Nutrición Hospitalaria

Original/*Cáncer*
Gastric cancer and associated factors in hospitalized patients

Ioná Galvão de Azevêdo[1], Izabel Cristina Leal Muniz Carneiro[2], Marília Tokiko Oliveira Tomiya[3] and Maria Goretti Pessoa de Araújo Burgos[3]

[1]Hospital of Clínics of University Federal of Pernambuco. [2]Câncer Hospital of Pernambuco. [3]Departament of Nutrition of Center for Health Sciences of University Federal of Pernambuco (UFPE), Brazil.

Abstract

Background: despite the decline in its incidence and mortality rate, gastric cancer continues to be the 4th most common tumor and the 2nd cause of death in the world.

Objective(s): to analyze the factors associated with gastric cancer in hospitalized patients.

Method: Transversal study of case series type made at Recife hospitals. The data were obtained from a questionnaire adapted from a previously validated model, which consists of socioeconomic factors, eating habits, lifestyle, family history of cancer, infection by *H. pylori* and anthropometric data.

Results: among 33 patients, there was a slight prevalence of women aged ≥ 60, from rural areas, with low education and income levels. According to IMC, 57.6% were eutrophics and 69.7% at nutritional risk when used % PP. It was found that 42.4% did not undergo any examination for *H. pylori*, 48.5% had a genetic predisposition, 75.8% were sedentary, 60.6% smokers and former smokers, 51.5% addicted to alcohol and 36.4% were overweight patients. There was frequent consumption of salty foods, fried foods, and low intake of fruits, foods containing nitrates / nitrites and inadequate food storage.

Conclusion: low socioeconomic status, physical inactivity and inappropriate diet patterns were prevalent factors for gastric cancer in the treated group.

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Key words: *Gastric cancer. Risk factors. Diet. Lifestyle.*

EL CÁNCER GÁSTRICO Y FACTORES ASOCIADOS EN PACIENTES HOSPITALIZADOS

Resumen

Introducción: a pesar de la disminución de la incidencia y la mortalidad, el cáncer gástrico sigue siendo el cuarto tumor más frecuente y la segunda causa de muerte por cáncer en el mundo.

Objetivos: analizar los factores asociados con el cáncer gástrico en pacientes hospitalizados.

Método: estudio de corte serie de casos, realizado en hospitales de Recife. Los datos fueron obtenidos a partir de cuestionarios adaptados de un modelo previamente validado, que contenían los problemas socioeconómicos, los hábitos alimentarios, el estilo de vida, los antecedentes familiares de cáncer, la infección por *H. pylori* y los datos antropométricos.

Resultados: de los 33 pacientes, tuvieron un ligero predominio las mujeres con edades ≥ 60 años, de zonas rurales, con bajos niveles de educación e ingresos. De acuerdo con el IMC, el 57,6% fueron normales y el 69,7% en riesgo nutricional cuando se utiliza% PP. Se encontró que el 42,4% no se sometió a examen para *H. pylori*, el 48,5% tenían una predisposición genética, el 75,8% eran sedentarios, el 60,6% eran fumadores y ex fumadores, el 51,5% eran adictos al alcohol y el 36,4% tenían sobrepeso. Hubo consumo frecuente de alimentos salados, alimentos fritos, baja ingesta de frutas, alimentos que contienen nitratos/nitritos, así como una inadecuada conservación de los alimentos.

Conclusión: el bajo nivel socioeconómico, la inactividad física y los hábitos alimentarios inadecuados fueron factores predominantes para el cáncer gástrico en el grupo analizado.

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Palabras clave: *Cáncer gástrico. Factores de riesgo. Dieta. Estilo de vida.*

Introduction

The epidemiology of gastric cancer is remarkable although we have observed the decline in its incidence and mortality for several decades all over the world. This neoplasia continues to be a serious public health problem, being the fourth most common cancer and the second cause of cancer death in the world[1]. In 2000, stomach cancer showed an estimated number of 650 thousand dead and 880 thousand new cases every year and almost two thirds of these new cases occurred in developing countries[2]. In Brazil, gastric carcinoma still takes the fifth position as a cause of death and new cases of the disease in both sexes[3].

The neopalsia of stomach is a multifactorial disease; the main risk factors associated with gastric carcinogenesis are the inadequate diets, that is, the low consumption of fresh fruits and vegetables, the overconsumption of sodium chloride, nitrates and nitrites (in processed meat and smoked foods), and fried foods, as well as the inadequate food storage, alcohol intake, tobacco use, infection by *H. pylori* and genetic predisposition[4-6].

By facing the information data, the identification of these factors is important to plan preventive health measures to reduce the development of this pathology. Therefore, this study had as an objective to analyze the factors associated with gastric cancer in hospitalized patients.

Methods

Transversal study of case series type made with hospitalized patients at General Surgery Clinic at "*Hospital das Clínicas*" (HC/UFPE) and "Cancer Hospital of Pernambuco" (HCP) from March to September 2009. The criteria for inclusion were: patients oriented or patients accompanied by people oriented, with a diagnosis of gastric cancer confirmed by biopsy, both sexes at the age of ≥ 20. The patients without a diagnosis defined by histopathology, aged below 20, pregnant women, nursing mothers, bedridden, edemaciated, disabled and terminally ill ones were excluded from the study.

The study was previously approved by the Ethics Committee on Research involving people of UFPE Health Science Center and the Ethics and Research Committee on Human Beings of "Sociedade *Pernambucana de Combate ao Cancer*" at HCP, according to the normative resolution number 196/96 of the National Health Council , registration 11/2009 and 45/2009 respectively. All the patients of the study signed the informed consent and the research in human beings.

To obtain data we used a structured questionnaire adapted to the one validated by Teixeira & Nogueira[6], which had socioeconomic factors, eating habits, lifestyle, family history, infection *by H. pylori*, level of education and anthropometric data. The presence of infection by *H. pylori* was confirmed by histopathology attached to prontuaries.

With regard to diet data, it was verified weekly frequency (never, rarely, <3times/week, $\geq$ 3times/week, daily) of food consumption potentially carcinogenic and protective of gastric mucosa. Those potentially carcinogenic ones were classified into 3 groups:

Group 1 - Foods containing nitrates / nitrites (processed meat / canned food, sausage/spicy sausage / salami/ham), Group 2 - Foods with high sodium quantity (jerked meat / dried and salt meat, codfish, readymade seasonings and food mixtures such as broths, soups and readymade sauces) and Group 3 – Foods with high fat quantity (fried foods, coconut milk / whipped cream, lard). The investigated foods considered protective were fruits (orange, lemon, cashew, guava, papaya, and mango) and vegetables (carrots, pumpkins, tomatoes, collard greens, cabbage. Regarding the food conservation, it was verified if patients always had a refrigerator and how long they had used it. It was also questioned the preference for salty foods and adding salt to readymade meals.

As to lifestyle, tabagism was categorized as non-smokers, former smokers and smokers. It was analyzed the intake of alcohol, the kind of beverage (distillates, beer and wine) and the daily amount (1 to 2 shots / day, <1 shot / day,> 2 shots / day). It was also observed the physical activity in accordance with the recommendation of the Word Cancer Research Fund (WCRF) and The American Institute for Cancer Research (AICR)[3].

The level of education was classified as illiterate, 1 elementary school not finished, 1 elementary school finished, 2 high school not finished, 2 high school finished, college and degree not finished, college and degree finished. The Income was divided into <3 minimum wages, 3 to 6 minimum wages, 6 to 10 minimum wages, >10 minimum wages and not mention. The place of residence was categorized into rural and urban ones.

In anthropometry, were measured height and weight, resulting in the Body Mass Index (BMI). To classify the nutritional status, it was used the WHO (World Health Organization) recommendation[7] for adults (<60 years) and Lipschitz[8] for the elderly. Besides, it was evaluated the weight loss percentage (% PP), which compares the involuntary weight loss in a certain period of time, using the formula: Weight Loss

(%) = (usual weight - current weight) x 100 ÷ usual weight, and adopted the classification of nutritional status proposed by Blackburn and Bristian[9]. Patients were weighed by using a *Filizola* scale ®, with the capacity of 150 kg and divisions of 0.1 kg and height was measured with an anthropometer made of aluminum attached to the scale. All data described were collected by the researcher, until 48 hours after the hospital admission, in order to standardize the data collection.

Descriptive and inferential statistics techniques were used in the data analysis. The descriptive statistics techniques consisted of the obtainment of the statistics average and standard deviation and absolute and percentage distributions. As a technique of inferential statistics, it was used the Chi-square test for homogeneity (equality) of proportions.

The database was developed in EXCEL and the statistics calculations were performed with SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) version 15. The level of significance was set by $p < 0.05$.

Results

The sample was made up of 33 patients, with an average age of 59.5 ± 14.8 years, varying from 35 to 89, but 54.5% were 60 years or over. Regarding gender, 54.5% were female. As to origin, 63.6% were from the rural zone, predominantly illiterate ones, with the elementary school not finished and income inferior to 3 minimum wages, working mostly in agriculture (Table I).

The anthropometric evaluation found that more than half of patients were well nourished at admission, although the nutritional risk is high when using the% PP (Table II).

It was found that, in 33 patients with gastric cancer, 11 (33%) were infected by the *H. pylori* bacterium, 8 (24.2%) had a negative test result and 14 (42.4%) were not submitted to the search for the *H. pylori* bacterium, with no significant difference ($p = 0.441$).

As to the family history, 16 (48.5%) had history of cancer in the family, 8 (24.2%) denied and 9 (27.3%)

Variaties		n	%
Sex	Male	15	45,5
	Female	18	54,5
Age	≤ 45	8	24.2
	46 to 59	7	21.2
	≥ 60	18	54.5
Origin	Rural	21	63,6
	Urban	12	36,4
Income	< 3 minimal wages	28	84,8
	3 to 6 minimal wages	4	12,1
	> 6 minimal wages	1	3,0
Education	Illiterate to Primary School not finished	27	81,8
	Primary School and High School	5	15,2
	Higher Education (finished)	1	3,0
Occupation	Grower	19	57,6
	Housewife	4	12,1
	Driver	2	6,1
	Dress msker	2	6,1
	Marketer	1	3,0
	Carpinter	1	3,0
	Worker	1	3,0
	Coach fixer	1	3,0
	General Assistant	1	3,0
	Freelance	1	3,0

Table I
Patient Socioeconomic Features with Gastric Cancer

Table II
Nutritional State of patients with gastric cancer in accordance with Body Mass Index and %PP

Nutritional State		N	%	Valor de p
Body Mass Index Now	Underweight	9	27,3	
	Nourishment	19	57,6	p = 0,073
	Overweight	5	15,2	
% Weight loss	Without Weight loss	10	30,3	
	Significant weight loss	9	27,3	p = 0,529
	Serious weigh loss	14	42,4	

Chi-square test for homogeneity (equality) of proportions.

did not know how to refer to it, without any significant difference (p = 0.178).

In the lifestyle analysis (Table III), it was observed a predominance of a sedentary lifestyle. Tabagism was 60.6% (smokers and former smokers) and as to the alcohol intake, it was found that 51.5% were etilists. It was identified that 21.2% of the sample drank only distillates, 12.1% drank beer, 12.1% drank both distillates and beer, 6.1% drank distillates, beer and wine. The most drunk distillate one was the sugar cane brandy. Regarding the quantity, in 17 patients who had the habit of drinking, 11 drank 1 to 2 shots / day and 6, more than 2 shots / day. Overweight patient was present in 36.4% of the total sample, before the diagnosis, using the normal BMI.

Table IV shows the weekly frequency of food consumption considered of risk and those protective of the gastric mucosa. Among the potentially carcinogenic ones, we found higher consumption of jerked meat, dried and salt meat, readymade seasonings and fries when daily used. Regarding the protective foods, we found that vegetables were the most consumed ones. These ones showed the highest percentage when the use rare or <3 times / week are indicated.

We observed a preference for salty foods, but the habit of adding salt at meals was not a prevalent factor (Table V).

As to food storage, in 33 patients, only 5 (15.2%) always had access to frozen food, and 28 (84.8%) did not always have the refrigerator, with a significant difference (p <0.001). From these ones, 4 (12.2%) have got a refrigerator until the time of the study and 24 (72.7%) already had the appliance (p <0.001), with time of use from 5 to 49 years and an average of 22.4 ± 17.0 years.

Table III
Lifestyle Evaluation of Patients with gastric cancer

Llife style	Total		Value of p
	n	%	
Physical Activity			
Yes	8	24,2	p = 0,005
No	25	75,8	
Smoking			
Smokers	13	39,4	
Former Smokers	7	21,2	p = 0,336
Non-smokers	13	39,4	
Etilism			
Yes	17	51,5	p =0,862
No	16	48,5	
Obesity			
Yes	12	36,4	p = 0,117
No	21	63,6	

Chi-square test for homogeneity (equality) of proportions.

Discussion

Over the past 25 years, one has studied the relationship between stomach cancer and nutrition[10]. The determination of risk factors in the etiology of this disease in hospitals in the northeastern region of Brazil has got importance due to the deficiency of regional studies.

According to Kelley et al.[11], gastric cancer increases progressively with age. The majority of cases is presented between the ages of 50 and 70, and with people under 30 years is very rare. In a study by Strumylaité et al.[12], the prevalent age group was ≥ 65 years in 50.66%, similar to this study.

Regarding gender, the incidence of this neoplasia is about two times higher among men than women[1]. Studies confirm the predominance of man, although this issue shows a greater presence of women[13]. This probably might have occurred due to the greater demand of this northeastern region group for health services and also the number of the samples.

According to Roder[5], the rates of stomach cancer are generally higher in lower socioeconomic groups. By analyzing the different levels of education, place and income, it was observed that the majority of them were less-favored people, that is, with low level

Foods considered risky	Never		Rarely		< 3 time		≥ 3 times		Daily	
	n	%	n	%	n	%	n	%	n	%
Group 1 - Nitrates and nitrites										
Processed meats / Canned products	11	33.3	13	39.4	8	24.2	1	3.0	-	-
Hotdog / Sausage	9	27.3	9	27.3	10	30.3	4	12.1	1	3.0
Bologna / Ham	6	18.2	7	21.2	14	42.4	6	18.2	-	-
Group 2 - High Na content										
Heavily salted beef / Beef jerky	-	-	3	9.1	9	27.3	8	24.2	13	39.4
Cod	6	18.2	21	63.6	5	15.2	1	3.0	-	-
Processed spices (industrialized bouillon cubes, soups and sauces)	10	30.3	8	24.2	2	6.1	1	3.0	12	36.4
Group 3 – High fat content										
Fried foods	-	-	4	12.1	6	18.2	9	27.3	14	42.4
Coconut milk / Heavy cream	6	18.2	17	51.5	10	30.3	-	-	-	-
Lard	25	75.8	7	21.2	-	-	-	-	1	3.0
Foods considered protectors										
Fruits										
Orange	1	3.0	7	21.2	12	36.4	5	15.2	8	24.2
Lime	10	30.3	13	39.4	6	18.2	3	9.1	1	3.0
Cashew apple	5	15.2	16	48.5	7	21.2	3	9.1	2	6.1
Guava	1	3.0	17	51.5	6	18.2	5	15.2	4	12.1
Papaya	1	3.0	14	42.4	8	24.2	5	15.2	5	15.2
Mango	3	9.1	15	45.5	8	24.2	5	15.2	2	6.1
Vegetables										
Carrot	4	12.1	5	15.2	7	21.2	9	27.3	8	24.2
Pumpkin	1	3.0	4	12.1	7	21.2	9	27.3	12	36.4
Tomato	1	3.0	5	15.2	5	15.2	12	36.4	10	30.3
Kale	7	21.2	14	42.4	8	24.2	2	6.1	2	6.1
Cabbage	9	27.3	13	39.4	7	21.2	2	6.1	2	6.1

of education, rural residents and with incomes below three minimum wages, confirming the results found by Magalhães et al.[10] and Nishimoto et al.[14].

In terms of occupation, agriculture was the most commonly found activity in this study. A case-control study with farm workers in California showed an link of stomach cancer to the use of herbicides and insecticides[15]. It is assumed that these professionals are more exposed, since in agricultural operations, it may occur inhalation and ingestion of these substances during its handling and application, although in this study the use of these products has not been searched.

According to Magalhães et al.[10], people who have digestive system cancer often report loss of weight in a short period of time, feeding difficulties, local pain, nausea, vomiting, flatulence and a sensation of early

Table V
Salt intake of patients with stomach cancer

Variable	Total		p-value
	n	%	
Use of salty foods			
Yes	24	72.7	p = 0.009
No	9	27.3	
Addition of salt to prepared meals			
Yes	15	45.5	p = 0.003
No	16	48.5	
Sometimes	2	6.1	

Chi-square equality test

fullness that contribute to the worsening of the disease, make the proposed treatments difficulty and lead to the worst prognosis. When we analyze the nutrition current status of the patients, we found that more than half were eutrophic ones at the admission, although the nutritional risk is high when using the %WL, similar to López et al (2013)[16]. However, it is known that BMI reflects the total body mass and it is of limited value, for example, in people with edema. The patient with cancer may have increased inflammatory mediators such as cytokines. This situation can not only cause the decrease of the body cell mass, but also the expansion of another part, as the extracellular fluid[17]. Thus, the body weight and, therefore, the BMI may be normal, despite the decrease of the body cell mass due to hypermetabolism and the protein degradation increase[17]. This way, the patient may present the current BMI value, still in the mortality rate or even above the regular average, despite the significant weight loss in relation to his body weight before. This suggests that these patients are also malnourished. Due to the lack of data in the records on the nutritional status of patients with stomach cancer in the pre-operatory phase, there was no position to compare with other studies.

Another important factor in the gastric etiopathogenesis would be the infection *by H. pylori*. In 1994, the International Agency for Research on Cancer defines this bacterium as carcinogenic in humans[18]. This microorganism predisposes the mucosa of the stomach to gastritis, which may evolve through metaplastic and dysplastic to the cancer development[4]. In the people studied, it was found a high percentage of patients who underwent the study for the bacterium *H. pylori*, although no significant difference occurred. This may reflect some access difficulty to health and deficiencies in the public service. A prospective study in China showed that a group of patients with precancerous lesions after the treatment of Helicobacter pylori eradication, no patient developed gastric cancer during the follow-up of 7.5 years compared with those who received placebo (p = 0.02)[19].

The genetic susceptibility to cancer is very evidenciated, a fact that was seen in this study in almost half of the group, but there was no significant statistical difference. Data of Bakir et al.[20], found a risk of 3.35 times bigger for gastric cancer in patients with family history of the disease or other body organs with p <0.01. This fact is justified, probably by the size of the sample and the low socioeconomic status of patients.

In the majority of the samples, the sedentary life was present. A cohort study by Sjödahl et al.[21] showed that physical activity has a protective effect against stomach cancer. Almeida et al (2013)[22] also found that usual and current physical activity were very low (77 and 94%, respectively) in cancer patients. The practice of physical activity has shown to be protective in various neoplasias, but the small number of studies on the relationship between physical activity and risk of gastric cancer has blocked up any conclusion[23]. Therefore, it is important to encourage physical activity by health professionals as a way of preventing this and other diseases.

There are enough evidences that the smoking habit increases the risk of gastric cancer. It increases with the smoking hours and the number of cigarettes smoked, and it decreases with abstinence[24]. In this study it was verified that more than half of patients had smoked or were still smoking, but no statistical difference. These results were against several studies[10,14]. It was assumed that the number of the sample was not representative.

Etilism was another risk factor investigated where it was observed that just over half of the sample drank alcoholic beverages; however the results were not statistically significant, similar results to Nishimoto et al.[14]. On the other hand, other studies showed that alcohol increased the risk of gastric cancer[10,25]. Up to now, the causal role of alcohol in carcinogenesis has not been established, being necessary more research.

Considering that the prevalence of obesity in society has increased a lot, and that there is a link between overweight people, cancer incidence and general mortality[26], the epidemiological findings on the relationship between body mass index and risk of gastric cancer have been inconsistent[27]. Overweight patient was identified, part in the sample, before the disease. But this index was reduced after the diagnosis. A study by Magalhaes et al.[10] refers to the same finding. However, it does not measure the results.

As to dietetic factors, according to Martins et al.[28] a diet rich in nitrate can be associated with stomach cancer. Nitrate is reduced to nitrite, which produces nitrosant agents, which will react together with the secondary amines derived from the diet to form nitrosamines, which are powerful carcinogens. The nitrates and nitrites food group presented a less frequent consumption. In this study, most of them would fit the category never or rarely. Only the salami and ham were cited as consumed <3times/week. On the other hand, data of Hernandez-Ramirez et al.[29] showed that a high nitrate and nitrite intake from animal origin doubled the GC risk. The less usual consumption of these foods probably might have been attributed to the low purchasing power and the small number of sample.

The Intersalt study showed that the gastric cancer prevalence tends to be higher in populations where salt intake is high[30]. It was observed the preference for salty foods in more than half of the group analyzed and the practice of adding salt to readymade food was not prevalent, with significant difference in both. This can be justified because the majority likes salty food, so when preparing food they already use too much salt. It was also observed the consumption of jerked meat, dried and salt meat and readymade seasonings. In a case-control study conducted in Lithuania, it was discovered that people used salt in readymade meals and liked salty food had an increase of gastric cancer risk (p <0.001), and consumption of salty meat with frequency ≥ 1 in the 2 times a week increased the risk for this cancer (p <0.001)[12]. According to Wang et al.[31] salt can cause

stomach cancer, directly damaging the gastric mucosa, leading to epithelial proliferation and the incidence of endogenous mutations, induces hypergastrinaemia leading to eventual parietal cell loss and progression to gastric cancer. Besides, when salt intake is associated with the presence of *H. pylori*, the salt seems to increase the colonization of this bacterium.

Within the group of foods with high fat grade, fried foods had the highest percentage of consumption. In a cohort study with 13,250 people, where it was showed that the frequent use of cooking oil (RR = 4.0, 95% CI = 1.3-11.8) significantly increased the risk of stomach cancer[32]. According to the National Cancer (INCA) information, the kind of food preparation also influences the risk of cancer, when frying, grilling or preparing meat on hot ember (at very high temperatures), compounds can be created (heterocyclic aromatic amines) that increase the risk of stomach cancer, colon and rectum. Therefore, cooking methods that use low temperatures are more healthy choices and as an example we can mention the steam, ebullition, poached, stew, hash, boiled and baked[33].

A high intake of fruits and vegetables have a negative relationship with the risk of gastric cancer, this protective effect can be attributed to their content of antioxidant vitamins, flavonoids, phytoestrogens, isothiocyanates and fiber[5,34]. Vitamin C reduces the formation of N-methylurea compounds and modifies the growth and proliferation of *H. pylori* and carotenoids may suppress the progression of atrophic gastritis and neutralize the formation of free radicals[35]. In this study we estimate the frequency of intake of foods considered protectors of the mucosa, and found that fruits were not part of regular diet, although the greens had showed a more frequent consumption. However, we cannot say that this use is appropriate, because we use a qualitative questionnaire only, not a quantitative one, which is a limiting factor of this study. Probably the inadequate consumption of fruit might be due to the low purchasing power of the individuals evaluated. Silva et al (2014)[36], in your study analyzed the food intake and consumption of macro and micronutrients in an inpatient cancer group, comparing, found that 70% resulted in an insufficient intake of fruits (average intake: 345 ± 317 g).

To prevent stomach cancer it is crucial a balanced diet consisting of raw vegetables, citrus fruits and foods rich in fiber[33]. A World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) recommend the intake of 400 to 800g or 5 or more servings of fruits and vegetables per day[3].

The refrigeration increase and decrease use of the oldest methods of food preservation have been attributed to the decrease in deaths from stomach cancers, liver and rectum[37]. When asked if they always had a refrigerator, the majority denied and the time of use was also inadequate, with significant difference in the two variants. According to La Vecchia et al.[38], 5% of gastric cancer cases were assigned to use less than 30 years of this equipment. As to this respect, it appears that inade-

quate food storage by this group, constituted a significant risk factor.

Conclusions

The low socioeconomic status, physical inactivity, an inadequate diet standard characterized by consumption of foods high salt grade, fried foods and low intake of fruits, and the lack of access to frozen foods were prevalent factors for gastric cancer in this group of patients.

Further studies with larger number of patients in the northeastern region of the country are going to be necessary. The characterization performed has practical implications for the identification of risk groups and the development of gastric cancer and it can be used in the control and prevention of this neoplasia.

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