

Possible associations between anemia and gastric cancer

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1016



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Abstract

Gastric cancer has been affecting the Brazilian population, especially men and the population aged over 50 years old, and is therefore a relevant topic for promoting quality of life. This neoplasm may present comorbidities, creating obstacles in the patient's prognosis, such as anemia. Thus, herein, the analysis of the possible associations between anemia and gastric cancer, and the categorization tumor staging, histological type, location, gender, age, leukogram and cause of death of patients with gastric cancer treated at the Regional Cancer Hospital (HRC) of Passos- MG, from January 2012 to December 2014, was proposed. This was a cross-sectional observational study with data obtained from documentary sources. The results from the analysis of 78 medical records showed that 69.23% of the patients are men and the predominant age range was between 70 and 80 years (32.04%). The gastric antrum was the most recurrent location of primary tumors (26.92%) and the prevalent histological type was adenocarcinoma (66.67%). Regarding tumor staging, T3, N0, M0 was observed in 23.07% of the cases. Regarding the mortality rate, it was observed that 64.1% of the deaths resulted from cancer. Meanwhile, for the hemogram, 61% anemia was observed, and all presented normal values when the leukogram was analyzed. It is concluded that the majority of gastric cancer patients had anemia, were male, predominantly aged between 70 and 80 years, with adenocarcinoma being the most prevalent type of tumor and gastric antrum being the most affected anatomical region.

Keywords: Gastric cancer. Anemia. Prevalences. Erythrogram. Quality of life.

INTRODUCTION

The National Cancer Institute (INCA), estimated for 2018, 20,290 new cases of gastric cancer; more than 60% of these were represented by male patients and the highest incidence would be among those aged 50-70 years¹.

Gastric or stomach cancer is characterized

by abnormal growth of stomach cells, thus generating tumors. The most common histological type is adenocarcinoma, and there are GISTs (gastrointestinal stromal tumors), gastric lymphomas, sarcomas, neuroendocrine tumors, and other rarer tumors². These tumors may be located in various parts of the stomach

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and may be classified into stages; thus, just as there are different types of stomach cancer tumors. There are also several ways to treat them, such as surgery, chemotherapy, targeted therapy, and radiation therapy. However, the choice of therapeutic modality should not only be based on tumor characteristics, but also on the patient's general health⁴.

When addressing the patient's general health status, it involves not only problems that the patient had prior to diagnosis, but especially the comorbidities arising from it and its treatment⁵. For example, patients with neoplastic diseases have a high frequency of hematological alterations. The mechanisms are related to the elimination of pluripotent stem cells, damage to the bone marrow microenvironment, inhibition of production of hematopoietic growth factors and/or production of hematopoiesis inhibiting cytokines. Gastric tumor bleeding is a clinical manifestation that may occur in patients with intraluminal tumors, such as primary or metastatic tumors for the gastrointestinal and genitourinary tract. Moreover, such blood losses may be acute or chronic causing progressive decreases in iron stores⁶. Such adverse effects on hematopoiesis are often aggravated by treatment of the neoplasia (ionizing radiation, antineoplastic drugs)⁷. Thus, the patient may develop anemia, characterized by a reduction in hemoglobin levels, which may promote prognostic barriers such as excess fatigue, impacting the quality of life of the individual and the integral care of their health⁸.

The etiological diagnosis of anemia is made by performing a blood count, which is a laboratory examination that allows for the investigation of several parameters, such as hemoglobin, leukocytes, red blood cells and hematocrit values. The latter of which is responsible for assessing the degree of anemia by red cell count⁷. The change in the number of white blood cells may also be present when some types of chemotherapy are required⁹.

The focus attributed to the incidence of anemia in gastric cancer patients is justified by the literature^{5,6,10}, which show that patients with neoplastic diseases have a high frequency

of blood cell abnormalities and, among them, those affected by gastric cancer. Thus, herein, the analysis of the possible associations between anemia and gastric cancer, and the categorization tumor staging, histological type, location, gender, age, leukogram and cause of death of patients with gastric cancer treated at the Regional Cancer Hospital (HRC) of Passos-MG, from January 2012 to December 2014, was proposed.

MATERIALS AND METHODS

This was an observational cross-sectional study conducted from March 2018 to January 2019. Data from all gastric cancer patients treated at the Passos-MG Regional Cancer Hospital (HRC) from January 2012 to December were analyzed. The choice of the period was based on a pilot study, which addressed the number of cases of gastric cancer of Passos-MG HRC as well as the histological types from January 2012 to December 2014.¹¹ This study was submitted and approved by the Research Ethics Committee, under protocol number 2.836.012.

Information regarding hemogram variables, tumor staging, histological type, location, gender, age, and cause of death were obtained from the HRC's medical records and internal statistics system (SISRHC). This data was entered in an Excel spreadsheet.

For analysis of hemogram variables, the following reference values were considered:

Hematocrit (women: 36-48%; men: 40-54%);

Leukocytes (men and women: $4-11 \times 10^9$);

Hemoglobin (women: 11.5-15.5g/dL; men: 12.5-16.5g/dL);

Red blood cells (women: $4-5.4$; men: $4.5-6.1 \times 10^{12}/L$)¹²

Those with hemoglobin (Hb) <10g% and hematocrit (Ht) <30% were classified as anemic⁹.



Analysis of possible associations between categorical variables (occurrence of anemia and age of patients; occurrence of anemia and gender of patients; occurrence of anemia and characteristics of tumors) was verified by the hypothesis test, Chi Squared (χ^2)¹³.

Pearson's correlation coefficient (r) was also used to demonstrate the degree of correlation through values placed between -1 (negative correlation) and 1 (positive correlation)¹⁴.

For all analyses, p-values <0.05 were considered significant.

RESULTS

1. Gender and age

Data from 78 patients with gastric cancer were analyzed. Of these patients 69.23% were male and 30.77% female. The average age was 65 years, where the minimum found was 31 and the maximum 86.

According to age group, 2 (2.56%) patients were aged between 34 and 39 years, 8 (10.25%) between 40 and 49 years, 15 (19.23%) between 50 and 59 years, 21 (26.92%) between 60 and 69 years old and 32 (41.02%) were aged 70 and above (Table 1). Thus, there was a growing prevalence beginning from the age of 30, especially between 70 and 80 years (32.04%) (Graph 1).

2. Location, histological type and tumor staging

Regarding the location of the tumor, the analyzed data showed that the gastric antrum was the site of compromised by primary tumors (26.92%) and the most prevalent histological type was adenocarcinoma (66.67%). T3 (46.15%), N0 (57.69%), M0 (67.23) staging corresponded to 23.07% of the tumors.

3. Cause of death

The mortality rate observed in the patients showed that cancer was its main cause of death (64.1%).

4. Anemia and gastric cancer

Regarding the blood count, it was noted that most patients had hemoglobin (72%), red blood cells (49%) and hematocrit (63%) levels below the recommended reference values (Graph 2). 61% of patients had anemia. Finally, the linear correlation coefficient between the hematocrit and hemoglobin variables was determined, and the result showed a correlation between the two variables ($R^2 = 0.9679$) (Graph 3).

5. Leukogram

Analyses of the leukogram demonstrate that 100% (n=78) of the patients had normal leukocyte levels.

6. Categorical Variables

Regarding the categorical variables (occurrence of anemia and age of patients; occurrence of anemia and gender of patients; occurrence of anemia and tumor characteristics), no significance was found in the results.

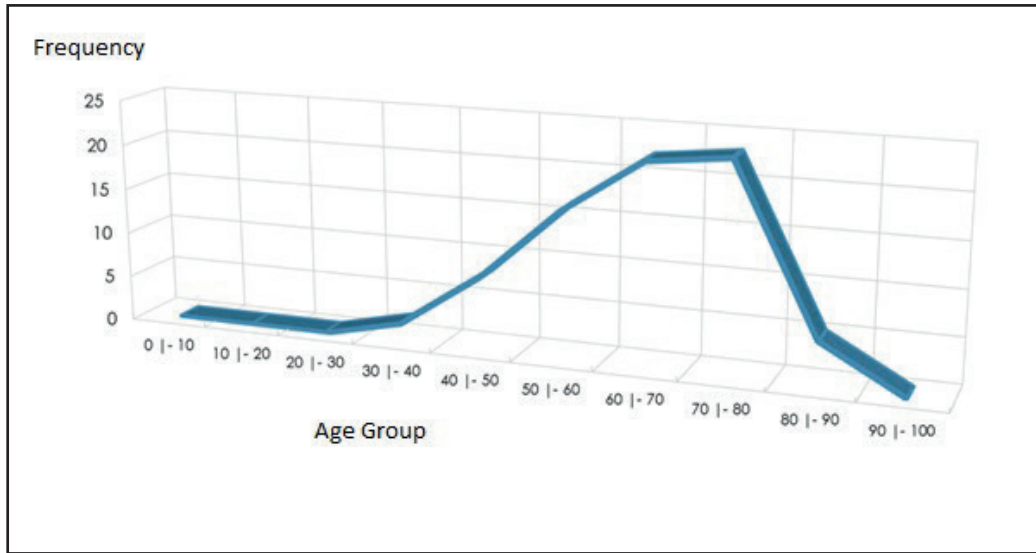
Table 1- Age frequency of gastric cancer patients treated at the Regional Cancer Hospital from January 2012 to December 2014.

Age Group	N	Frequency
34 - 39	2	2.56%
40 - 49	8	10.25%
50 - 59	15	19.23%
60 - 69	21	26.92%
70 - 86	32	41.02%

Source: Data obtained from the Regional Statistics and Registration System of the Regional Cancer Hospital (SISRHC), 2018.

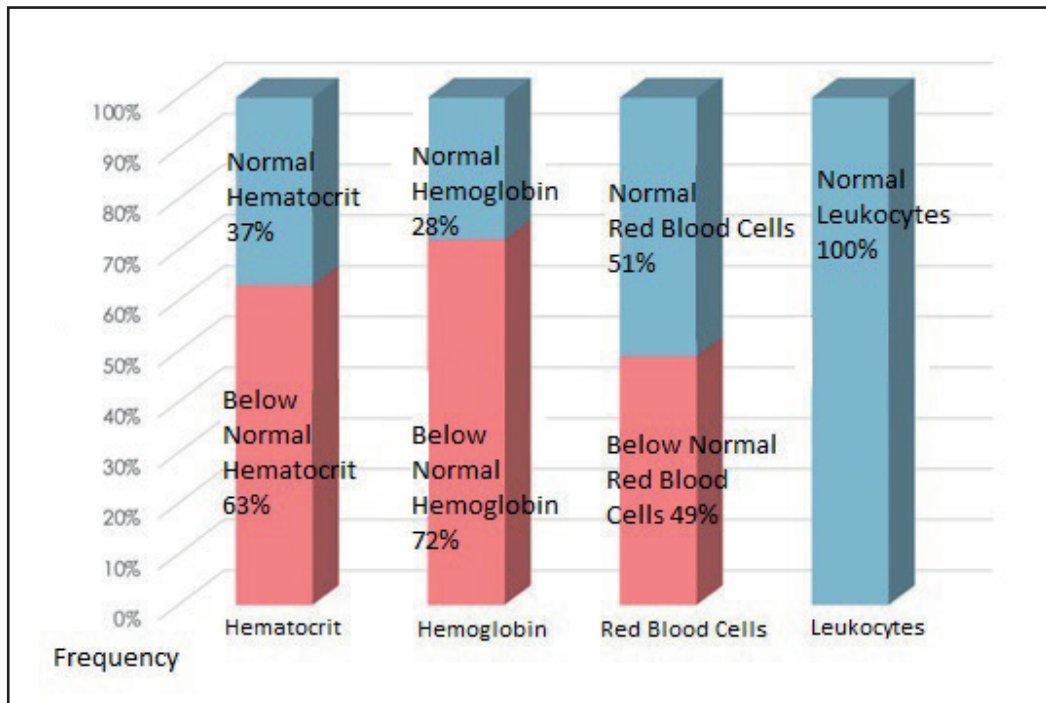


Figure 1 - Age range of gastric cancer patients treated at the Regional Cancer Hospital from January 2012 to December 2014.



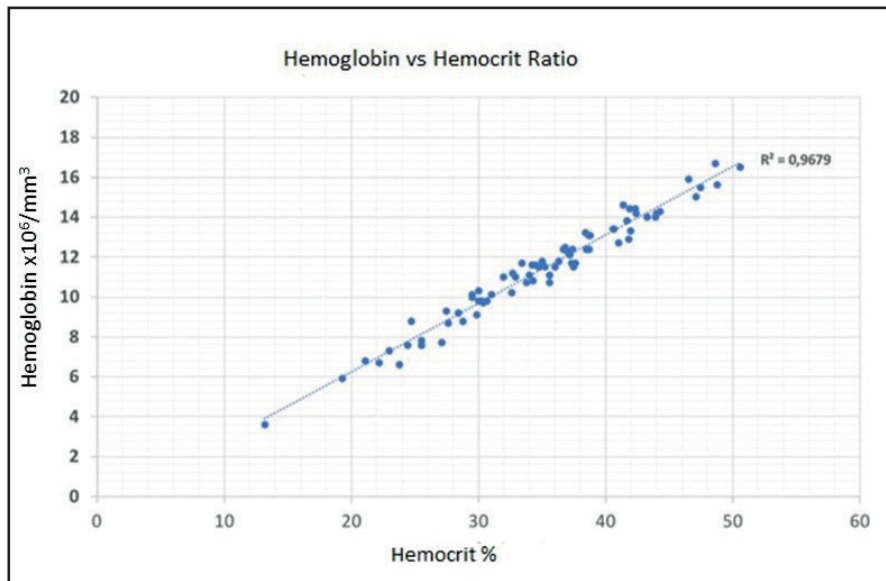
Extracted from: Internal Statistics and Registration System of the Regional Cancer Hospital (SISRHC), 2018.

Figure 2 - Number of gastric cancer patients treated at the Regional Cancer Hospital from January 2012 to December 2014 with normal and below normal erythrocyte levels.



Extracted from: Records of 78 gastric cancer patients treated at the Regional Cancer Hospital from January 2012 to December 2014.

Figure 3 - Linear correlation between hemoglobin and hematocrit levels of gastric cancer patients treated at the Regional Cancer Hospital from January 2012 to December 2014.



Extracted from: Analysis of data obtained from medical records of 78 gastric cancer patients treated at the Regional Cancer Hospital from January 2012 to December 2014.

DISCUSSION

Gastric cancer and anemia may be significantly related, as blood cells may be damaged due to treatment, or the tumor itself which may alter the organism's homeostasis⁵. It was found that 61% of cancer patients analyzed had anemia, corroborating the findings of Rocha *et al.* (2016)⁵; who demonstrated that anemia is a frequent finding in cancer patients, occurring in more than 40% of the cases studied, and patients with stomach cancer were the most affected. Similar data was observed by Lima *et al.*¹⁵ in a study on nutritional management in cancer patients, which showed that hemoglobin and hematocrit levels were below normal. Therefore, this demonstrates that such parameters are altered in these individuals.

Anemia is a frequent complication in cancer patients, as up to 70% of these patients develop it at some point in their disease or treatment⁶. This pathology may be one of the early signs of a neoplastic disease, but it is more

often related to antineoplastic treatment or disease progression. In addition, its incidence and severity may be derived from tumor type, patient age, disease stage, intensity and type of treatment¹⁵.

Therefore, maintaining adequate hemoglobin levels is important, as symptoms related to anemia such as fatigue, lethargy, dyspnea, loss of appetite and difficulty concentrating, added to other emotional and physical problems contribute negatively to the quality of life of these patients¹⁶. It is noteworthy that many patients do not have changes such as blood loss, kidney or hepatic dysfunction, spinal cord infiltration, hemolysis or nutritional deficiencies that could explain the anemia and iron deficiency diagnosed as chronic anemia¹³.

Leukocyte analysis is recurrent in the literature when treating cancer. Lundgren *et al.*¹⁷, realized that the sequence of changes in the hematopoietic system that occurs during



and after conventional external irradiation leads to a statistically significant decrease in total leukocyte counts in cancer patients, making them more debilitated. The studies by Feng *et al.*¹⁸ observed that the increase in leukocyte numbers is also associated with poor prognosis of gastric cancer. Thus, both increasing and decreasing leukocyte levels interfere with the health status of cancer patients¹⁷. In this study, there was no change in leukocyte levels of the patients studied, which characterizes a positive aspect in their prognosis. A similar finding was observed by Lima *et al.*¹⁵, who investigated patients with gastric metastasis, and adequate leukocyte levels were recorded.

Our findings also revealed that most patients were male, corroborating other findings that show that this neoplasm has an approximate 1:2 ratio in both developed and developing countries^{19,20}. In addition, it was demonstrated that the average age was 65 years. This brings a warning to oncology as an increase in this group of individuals is expected, and in the United States 1.2 million 100-year-olds are expected by 2050²¹. Similarly, this information impacts Brazil given that, currently, the number of people over 65 is approximately 1 out of 10 Brazilians and by 2060, 1 in 4 Brazilians will be in this age group²².

Among the areas affected by the primary

gastric tumor, it was shown that the gastric antrum was the most affected anatomical region (26.92%). This same data was found in the study by Carbonera²³, which documented this location in 41 (56.2%) cases. The gastric antrum is located on the inferior portion of the gastric body and superior to the pyloric canal²⁴.

Regarding the characteristics of the tumor, we observed the prevalence of adenocarcinomas, a malignant tumor of glandular origin (66.67%). According to INCA, the histological type, adenocarcinoma, is responsible for about 95% of cases of stomach tumors³. The staging of this neoplasm is based on the TNM classification, adopted worldwide and applicable only to carcinomas. T3, N0, M0 was shown to be the most prevalent; that is, most tumors penetrated the serosa, but did not reach the adjacent organs (T3), had no regional lymph node metastasis (N0), and no distant metastasis was found (M0)²⁵.

Therefore, a broader approach and monitoring of hematopoietic parameters is suggested for better management of cancer patients, as well as gaining more attention of professionals concerning the prevalence of gastric cancer in order to promote prevention and consequent assistance in the therapeutic response and promotion of quality of life in the cancer patient.

CONCLUSION

It was demonstrated in this study that the majority of gastric cancer patients had anemia, most of the cases are represented by male patients

around the age of 65 years, adenocarcinomas were the most prevalent type of tumor and the gastric antrum was the most affected anatomical region.

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