ORIGINAL ARTICLES

The trend of bladder cancer among Iranian military community from 2007 to 2019

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Abstract: *Purpose: Cancers are one of the main causes of mortality in the world. The incidence of cancers in the world and mainly in developing countries is increasing. Due to the importance of this issue, the purpose of the current study was to assess the trend of incidence and death of Bladder Cancer among Iranian Military Community (MC) from 2007 to 2019.*

Methods: This is a cross-sectional study using time series data. All registered bladder cancer in Iranian Military community from March 2007 to February 2017 entered in this study. The future trend predicted using ARIMA (p,d,q) model. All analyzes were performed using ITSM and Excel (2010) software.

Results: According to ARIMA (2, 2, 1) model, the bladder cancer among the Iranian military community had an increasing trend. The AR (12, 2, 0) model showed an increasing trend of this cancer among males but it seems the trend of bladder cancer among females will have a constant trend AR (12, 2, 1). The death due to bladder cancer was showed a decreasing trend using AR (14, 2, 1) model.

Conclusion: In spite of decreasing trend in death due to bladder cancer, the trend of incidence of the Bladder cancer among the Iranian Military Community was increasing. However, it is necessary to adjust the effect of many factors that may have an important role in this trend.

Keywords: *bladder cancer, military community, Iran, Time Series Analysis*

INTRODUCTION

Cancers are one of the main public health problems in the world with different pattern in developed and developing countries. Only 5-10% of cancers are related to human genetics and 90-95% of them are due to exposure to environmental factors and lifestyle [1]. Cancer tumors can affect different organs. One of the common organs involved in tumors is the bladder. Bladder cancer is one of the most prevalent cancers in the world. annually there are many people getting this cancer in the world [2]. Smoking and Infection with Schistosoma haematobium are the main risk factors for the disease [3, 4]. The highest and lowest incidence of the disease was observed in Northern Europe and Asia, respectively [5]. In Iran as a developing country in Persian Gulf Region (southwest Asia), an epidemiologic transition is ongoing from communicable to non-communicable diseases, bladder cancer is sixth most common cancer [6] with estimated age-standardized incidence rate of 10.92 and 2.80 in men and women,

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respectively [7]. In spite of a lower incidence of bladder cancer in the Asian region in comparing to western countries, in Iran, the bladder cancer is one of the most prevalent urological malignancy [8]. according to the results of research, some jobs such as Truck drivers, road construction workers, mechanics, petrochemical workers, plastic and metal industries, welding, and pipeline workers are most prone to getting bladder cancer [9]. To the best of our knowledge there is no study about bladder cancer morbidity and mortality trends among Iranian Military community (active, retired, family, veterans) = MC, so this study performed to time series analysis of bladder cancer in Iranian MC. The trend analysis and prediction of future trends can provide very beneficial information for health policymakers and managers to programing and designing prevention programs. Due to importance of problem the purpose of the current paper was to describe the incidence of registered cases of bladder cancer among Iranian MC during the March 2007 to February 2017 and Forecasting its incidence in the coming years using the Iranian Armed Forces Health Insurance database.

MATERIAL AND METHODS

Study Design

In the current cross-sectional study, the required data were extracted from the registered cases in the Iranian Armed Forces Health Insurance. This data was registered according to the time of diagnosed and registered cases.

Inclusion criteria

All registered bladder cancers in the Iranian MC during the March 2007 to February 2017 entered in this study.

Data analysis

Removing non-stationary in data

Due to the non-stationary nature of the used data set, the needed transformation applied to the used time series. To remove variance fluctuation the Box cox transformation was used. In addition, to remove non-stationary in the mean of data set the differencing was used.

Selection of models

The partial autocorrelation function (PACF) and auto-correlation function (ACF) graphs were used to selection of the prediction model. By using the mentioned graphs the parameters of ARIMA models that include Autoregressive (AR) (p) and Moving Average (MA) (q) were determined.to determine the best model of prediction the different

parameters of P and q were tested and the model with minimum Akaike Information Criterion (AIC) statistic was selected to the prediction of the future trend.

Assessing the fitness of the selected models

To assess the fitness of selected model the tests of randomness on residuals that include Ljung - Box statistic, McLeod - Li statistic, Turning points, Diff sign points, Rank test statistic, Jarque-Bera test statistic (for normality) also the schematic checking of the residual graph were used.

Prediction

To prediction of future trends, the ARIMA (p, d, q) model with the minimum amount of AIC was used. By considering monthly time intervals, 120 months from 21 March 2007 to 20 February 2017 were entered into the time series model and the prediction was made from March 20, 2017, to 20 August 2019. All analysis was performed using the ITSM (Interactive Time Series Modeling) software and Excel 2010 by considering the α: 0.05 as a significant level.

RESULTS

The total registered cases of Bladder cancer during the March 2007 to February 2017 were 1,640 cases. The mean age of registered cases was 70.31±11.63 years. 1,386(84.51%) of total cases were males and 254(15.49%) of total cases were females. Most of cases have had been registered in March and June respectively (Figure 1).

An increasing trend was predicted by a time series Analysis with autoregressive integrated moving average (ARIMA) model with AR = 2, MA= 1, and Akaike information criterion statistics (AIC) = 263 were used (ARIMA [2, 2, 1]) for the coming years (Figure 2).

In addition, an increasing trend was predicted among males (autoregressive model (AR) model with AR = 12, MA= 0, and Akaike information criterion statistics (AIC) = 271 were used (AR [12, 2, 0]). While a constant trend was predicted among females, for the coming years (Figure 4). For the prediction of the trend of this cancer among females the autoregressive model (AR) model with AR = 12, MA= 1, and Akaike information criterion statistics (AIC) = 281 were used (AR [12, 2, 1]) (Table 1). Regarding the prediction of Bladder cancer Mortality among Iranian Military community, the results of time series analysis showed a decreasing trend for the coming years (Figure 5). For the prediction of the Mortality trend the autoregressive model (AR) model with AR = 14, MA= 1, and Akaike information criterion statistics (AIC) = 449 were used (AR [14, 2, 1]) (Table 1).

Figure 1: The registered cases of bladder cancer among Iranian military community in different month.
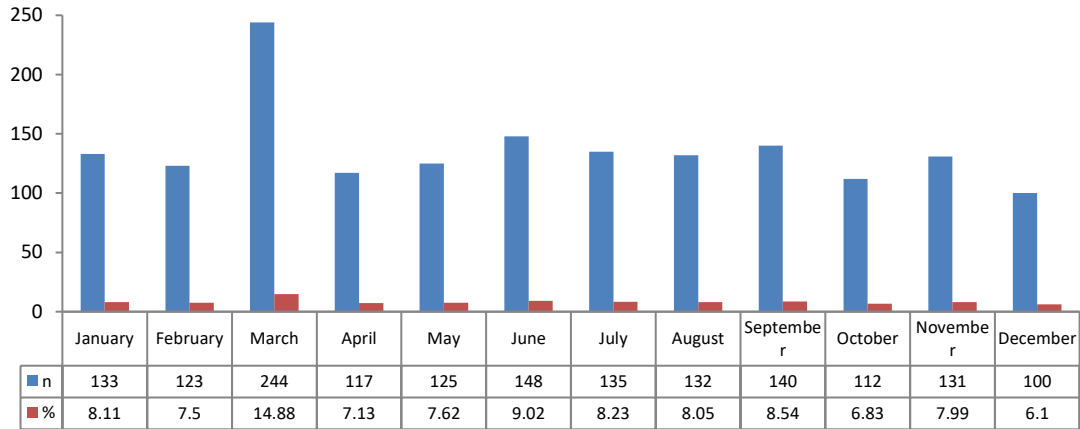
	January	February	March	April	May	June	July	August	September	October	November	December
n	133	123	244	117	125	148	135	132	140	112	131	100
%	8.11	7.5	14.88	7.13	7.62	9.02	8.23	8.05	8.54	6.83	7.99	6.1

Figure 2: The trend of bladder cancer and predicted value among Iranian military community during 2007-2019.
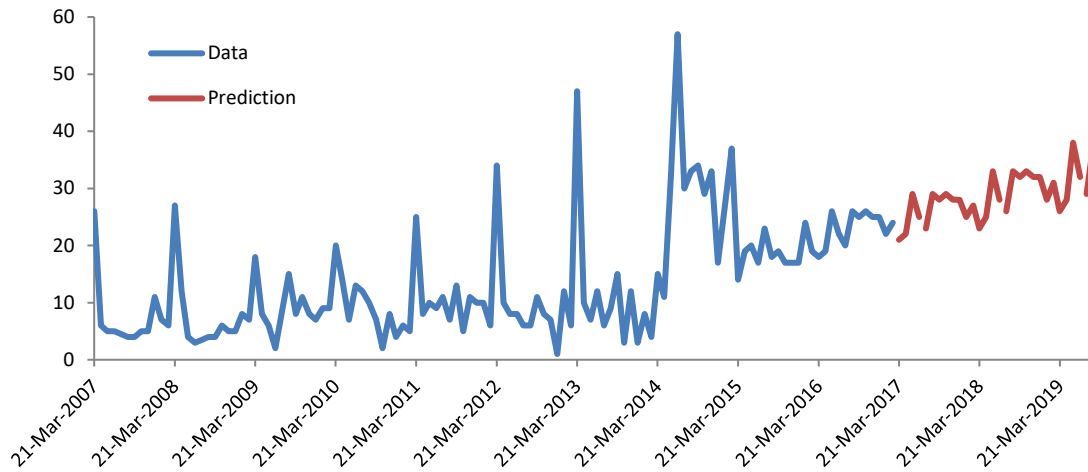
Figure 3: The trend of bladder cancer and predicted value among males of the Iranian military community during 2007-2019.
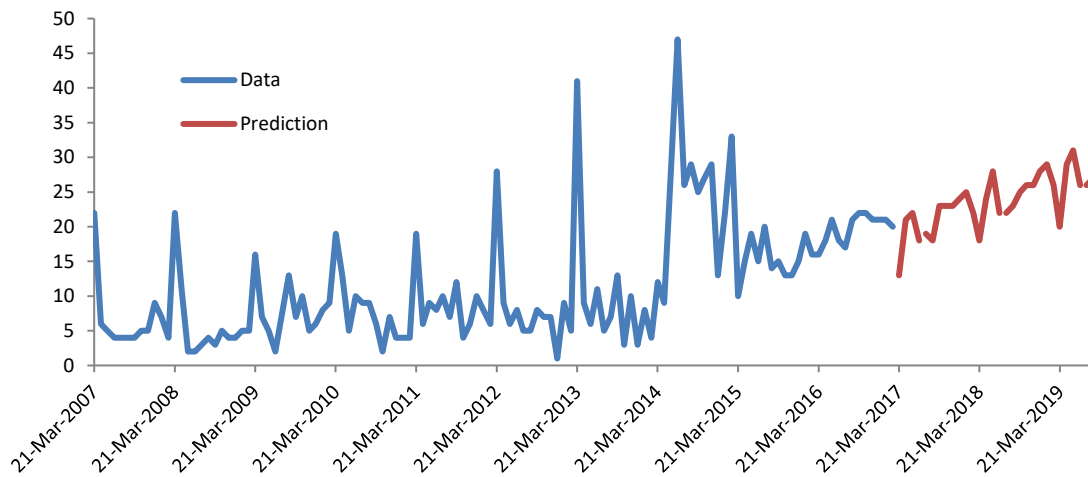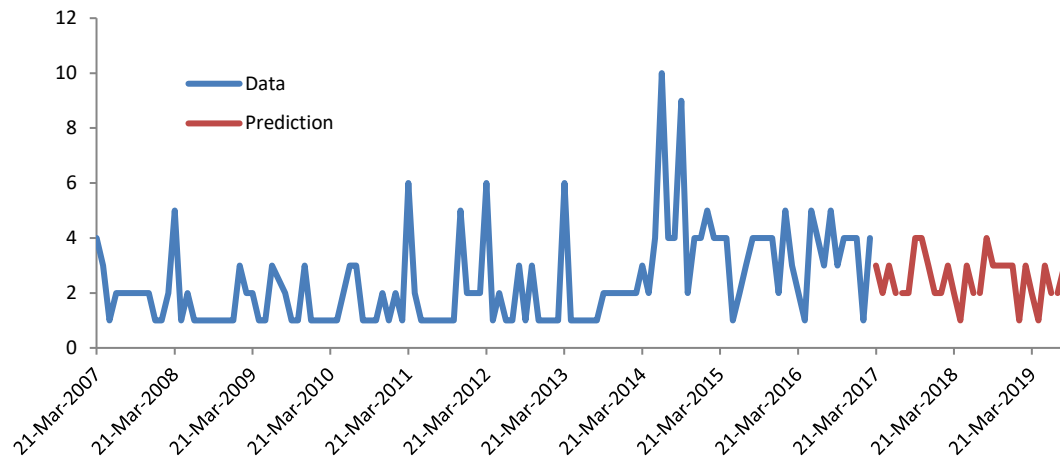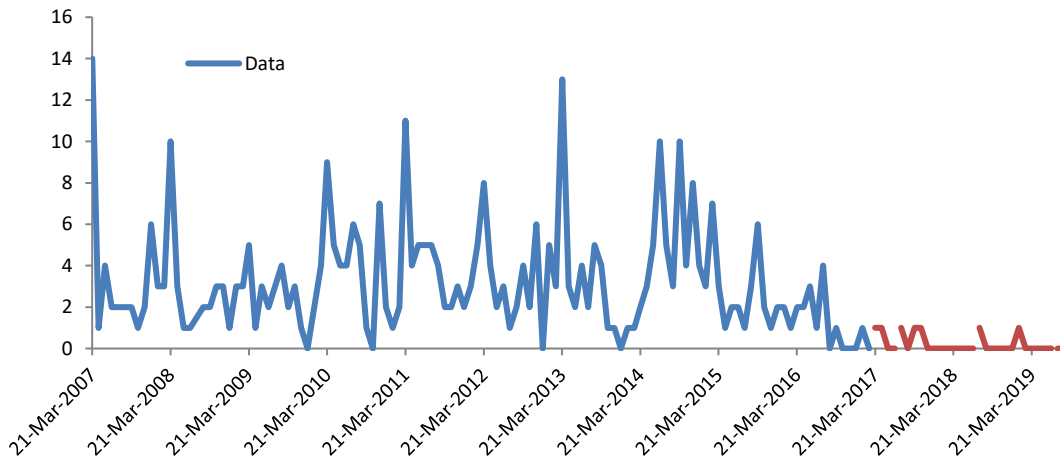
Figure 4: The trend of bladder cancer and predicted value among females of the Iranian military community during 2007-2019.

Figure 5: The trend of death due to bladder cancer and predicted value among females of the Iranian military community during 2007-2019.

DISCUSSIONS

Cancer is one of the main causes of mortality in human populations. The high incidence of malignancies may be a consequence of some factors such as aging of the population, sedentary life style, lack of a healthy diet, specific occupational exposures, stress etc [10-12]. Age and gender are related to bladder cancer morbidity [13, 14]. The epidemiological pattern of diseases incidence in developing societies is not similar to that of industrialized nations. Therefore, the investigation and monitoring of overall patterns of malignancies is valuable and it could help public health authorities to trace the etiology and evaluate the effects of diagnostic and screening interventions [15]. Accordingly, the purpose of current study was to assess the trend of bladder cancer incidence and it's mortality among Iranian MC. To the best of our knowledge, no study has assessed both the incidence and mortality rates for Bladder cancer in Iranian MC. According to results of the current study, mean age of registered cases was 70.31±11.63 years. A research in Pakistan reported a mean age of 55.5 years [16] and a study conducted in Iran reported it as to 65.1±12.7 years [5], so it seems the risk of bladder cancer increases with increase in age. The global sex (male/female) ratio for the incidence of bladder cancer is 3.3:1.0. However, it has been reported as 1.1:1.0 in Africa and 5.1:1.0 in Europe [17]. In our sample, this ratio (5.5:1) was comparable to the figures reported in previous research in other studies [5, 16, 18]. More exposure to tobacco, opium, and occupational carcinogens in men may account for the difference in the incidence of bladder cancer between men and women [19]. The time series analysis results showed that the incident cases of bladder cancer among Iranian MC have an increasing trend. Maybe it is due to improving cancer registration system. In addition, changing some lifestyle factors, such as obesity and lack of physical activity should be regarded. Other studies also showed an increasing trend

of bladder cancer in Iran [9, 20] and also in Egypt [21]. Several studies reported an increase in the overall incidence of bladder cancer [22, 23]. However, the trend of incidence may affect by some risk factors for bladder cancer, including tobacco, non-occupational and industrial carcinogens, and population aging [23]. In comparison future trend between males and females, the incidence of bladder cancer among males had increasing trend but the incidence of this cancer among females showed a constant trend. A study by Antoni et al. [24] has studied the global morbidity and mortality trends of bladder cancer. They reported that the incidence rates were diverging, with stabilizing or declining rates for men but increasing rates for females in many countries.

Table1: The related coefficients for prediction incidence of bladder cancer among Iranian military community

	Overall incidence	Incidence in males	Incidence in females	Total death
BOX COX	100	100	100	700
AR	2	12	12	14
MA	1	0	1	1
AIC	263643E+03	271944E+03	281468E+03	449345+03

Some studies showed that obesity and diabetes mellitus is associated with increased risk of bladder cancer [25-27]. However, the results of a recent systematic review and meta-analysis on Iranian military personnel indicate that the prevalence of overweight and obesity in Iranian military personnel is 41% (95% CI: 26.57%) and 13% (95% CI: 10.17%), respectively [28]. So probably, we will oppose to a higher incidence of bladder cancer in the future.

Our study has some limitations: Firstly, all analyses and predictions were performed based on registered data. Therefore, the quality of the registration system could affect the validity of the prediction. For example, to some extent, the increasing trend of incidence may be due to the improvement of the registration system and not related to the increase in the true incidence of cancer cases.

Second, as in most of epidemiological studies we were unable to distinguish between tumor stages because of the nature of the available data. This could reduce the amount of details that can be found from the analyses.

Third, sociodemographic and economic variances can affect the morbidity and mortality of bladder cancer [29]. So lack of investigation about these underlying factors, in the current study could be considered as a major limitation. For example, we don't have any information regarding the size of the covered population by insurance organization of the Iranian military community so the increase in the size of that population may leads to an increase in incidence cases.

Finally, known risk factors, such as smoking habits, obesity, and occupational exposure may affect the interpretation of our results.

In addition, the impact of screening programs on registered cases of cancers should be considered. The improving and developing of such programs may help the diagnosis of cancer cases. Further studies are recommended in the future taking into account the mentioned points, in this regard.

CONCLUSIONS

Our study is the first report on trends of incidence and mortality of bladder Cancer in Iranian MC. Based on the results of this study the need for promoting screening programs is emphasized.

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