Original Article

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Association of Number of Incident Cases and Deaths of Cancers with Health Indicators among Iranian Military Community: An Ecological Study

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Abstract

Aims: Cancers are the second leading cause of death in developing countries. Because of the impact of health indicators on incidence and mortality of many diseases such as cancers and the lack of similar studies in Iran especially among the military community (MC) the current study was aimed to assess the association between the incident cases and deaths of cancers with some health indicators among Iranian MC. **Materials and Methods:** In the current ecological study, the required data about the cancer patients were earned from the registered cases in the insurance organization of the Iranian MC. Other data were extracted from the statistical center of Iran. Pearson correlation coefficient was used to examine the correlation between the under studied variables**.** All analyses were done using Stata 14 software. The significance level was set at $\alpha = 0.05$. **Results:** The most incidence and deaths of cancer cases were reported from Tehran, Isfahan, and Khorasan Razavi provinces, respectively**.** There was a significant correlation between the number of health houses, active health houses, number of hospitals, number of clinics, number of hospital beds, number of literacy people with death, and incidence case of cancers among Iranian MC ($P < 0.05$). **Conclusions:** Health-care centers and the education status of individuals are associated with cancers incidence and mortality. These findings can be very helpful for health planners and policymakers to designing intervention programs to prevent incidence and decrease the burden of these diseases.

Keywords: Cancer, health indicators, Iran, military community

Introduction

Cancers are second leading cause of deaths in developing countries.[1-4] On average, about 25 million new cases, and 17 million deaths due to cancers occurs each year. Cancers are one of the main public health challenges and rapid growth in the incidence and change in lifestyle has led to an increase in cancers mortality in the world.[5]

In Iran, according to national reports in 2015, cancers were the third leading cause of mortality after cardiovascular disease and accidents.[6] The military population may differ from the general population in exposure to some risk factors such as physical inactivity, smoking, diet, alcohol consumption, sunlight exposure, or some special exposures such as military immunization and exposure to radioactive that can have an effective role on cancers risk in the military population.[7]

Remarkable progress has been made in the treatment of cancer patients in the past few decades.[8] These improvements had an important role on survival time of patients.[9] Optimal care of cancer patients requires multidisciplinary approaches,

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including chemotherapy, surgery, radiology, and pathology. Many factors affect cancer patients' survival, such as patient age, race, cancer stage, tumor size, and so on. In addition to these cases, the health indicators such as access to health facilities, providing appropriate treatments,[10-12] and quality of hospital cares are associated with survival in cancer patients.[13,14] Because of the impact of health indicators on incidence and mortality of many diseases such as cancers and the lack of similar studies in Iran especially among the military community (MC) the current study was aimed to assess the association between the number of incident cases and deaths of cancers with health indices among the Iranian MC in an ecological study.

Materials and Methods

The current study was an ecological study. The variables used in this study included number of health houses, number of health stations, number of active health houses, number of hospitals, number of clinics, number of hospital beds, number of literacy people, number of doctors, Per capita smoking, number of deaths due to cancers and finally the number of incident cancer cases among the Iranian MC. The required data about the cancer patients were extracted from the registered cases in the insurance organization of the Iranian MC. Other data were extracted from the statistical center of Iran.

Analysis methods

To describe the data, we used descriptive statistics such as mean and standard deviation. The Pearson correlation coefficient was used to examine the correlation between the understudied variables after checking the presence of normal distribution by the Kolmogorov–Smirnov test. Furthermore, scatter plots were used for the schematic representation of the data correlation. All analyses were done using StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.. To examine the correlation between the variables, the significance level was set at $\alpha = 0.05$.

Results

According to results, most of the incidence and deaths of cancer cases were reported from Tehran, Isfahan, and Khorasan Razavi provinces respectively [Figure 1]. The mean incidence of cancer and death cases among the Iranian MC was 1034.74 ± 2297.08 and 293.61 ± 609.85 cases during the understudied period. The mean of Human Development Index (HDI) in Iran was 0.71 ± 0.04. Other descriptive results about the other understudied variables are shown in Table 1.

In terms of the association between under-studied variables, there was a significant and direct correlation between the number of health houses and the number of deaths (r: 0.59, $P < 0.001$). It means that increases in the number of health houses are associated with an increase in the number of deaths due to cancer among the Iranian MC. The correlation between the number of active health houses and the number of cancer deaths was statistically significant (r: 0.56, $P < 0.001$). It means that increases in the number of active health houses are associated with an increase in the number of deaths due to cancer among the Iranian MC. The number of hospitals and the number of deaths was showed a significant and direct correlation (r: 0.56, $P < 0.001$). It means that increases in the number of hospitals are associated with an increase in the number of deaths due to cancer among the Iranian MC. There was a significant and direct correlation between the number of clinics, number of hospital beds, number of literacy people, and the number of deaths. It means that increase in the number of clinics; number of hospital beds, number of literate people are associated with an increase in the number of deaths due to cancer among the Iranian MC.

There was a significant and direct correlation between the number of health houses and the number of cancer cases (r: 0.56, $P < 0.001$). It means that increases in the number of health houses are associated with an increase in the trend of cancer cases among the Iranian MC.

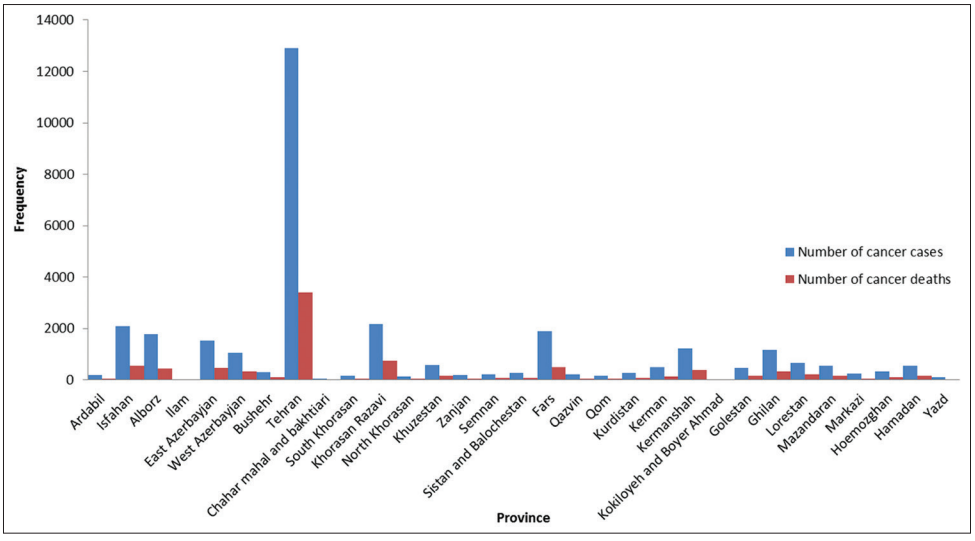

Figure 1: Distribution of cancer cases and deaths among Iranian military community in different provinces

The correlation between the number of active health houses and the number of cancer cases was statistically significant (r: 0.56, $P < 0.001$). It means that increases in the number of active health houses are associated with an increase in the number of cancer cases among the Iranian MC. The number of hospitals and the number of cancer cases was showed a significant and direct correlation (r: 0.84, $P < 0.001$). It means that increases in the number of hospitals are associated with an increase in the number of cancer cases among the Iranian MC. There was a significant and direct correlation between the number of clinics, number of hospital beds, number of literacy people, and the number of cancer cases. It means that increase in the number of clinics; number of hospital beds, number of literacy people is associated with an increase in the number of cancer cases among the Iranian MC [Table 2 and Figure 2].

Discussion

This ecological study examined the correlation between some health indicators with the incidence of and mortality for cancer among the Iranian MC. The findings of this study revealed a significant positive correlation between death cases and incidence of cancer with the number of health houses, active health houses, hospitals and clinics, number of hospital beds, and number of literate persons. In contrast, the incidence and mortality of cancer were negatively correlated with HDI and

Table 1: Descriptive characteristics of understudied variables

Variables	Mean	SD	Range
Number of cancer cases	1034.74	2297.08	12,892.00
Number of health houses	150.71	89.02	359.00
Number of health stations	94.03	91.48	380.00
Number of active health houses	575.87	360.74	1344.00
Number of hospitals	29.00	29.89	153.00
Number of clinics	134.45	138.38	674.00
Number of hospital beds	3758.42	4941.05	26887.00
HDI	0.71	0.04	0.23
Number of literate people	2,021,508.39	2,081,316.85	10,815,139.00
Number of doctors	61.73	15.09	61.50
Per capita smoking	38.23	23.60	108.00
Number of deaths	293.61	609.85	3408.00

HDI: Human development index, SD: Standard deviation

Table 2: The association between the number of cancer deaths and cancer cases with health indicators in Iranian military community

Variables	*r* (correlation coefficient)	*P*
Incidence		
Number of health houses-number of deaths	0.59	<0.001
Number of health stations-number of deaths	0.23	0.19
Number of active health houses -number of deaths	0.56	0.001
Number of hospitals-number of deaths	0.84	0.001
Number of clinics-number of deaths	0.77	<0.001
Number of hospital beds-number of deaths	0.71	<0.001
HDI-number of deaths	−0.23	0. 20
Number of literacy people-number of deaths	0.91	<0.001
Number of doctors-number of deaths	−0.21	0.24
Per capita smoking-number of deaths	0.11	0.54
Deaths		
Number of health houses -number of cancer cases	0.56	0.001
Number of health stations-number of cancer cases	0.26	0.15
Number of active health houses -number of cancer cases	0.56	0.001
Number of hospitals-number of cancer cases	0.84	<0.001
Number of clinics-number of cancer cases	0.76	<0.001
Number of hospital beds-number of cancer cases	0.71	<0.001
HDI-Number of cancer cases	−0.22	0.22
Number of literacy people-number of cancer cases	0.91	<0.001
Number of doctors-number of cancer cases	−0.22	0.22
Per capita smoking-number of cancer cases	0.14	0.44

HDI: Human development index

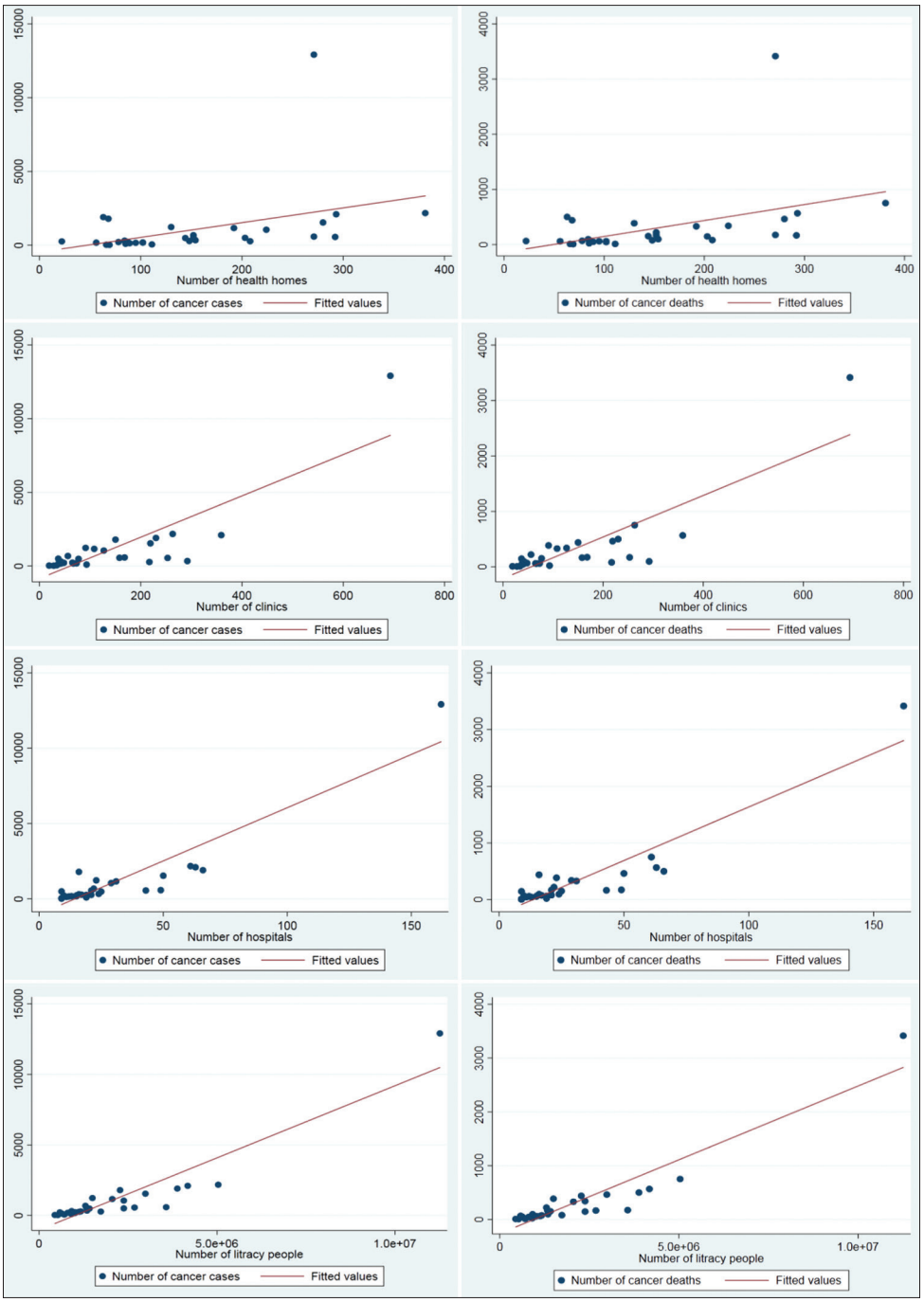

Figure 2: The scatter plots of the number of cancer deaths and cancer cases with some health indicators in Iranian military community

the number of physicians, but not statistically significant. Furthermore, there was no significant positive correlation between cigarette consumption per capita and the number of health centers with cancer incidence and mortality.

The results of our study suggest a positive correlation between the number of health houses and the number of active health houses with cancer incidence and mortality in the Iranian MC. In the United States, health centers provide primary health care (PHC) and prevention services, such as cancer screening, an increasing number of health centers, and improved access to these centers may play a magnificent role in the reduction of cancer mortality rates.[15] Social inequalities affect all aspects of cancer, ranging from cancer incidence variations to treatment outcomes and life after cancer, which is associated with an increased burden of cancer worldwide. Therefore, differences in cancer incidence and mortality may be explained by the variety in access to health care and screening programs.[16] A study conducted in Iran showed that health centers are equally distributed between Iran's provinces, thus health policymakers should focus on the distribution of resources and quality of services provided in these centers and their activism to improve

registration and reporting procedures and accessibility of services.[17] PHC can reduce the incidence and complications of disease through primary and secondary prevention. The PHC services in Iran's health houses are free to reduce geographical and economic barriers and facilitate healthcare and patient follow-up. Accordingly, implementing screening programs on people referring to health houses located in considerably far areas can effectively contribute to cancer detection, resulting in an increased number of reported cases, and elevated cancer mortality rates through recording cancer-related deaths.

Our findings indicate a positive significant relationship between the number of hospitals and clinics with cancer incidence and mortality. Kada *et al*. showed that a larger number of hospitals was associated with lower cardiovascular disease mortality in Japan.[18] In another study in West Virginia, the fewer number of hospitals caused patients to receive their treatments out of effective time, which can lead to increased risk of death among these individuals.[19] According to these findings, hospitals are one of the main social organizations in providing medical services to patients and improving their health status, and subsequently increase the number of these organizations can lead to increase patients' access to medical cares. Hospitals also have efficient information systems to report and document cases of different diseases and this information can led to decrease underestimation in morbidity and mortality of diseases.

The findings of the current study showed a significant positive correlation between the number of hospital beds and the incidence and mortality of cancers among the Iranian MC. A study in Brazil showed that an increased number of hospital beds can reduced the cancer mortality rate. In this country, cancer had an increasing trend in the north and northeast, while in other regions, it was showed stable or declining trend. These patterns indicate differences in the provision of health care services in various regions.[20] Dornquast *et al*. showed that the number of hospital beds was correlated with the prevalence of the cardiovascular disease, which may be related to a higher rate of disease diagnosis due to higher number of hospitals and other health facilities.[21] The number of hospital beds can be considered as an indicator of the capacity of the health-care system, which can affect the quality of provided care and health status of the patients, as well as indicate further detection of new cases and improvement of reported death cases.

The results of our study reveal that HDI was negatively correlated with cancer incidence and mortality, but the relation was not statistically significant. The effect of HDI on various cancers is different so that in one study, increase in HDI was associated with reduction in the trend of breast cancer mortality, whereas, some studies revealed that increased HDI was shown to increase colorectal cancer mortality.[22] Cancer incidence is affected by diagnosis and access to health care services. In countries with low HDI, poor access to cancer control and prevention and late diagnosis is associated with lower incidence and higher mortality rate of cancer.[23] Since one of the most important components of HDI is economic and social conditions, better access to health facilities and advertisement on cancer risk factors will help people to use better screening and diagnostic programs and reduce cancer mortality. Furthermore, increasing knowledge of cancer and related risk factors can affect a person's behavior and health conditions (bad health habits), and the behavior change is expected to reduce the incidence of cancer.

We found that increase cigarette consumption per capita can lead to increase cancer incidence and mortality among MC. However, the relationship was not statistically significant. Epidemiological studies in the past half-century have shown a huge burden of cancers caused by smoking.[24,25] Bergman *et al*. showed that veterans born between 1950 and 1954 were more susceptible to smoking-related cancers than their civilian counterparts, which may be due to increased frequency of smoking during military service and smoking continuation in their civilian life.[26]

The results of the present study showed that the number of literate people was positively correlated with the incidence and mortality of cancer. Low education can directly affect a person's ability to receive effective care through low awareness of timely care and reduced access to health care, indicating that people may not be able to maintain their health and live in places with poor access to health centers, which reduce the odds of living longer.[27] On the other hand, an increased average number of educational years increases the level of health literacy in different countries, which can lead to increased awareness of cancer screening and diagnostic programs and the importance of participation in these programs.[28] In conclusion, people with more education are more likely to demand health and wellbeing, and that education can be an important factor for health improvement through increased health care, and can effectively improve reporting of cancer incidence and mortality.

Appropriate access to health care services can lead to early diagnosis and treatment of cancer patients. Frye *et al*. found that low number of urologist is associated with increase in death due to kidney cancer.[29] Another study conducted in the United States found that providing more physicians was associated with lower mortality rates.[30] Most physicians in clinics provide PHC, which may increase the quality of care as the number of physicians increases, so early detection of disease can help to reduce the complications and consequences of the disease and subsequently reduce mortality rates.[31] It seems that the appropriate distribution of physicians for cancer diagnosis and care demands is of great importance.

Limitations

The observed association between the understudied variables can be affected by many confounders. The results of this study should be interpreted at the community level, and interpretation of statistical data at the individual level will lead to ecological fallacy.

Conclusions

This ecological study assessed the correlation between incidence and mortality of cancers by health indicators in the Iranian MC. It can be concluded that an increase in access to health care and health-care centers and the level of the education level of individuals, can lead to a decrease in cancer incidence and mortality. Thus, health planners and policymakers can greatly reduce the burden of cancer by focusing on these cases and reducing related risk factors.

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Conflicts of interest

There are no conflicts of interest.

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