

# GEOGRAPHICAL DISTRIBUTION OF GASTRIC CANCER IN NORTH OF IRAN – A CROSS-SECTIONAL STUDY

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**Abstract – Objective:** We aimed at determining the geographical distribution of gastric cancer in north of Iran, as hot zone area regarding this disease.

**Patients and Methods:** In current cross-sectional design we collected 1232 participants via convenient sampling method from pathology centres all over Mazandaran province between 2008-2012. Accordingly, obtained data were checked by Health Center with respect to proper coding, missing demographic information and rulling out repeated cases.

**Results:** According to the results of current study, 1232 patients with gastric cancer were identified. With respect to year, in 2008 number of patients was 246 cases (20%), 293 (23.8%) in 2009, 247 (20%) in 2010, 240 (19.5%) in 2011 and 206 (16.7%) in 2012. There were 817 (66.3%) men and 415 (33.7%) women and a sex ratio of 1.96. The mean age of the patients was  $65.9 \pm 15.3$  years (CI 95%: 65.1-66.8). The mean age was statistically significant difference between men ( $66.8 \pm 15.2$ ) and women ( $64.2 \pm 15.5$ ) ( $p=0.006$ ). The highest frequency of cancer was found in Sari (584 patients), after Sari highest frequency was observed in Ghaemshahr (197), Tonekabon (118) and patients in Amol (91).

**Conclusions:** It is appears plausible that Mazandaran Province can be considered as hot zone area with respect to pathogenesis of gastric cancer and further study should be conducted in order to minimize the risk factors leading to this disease.

**KEYWORDS:** Epidemiology, Gastric, Cancer.

## INTRODUCTION

Cancer begins with minute alteration in single cell; this change may be triggered by external factor or genetic dispositions. Cancer is considered as leading cause of mortality worldwide and it is responsible for roughly 7.6 million deaths around 2008<sup>1</sup>. Lung, stomach, liver, colon and breast cancer cause the most cancer deaths annually.

Gastric cancer is the third most common cause of death worldwide, affecting both people with low socioeconomic status and people coming from developed countries<sup>2,3</sup>.

Several risk factors for gastric cancer have been identified, including *H. pylori* infection, salt-pre-

served foods, dietary nitrite, smoking, alcohol, obesity, radiation, and family history<sup>4</sup>. The incidence is particularly high in East Asia, Eastern Europe, and parts of Central and South America, and it is about twice as high among men than among women. Prognosis is generally rather poor, with 5-year relative survival below 30% in most countries<sup>5</sup>. Gastric cancer mortality still represents a significant proportion of all cancer deaths. The majority of patients with advanced cancer experience cancer anorexia-cachexia syndrome with weight loss, reduced appetite, fatigue, and weakness<sup>6</sup>. Tremendous variation in both incidence and mortality rates exists across geographic regions, with > 10-fold differences observed between low-risk and high-risk areas<sup>7</sup>.



Treatment choice differs from surgical resection with total or subtotal gastrectomy, depending to size and the location of primary tumor. Chemotherapy is considered as a prominent approach in dealing with this disease; however, according to SWOG (2008), postoperative chemotherapy is commonly not easily tolerated in this population<sup>8</sup>. Since gastric cancer is mostly accompanied with weak prognosis, the gold standard approach regarding boosting clinical outcomes is through initial prevention. Alleviating risk of gastric cancer morbidity is largely depending on unplanned prevention. The widespread introduction of refrigeration has led to a decrease in the intake of chemically preserved foods and increased consumption of fresh fruits and vegetables<sup>4,5</sup>. A decline in the prevalence of *H. pylori* infection may be due to amendments in sanitary and housing conditions, as well as the use of eradication therapy<sup>6</sup>. Furthermore, reduced tobacco smoking at least in males may have contributed to the decline in gastric cancer incidence<sup>7</sup>. Hence, it appears plausible that alleviating risk factors, such as high salt and nitrite consumption, low fruit and vegetable intake, cigarette smoking, and *H. pylori* infections, is vital regarding preventing of gastric cancer.

Researchers also found that the incidence rates of gastric cancer varied across different geographic regions and this variation may be associated with genetic, lifestyle or environmental factors, including diet<sup>8</sup>. Iran has high rates of gastric cancer<sup>9,10</sup>. There is evidence of sharp gradients in incidence rates over relatively short geographical distances in the Caspian region of Iran<sup>11</sup>. So, the aim of this study was to determine the geographical distribution of gastric cancer in north of Iran, as a high prevalence area.

## PATIENTS AND METHODS

A cross-sectional population-based study was conducted from 2008 to 2012. Registered data regarding gastric cancer cases in National Cancer Registry System were obtained from Health centers of Mazandaran University of Medical Sciences. The data were collected annually from pathology centers all over the province; after obtaining data, Health Center controlled the data in terms of proper coding, missing in demographic information, and omitting the repeated cases. Cancers were coded based on International Classification of Diseases ICD-10. In our work, code C16 was extracted for gastric cancer. After that, we divided the province into 15 cities: Amol, Babol, Babolsar, Behshahr, Chaloos, Feridoonkenar, Ghaemshahr, Joybar, Mahmoodabad, Neka, Noor, Ramsar, Sari,

Savadkooch and Tonkabon. Other variables such as age and sex were recorded. Data were analyzed with SPSS 15 (SPSS Inc., Chicago, IL, USA) and *t*-test;  $p < 0.005$  was considered statistically significant. Additionally, GIS map was plotted.

## RESULTS

From 2008 to 2012, a total of 1232 patients with gastric cancer were identified. Number of patients in each year was 246 cases (20%) in 2008, 293 (23.8%) in 2009, 247 (20%) in 2010, 240 (19.5%) in 2011 and 206 (16.7%) in 2012. There were 817 (66.3%) men and 415 (33.7%) women and a sex ratio of 1.96. The mean age of the patients was  $65.9 \pm 15.3$  years (CI 95%: 65.1-66.8). The mean age was statistically significant difference between men ( $66.8 \pm 15.2$ ) and women ( $64.2 \pm 15.5$ ) ( $p = 0.006$ ). The high frequency of cancer was found in Sari 584 patients, in follow, 197 patients in Ghaemshahr, 118 patients in Tonekabon, and 91 patients in Amol. Figure 1 shows geographic pattern of gastric cancer in Mazandaran Province.

## DISCUSSION

Gastric cancer is one of the most common malignancies in Iran and its incidence is particularly high in the northwest of the country<sup>12-14</sup>.

Current study highlighted the geographical pattern of gastric cancer prevalence in the southern region of the Caspian Sea and results are demonstrative of high prevalence of gastric cancer in this geographical area. In the north region of Iran, most people are occupied with agriculture industry; in this sense, elevated risk of gastric cancer may be linked to high exposure to pesticides, organic and inorganic dusts, fertilizers, and nitrates, which can be considered as major contributing risk factors<sup>15,16</sup>. There is no Pesticide Register in Iran to compile information on the use of these products. As a result, specific ecological indicators cannot be used to measure the populations' exposure to pesticides. It seems that an improvement in cancer diagnosis techniques, increase in public knowledge and doctor's sensitivity in the early diagnosis of cancer, and most importantly, improvement in the quality of cancer registry system and teaching hospital in this area may be other explanations for such increase.

We showed that the sex ratio of gastric cancer was 1.96 and that the number of men with gastric cancer was higher than women. This result is similar to other studies from different province of Iran<sup>17-22</sup>. In another work, gastric cancer has a

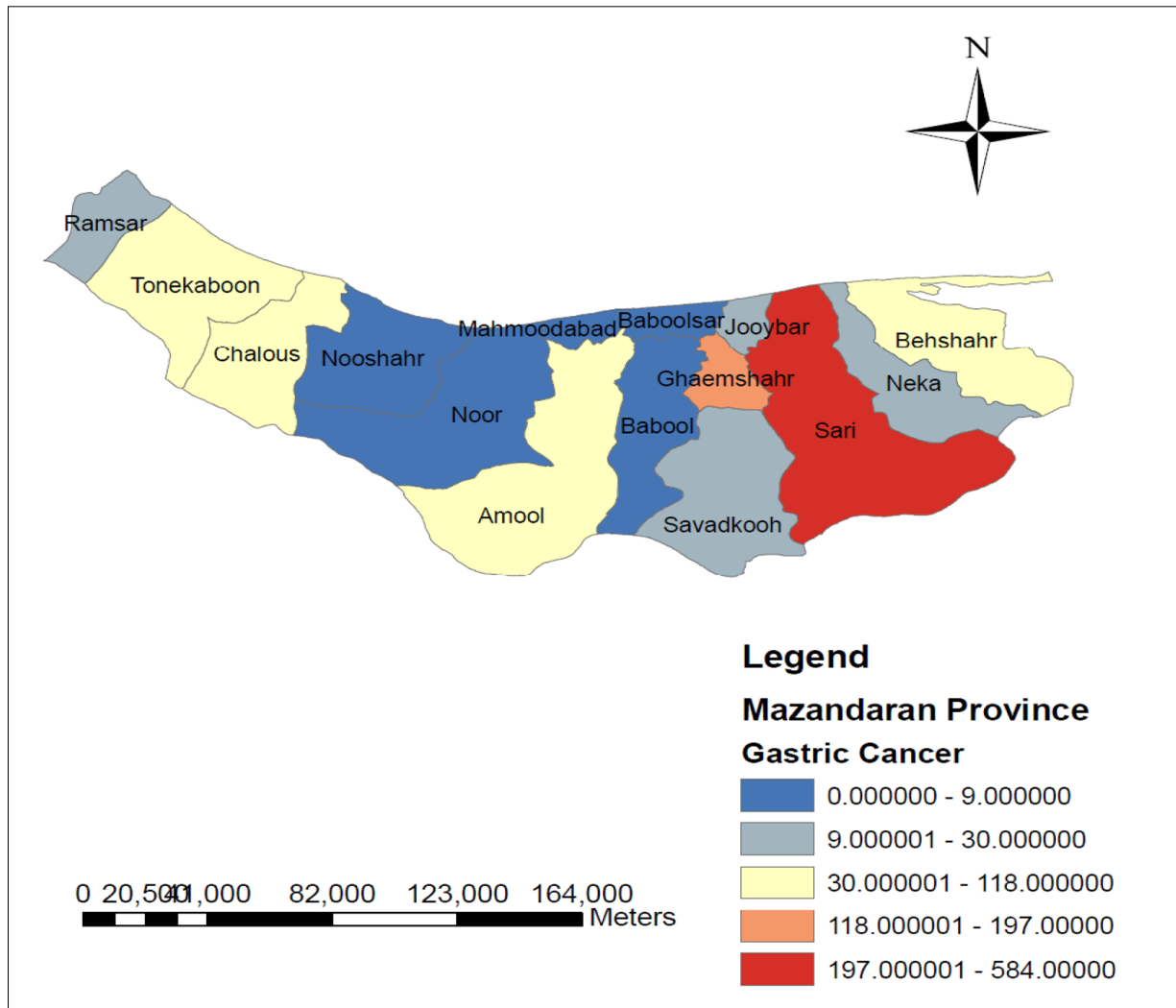


Fig. 1. Geographical Distribution of Gastric Cancer.

higher male-to-female ratio, reaching nearly 3:1 in the South America<sup>23</sup>. The high ratio also existed in the Hehuang valley: the 10 years' observation of gastric cancer<sup>24</sup> showed that the male-to-female ratio was 3.6:1. In consistent to the results of current study, Malekzadeh et al<sup>25</sup> studied epidemiology and risk factors of gastric cancer; they concluded that there are three main risk factors regarding gastric cancer in Iran: high prevalence of *H. pylori* infection, high dietary intake of salt and smoking. They postulated that, while interventions on modifiable environmental risk factors should be considered as the main modality to reduce gastric cancer development, surveillance programs for early detection of cancer in highly selected groups may increase overall survival rates in potential patients in this country<sup>25</sup>. In a different work, Movahedi et al<sup>26</sup> examined survival rate of gastric cancer in Iran and they concluded that gastric cancer, including relative low survival rate in Iran, indicates extremely urgent needs for health authorities to

adopt measures of cancer prevention that proved effective in other countries. The limitation of this study is the pathology-based cancer registry and not a population-based cancer registry.

## CONCLUSIONS

It is appears plausible that Mazandaran Province can be considered a hot zone area with respect to pathogenesis of gastric cancer. Further study should be conducted in order to minimize the risk factors leading to this disease.

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## ETHICAL COMMITTEE:

The study was conducted according to the Institutional requirements and Helsinki Declaration.

## CONFLICT OF INTERESTS:

The Authors declare that have no conflicts of interest to disclose.

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