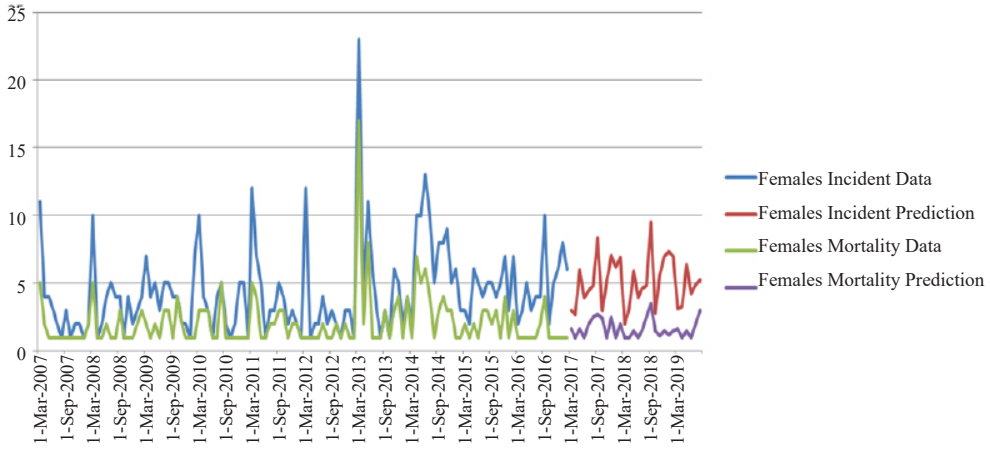

Figure 3: The Prediction of Incident Cases and Mortality of Gastric Cancer Among Females of Iranian MC During 2007-2019.

Table 1: The Related Coefficient for Prediction Incident Cases of Gastric Cancer Among Iranian Militaries.

	Total Incidence of Gastric Cancer	Total Mortality of Gastric Cancer	Incidence of Gastric Cancer in Males	Mortality of Gastric Cancer in Males	Incidence of Gastric Cancer in Females	Mortality of Gastric Cancer in Females
BOX-COX	300	200	200	200	400	200
AR	13	12	3	3	12	14
MA	2	5	2	1	1	1
AIC	0.353984E+03	0.375449E+03	0.350462E+03	0.228445E+03	0.367982E+03	0.441652E+03

AR: Auto Regressive, MA: Moving Average, AIC: Akaike Information Criterion

DISCUSSION

Gastric cancer among Iranian males and also in some provinces of Iran such as Ardabil is the most common one [15]. Taking into consideration the importance of gastric cancer in Iran especially in the military community, this study assessed the trend of incident cases and mortality of gastric cancer among Iranian MC and predicted this index by using time series methods. The result of the current study showed that the prevalence of gastric cancer among Iranian MC Males was more than females. In the similar study in Ardabil and Semnan province, the incidence rate of gastric cancer among males was more than females [11, 16]. It could be due to higher prevalence of risk factors in males. For example, some habits such as smoking and unhealthy diet and stress in males are more than females. According to our results, the mean age of cancer patients was more than 69 years old. The mean age of gastric patients cancer in the west of Iran was 65years [17]. In a similar study in the USA the incidence of gastric cancer among old people was more than younger people [18]. It shows the effect of environmental risk factors such as diet, lifestyle and so on. In comparison between genetic and environmental factors on Non-communicable disease occurrence, more time is required to investigate the effect of environmental risk factors on disease occurrences such as cancers. The trend of gastric cancer cases among Iranian increased during 1969 to 2004 [19]. The trend of newly diagnosed cases among Iranian MC is increasing with a mild slope. This result is similar to other reports [20, 21]. It might be due to the change in lifestyle, the increase of unhealthy diets and the exposure to risk factors such as nitrates and smoking, the increase of prevalence of Helicobacter pylori and conditions resulting in gastric dysplasia, cigarette smoking, Use of harmful drinks and grilled foods [11, 22, 23]. Helicobacter pylori infection has been found in many cases of gastric disorders and this infection is related to gastric malignancy [24], and prevalence of this infection is high in areas with high rates of gastric malignancy [20, 25]. Due to increasing risk factors during last decades, improvement of the cancer registration system should be taken into consideration since improving registration system influence the increase in the number of cancer cases. According to our results, the number of deaths due to gastric cancer in Iranian MC in the coming years will be constant. It may be due to early diagnosis of cancer, as early diagnosis can reduce the cancer related deaths [26]. Besides, unregistered death cases can be a reason for this constant trend. According to our results, the trend of new gastric cancer among males has a mild increasing trend but the number of death due to this cancer among males will have a constant trend in coming years. Also the trend of the number of new cases and mortality of mentioned cancer among females will have a constant trend in coming years. In a study in China, the results showed a decrease in the incidence and mortality of gastric cancer in men and an increase in this index in women [27]. Other study results in japan showed, the incidence of gastric cancer among males and females have an increasing trend but the trend of death due to this cancer had a decreasing trend [28]. According to another report, the death due to gastric cancer among both sexes in the USA has a decreasing trend [29]. Differences observed in incidence rates between regions may be due to the different risk factors. Another cause of difference in the pattern of incidence and mortality of gastric cancer between different areas is genetic differences between different populations. Reducing morbidity and incidence rates in populations with high-risk for this cancer may be accessible by correction some environmental factors such as eating and drinking habits and the quality of food. Screening programs as well as further evaluations must be considered to map out the risk factors. Finally, according to our results, the number of new gastric cancer among Iranian MC especially in males will increase in coming years. Thus, the prevention of this increasing trend needs taking fundamental actions such as changing the lifestyle, increasing physical activities, and reducing risk factors.

The occurrence of gastric cancer has an increasing trend among Iranian MC especially in males, so decreasing risk factors for prediction of this cancer among Iranian males should be considered.

This research was according to registered data, so the prediction of occurrence and mortality of gastric cancer could be affected by the quality and quantity of registered data. Also, we only had the number of death or incident cases and we did not have any information about MC population size, so the trend of gastric cancer can be affected by population size or improved registering system quality.

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

ETHICS APPROVAL

This study was approved by the ethics committee of the Aja University of Medical Sciences with the code IR.AJAUMS.REC.1395.27.

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