Republic of Yemen

Ministry of Higher Education and Scientific

21 September University for Medical and Applied Science

Prevalence and Risk Factors of Gastric cancer among Yemeni Patients Attending Oncology center in AL-Jomhori Hospitals - Sana'a city

A graduation research project submitted in partial fulfillment of requirements of for obtaining bachelor degree in medicine

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Contents

Abstract

Aim n of the study:

This study aimed to identify the prevalence of risk factors associated with gastric cancer among Yemeni patients who visit the oncology center at the Republican Hospital in Sanaa.

Methods:

Several methods were used in this study, including gathering patient responses on their practices and habits that may increase their risk of developing gastric cancer. Diagnostic data such as imaging and endoscopy were also used to evaluate the extent of cancer in the stomach and its spread in the patient's body. Various statistical techniques were employed, including frequencies, percentages, the Kai square correlation coefficient, and binary and multiple logistic regression analysis using a 95% confidence interval.

Results:

The majority of patients with gastric cancer were male, with a prevalence rate of 75.7%. The use of qat was a significant risk factor among men compared to women (OR=11.9; 95% CI: 1.9-74.4). Patients who did not receive any education were more likely to be diagnosed with gastric cancer, with a prevalence rate of 51.4%. The disease was also more prevalent in older age groups, with 30% and 35.7% of patients being between the ages of 61 and 46-60, respectively. The prevalence of gastric cancer was higher among older adults. Approximately 86% of patients had at least one habit (smoking, qat chewing, Shamah), and dietary factors were significant risk factors. The most prevalent dietary factors were consuming spicy foods and fruits and vegetables at rates of more than 62%, while the risk factor of eating salted, smoked foods, and low fruit and vegetable intake was 60%. Chronic gastritis was the most common comorbidity, affecting 70% of patients. The most common symptoms observed among patients with gastric cancer were indigestion and stomach discomfort (95.7%), unexplained weight loss (96%), stomach pain (90%), nausea (approximately 93%), loss of appetite (88.6%), bloated feeling after eating (87.1%), and heartburn (85.7%).

Conclusion:

The study findings suggest that a combination of risk factors contributes to the development of gastric cancer in Yemeni patients. Efforts should be made to raise awareness of these risk factors to promote early diagnosis and treatment.

CHAPTER 1

Introduction

Background of the study:

Gastric cancer (GC) is a significant source of global cancer death with a high mortality rate, because the majority of patients with GC are diagnosed at a late stage, with limited therapeutic choices and poor outcomes. Hiroyuki Yamamoto, etc

- Endoscopy has played an important role in gastrointestinal (GI) tract examination because it enables clinicians to directly observe the GI tract. Hong Jin Yoon1 and Jie-Hyun Kim, **etc**

Gastric cancer begins in the mucosa and spreads through the outer layers as it grows. **Stromal tumors** of the stomach begin in supporting connective tissue and are treated differently from gastric cancer.

The most popular classification of GC is the **Lauren classification**. According to this division, two subtypes of GC are displayed: **intestinal** and **diffuse**. ***Julita Machlowska, Jacek Baj, etc***

Risk Factors and Prevention

Environmental risk factors for gastric cancer include the following:

- Smoking
- Diets high in salt, smoked foods, salted fish and meat, and pickled vegetables
- **Qat chewing**
- **Helicobacter pylori** infection A study in Yemen carried out by Yahia et al showed that daily Qat chewing was found associated with high prevalence of H. pylori and duodenal ulcer. Yahia A., Tariq A., etc
- Previous gastric surgery

- Pernicious anemia
- Adenomatous polyps
- Chronic atrophic gastritis
- Intestinal metaplasia (a condition in which the normal stomach lining is replaced with the cells that line the intestines).
- Eating foods that have not been prepared or stored properly.
- Epstein-Barr virus infection.
- Being older or male.
- Familial syndromes (including familial adenomatous polyposis).
- Having a mother, father, sister, or brother who has had stomach cancer.
- Radiation exposure

Gastric cancers can be separated into two main topographical subsites; while most gastric cancers occur in distal regions of the stomach (non-cardia), globally about 18% of all gastric cancers arise in the cardia, the part of the stomach adjoining the oesophageal-gastric junction. Both anatomical subsites have overlapping risk factors; smoking, heavy alcohol consumption, foods preserved by salting but also distinct etiologies. (Morgan et al., 2022)

Symptoms of gastric cancer

It includes indigestion and stomach discomfort or pain. These and other signs and symptoms may be caused by gastric cancer or by other conditions.

In the early stages of gastric cancer, the following symptoms may occur:

- Indigestion and stomach discomfort.
- A bloated feeling after eating.
- Mild nausea.

- Loss of appetite.
- Heartburn.

In more advanced stages of gastric cancer, the following signs and symptoms may occur:

- Blood in the stool.
- Vomiting.
- Weight loss for no known reason.
- Stomach pain.
- Jaundice (yellowing of eyes and skin).
- Ascites (build-up of fluid in the abdomen).
- Trouble swallowing.

Diagnosis

Testing:

The goal of obtaining laboratory studies is to assist in determining optimal therapy. Potentially useful tests in patients with suspected gastric cancer include the following:

- **CBC**: May be helpful to identify anemia, which may be caused by bleeding, liver dysfunction, or poor nutrition; approximately 30% of patients have anemia
- **Electrolyte panels**
- **Liver function tests**
- **Tumor markers** such as CEA and CA 19-9: Elevated CEA in 45-50% of cases; elevated CA 19-9 in about 20% of cases

Imaging studies

Imaging studies that aid in the diagnosis of gastric cancer in patients in whom the disease is suggested clinically include the following:

- **Esophagogastroduodenoscopy** (EGD): To evaluate gastric wall and lymph node
- **Chest radiography**: To evaluate for metastatic lesions

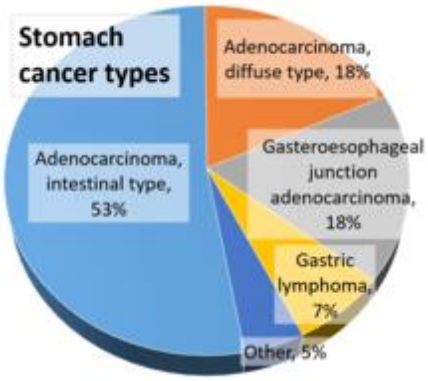
- **CT scanning or MRI of the chest, abdomen, and pelvis**: To assess the local disease process and evaluate potential areas of spread
- **Endoscopic ultrasonography** (EUS): Staging tool for more precise preoperative assessment of the tumor stage

Biopsy

Biopsy of any ulcerated lesion should include at least **six specimens** taken from around the lesion because of variable malignant transformation. In selected cases, endoscopic ultrasonography may be helpful in assessing depth of penetration of the tumor or involvement of adjacent structures.

Histologically, the frequency of different gastric malignancies is as follows

- Adenocarcinoma - 90-95%
- Lymphomas - 1-5%
- Gastrointestinal stromal tumors (formerly classified as either leiomyomas or leiomyosarcomas) - 2%
- Carcinoids - 1%
- Adenoacanthomas - 1%
- Squamous cell carcinomas - 1%



Histologically more than **95%** are **adenocarcinomas** which are divided into intestinal and diffuse types, the majority being the intestinal type which accounts for 50% - 70 % of the cases. (Kassim et al., 2018)

Management

Staging

Diagnosis and Staging

NCCN recommendations for diagnosis of gastric cancer are as follows [Medscape]:

- Endoscopy is the primary procedure for diagnosis, surveillance, and staging of gastric cancer

- Multiple biopsies should be performed, especially with ulcerated lesions
- Chest/abdomen/pelvic CT with oral and IV contrast
- Biopsy of metastatic disease as clinically indicated

Staging Systems

Two major staging systems are commonly used in gastric cancer, as follows:

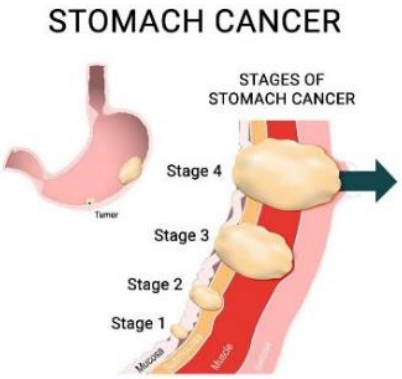
- The tumor-node-metastasis (TNM) system, developed by the International Union Against Cancer (UICC) and the American Joint Committee on Cancer (AJCC)
  The Japanese Research Society staging, based on where the lymph nodes with cancer are located in the stomach

The 2017 American Joint Committee on Cancer (AJCC) *Cancer Staging Manual* presents the following TNM classification system for staging gastric carcinoma [30] :

Primary tumor (T) See the list below:

- TX - Primary tumor cannot be assessed
- T0 - No evidence of primary tumor
- Tis - Carcinoma in situ, intraepithelial tumor without invasion of lamina propria
- T1 - Tumor invades lamina propria, muscularis mucosae, or submucosa
- T1a - Tumor invades lamina propria or muscularis mucosae
- T1b - Tumor invades submucosa
- T2 - Tumor invades muscularis propria
- T3 - Tumor penetrates subserosal connective tissue without invasion of visceral peritoneum or adjacent structures

- T4 - Tumor invades serosa (visceral peritoneum) or adjacent structures
- T4a - Tumor invades serosa (visceral peritoneum)
- T4b - Tumor invades adjacent structures/organs



Regional lymph nodes (N) See the list below:

- NX - Regional lymph node(s) cannot be assessed
- N0 - No regional lymph node metastases
- N1 - Metastases in 1-2 regional lymph nodes
- N2 - Metastases in 3-6 regional lymph nodes
- N3 - Metastases in 7 or more regional lymph nodes
- N3a - Metastases in 7-15 regional lymph nodes
- N3b - Metastases in 16 or more regional lymph nodes

Distant metastasis

See the list below:

- M0 - No distant metastasis
- M1 - Distant metastasis

Prognostic features

Clinical Staging See the list below:

- Stage 0 - Tis, N0, M0
- Stage I - T1-2, N0, M0
- Stage IIA - T1-2, N1-3, M0
- Stage IIB - T3, N0, M0 **or** T4a, N0, M0
- Stage III - T3, N0, M0 **or**; T4a, N1-3, M0
- Stage IVA - T4b, any N, M0
- Stage IVB - Any T, any N, M1

Spread patterns

Cancer of the stomach can spread directly, via lymphatics, or hematogenously.

Features of spread include the following:

- **Direct extension** into the omenta, pancreas, diaphragm, transverse colon or mesocolon, and duodenum is common
- If the lesion extends beyond the gastric wall to a **free peritoneal** (ie, serosal) surface, then peritoneal involvement is frequent
- The visible gross lesion frequently underestimates the true extent of the disease
- The abundant **lymphatic channels** within the submucosal and subserosal layers of the gastric wall allow for easy microscopic spread
- The **submucosal plexus** is prominent in the esophagus and the subserosal plexus is prominent in the duodenum, allowing proximal and distal spread
- **Lymphatic drainage** is through numerous pathways and can involve multiple nodal groups (e.g, gastric, gastroepiploic, celiac, porta hepatic, splenic, suprapancreatic, pancreaticoduodenal, paraesophageal, and paraaortic lymph nodes)
- **Hematogenous spread** commonly results in liver metastases.

CHAPTER 2

Literature Review

Gastric carcinoma as a malignancy of a high aggressiveness with its heterogenous na ture, and still constitutes a global health problem. **It** has the **fifth** highest incidence am ong cancers with 5.7% of all new cases attributable to the disease. That is why alternat ive prevention, considered as a proper diet, early diagnosis and follow-up proper treat ments, leads to the **reduction** of recorded incidents. Cancer of the stomach (also know n as gastric cancer) remains one of the most common and deadly neoplasms in the wo rld (Rawla & Barsouk, 2019).

Previously, Study at 2003 was reported that globally, gastric cancer is the **fourth** most common cancer in men, the **fifth** most common cancer in women, and the **second** leading cause of **death** due to cancer. About 10% of annual cancer deaths worldwide are attributed to gastric cancer, which means that gastric cancer has a high fatality to case ratio of about 70%. Kelley JR, Duggan JM.

While at 2012 and According to GLOBOCAN 2018 data, Gastric adenocarcinoma is the **fifth** most common cancer and **third** leading cause of cancer mortality in the world following only **lung** and **colorectal** cancer in overall mortality, with an estimated 723,000 deaths. Health Organization In the United States (US), gastric cancer is **one** of the deadliest cancers ranking only behind lung, pancreas, and esophageal cancer.2 Screening for gastric cancer has been shown to be effective and attribute a 30-60% de- crease in gastric cancer mortality in countries with national gastric cancer screening programs.3–5 Despite the success of gastric cancer screening programs in high-inci- dence countries, screening for gastric cancer is not performed in the US due to the low incidence rate of the disease (3.9 cases per 100,000 in the general population).1

Study at 2020, Gastric cancer (GC) ranks the **third** leading cause of cancer death in the world. Despite the improvement of screening techniques and early intervention,

the estimated mortality rate of GC is still high due to cancer metastasis and recurrence, particularly in advanced patients. Possible explanations for such phenomenon may include indistinct molecular mechanisms of GC and lack of tumor-specific molecular targets. Yongfu Shao1 & Xueping Tao & et al

Current statistics at 2021 display GC as the **fourth** leading cause of cancer deaths worldwide, where the rate of median survival is less than 12 months for the advanced stage. Once the second most common cancer worldwide, stomach cancer has dropped to **sixth** place, after cancers of the lung, breast, prostate, colon and rectum, and skin (non-melanoma). World Health Organization. Cancer. WHO February 22, 2021

Gastric cancer (GC) is a multifactorial disease, where many factors can influence its development, both environmental and genetic. Gastric cancer is becoming a global health challenge with substantial morbidity and mortality, in Asia, particularly China, accounting for a large proportion of the global burden of gastric cancer. Etemadi, A. et al. The highest incidence rates for gastric cancer occur in East Asia (China, Mongolia, Korea, and Japan). Mingjun Song, Tiing Leong Ang.

Statistical data show that the 5-year survival rate for patients treated with curative intent (gastric resection and lymphadenectomy) is 70% for stage-I resected gastric cancer and less than 30% for stage-IIB disease and beyond. Japanese Gastric Cancer Association.

The incidence and **death rates** increased with age in all five Asian countries. Globally, the incidence rate in 2019 increased with age, peaked at **85–89** years, and then dropped. The same trend was seen in the Republic of **Korea** and **China**. The incidence rate increased with age, peaked at **90–94** years, and then dropped in **Mongolia** and **Japan**. In the **DPRK**, the incidence rate increased with age and dropped after **75–79** years of age. **The death rate** worldwide increased progressively with age and

peaked at ≥ 95 years old. Similar trends were found in the Republic of Korea, Japan, and Mongolia. The death rate increased with age and dropped after 85–89 years of age in **China**, and increased with age, fell after 85–89 years, and peaked at ≥ 95 years in the **DPRK**. GC is rather rare and is not prevalent in the young population (under 45 years of age), where no more than 10% of patients are suffering from disease development.

Ten most common cancers in Oman **2017** in the figure, the already known and established risk factors for any cancer are diet, smoked and charcoal prepared food (Gastric Cancer and Colon Cancer). *Al-Lawati JA, et el*

It is most common in younger people, with 70% of cases occurring aged 45–55 years. This is in contrast to other cancers, such as lung disease, and the prevalence is three times as high in women than in men.

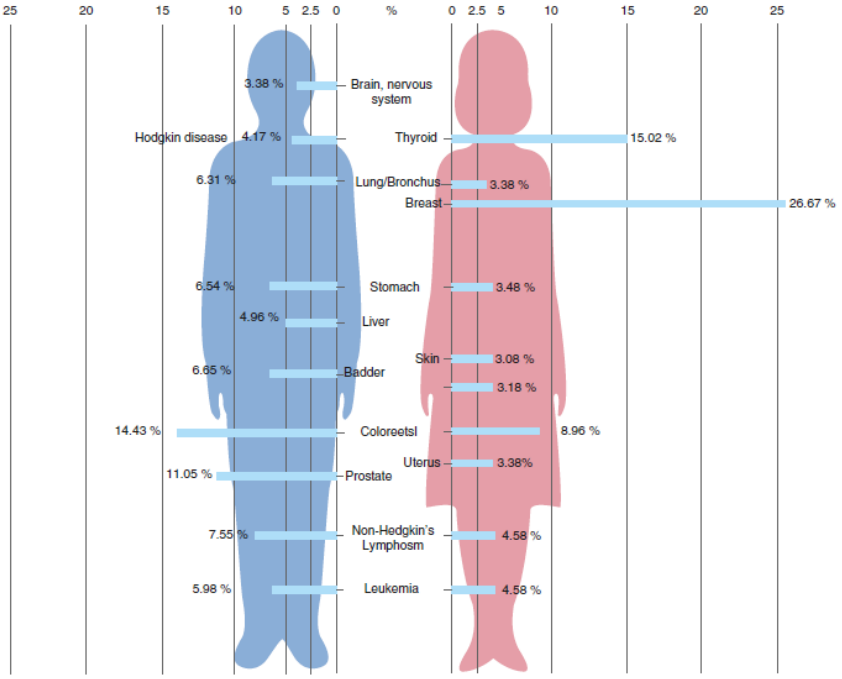


Fig. 12.3 Ten most common cancers in Oman 2017 [6]

H. O. Al-Shamsi et al. (eds.), *Cancer in the Arab World*,
https://doi.org/10.1007/978-981-16-7945-2_1

Over **one million** cases of **gastric cancer** are diagnosed each year around the world. Stomach cancer is the **5th** most commonly diagnosed cancer in the world, and the 7th most prevalence. In total, » **1.1 million** new cases and **770,000** deaths of gastric cancer were estimated in ***2020***. Incidence rates were on **average 2-fold higher** in males than females (15.8 and 7.0 per 100,000, respectively) with variation across countries. Highest incidence rates were observed in Eastern Asia for both males and females (32.5 and 13.2, respectively); males residing in Japan (48.1), Mongolia (47.2) and Korea (

39.7) had the highest rates in the world. Incidence was lowest in Africa with incidence rates < 5 per 100,000. Highest mortality rates were observed in Eastern Asia for both males (21.1) and females (8.8) (Zhang, 2013)

A **lower** share of deaths was observed in very high HDI countries compared to mediu m and low HDI countries. The annual burden of gastric cancer is predicted to **increas e** to 1.8 million new cases and 1.3 million deaths by 2004 (Morgan et al., 2022)

The cumulative risk of developing gastric cancer from birth to age 74 is 1.87% in ma les and 0.79% in females worldwide. Gastric cancer is more prevalent in **males**.

In developed countries, gastric cancer is 2.2 times more likely to be diagnosed in male s than females. In developing countries, this ratio is 1.83. In 5 countries worldwide (R awla & Barsouk,2019).

The first mortality statistics recorded dates back to between 1760 and 1839 from Italy, and the earliest description of this disease to be noted in the 3000 BC was from early Egypt and till date it continues to be a lethal malignancy albeit with significant geo- gr aphical, ethnic, gender as well as socioeconomic difference in its occurrence (Chan and Wong, 2017).

As per GLOBOCAN 2012, cancer in the stomach has been predominantly in Africa a nd Asia, where in 73% of the diagnosed have been recorded to be from Asia, among whom China alone harbours roughly 50% of the world's detected cases (Abuderman, 2019) .

Statement of problem:

Deaths by cancer in **Yemen** for the year 2020 were estimated with a total of 12,103 ca ses with 76.5 ASR (world) per 100,000. Males showed a slightly higher rate than fem ales (77.9 vs. 76.1 ASR (world) per 100,000, respectively). Among the sites of cancer, breast cancer ranked in the top of the death rates (12.1%), followed by colorectum (1

0.0%), stomach (9.7%), leukemia (8.6%), esophagus (8.3%), liver (6.5%), lung (6.2%), brain, CNS (6.0%), and non-Hodgkin lymphoma (3.2%)

In Yemen oncology centers is causing a huge burden to the national economy and on th e public health services.

Conflict had effect in socioeconomic status, screening and survey of gastric carcino ma. According to national cancer control network of care was completely disrupted in 2015 and by 2016 the country already faced shortages of qualified healthcare workers as well as essential medicines and materials. After **six years of war**, Yemen has lost s o much of the gains the country had made in health services, particularly cancer care. Many cancer clinics had to close, forcing people to travel great distances for treatment . Yemen one of developing country which had little resources in preventing and mana gement simple diseases rather than complicated disease.

Justification / Rational:

In Yemen, till now, there is no adequate data about the prevalence and related risk fact ors of gastroesophageal carcinoma. Our exception to generate new information and rel ated factors about gastric carcinoma. The Republic of Yemen is a large country with v arious climatic, topographic, and environmental conditions Cancer registry in Yemen i s still a major challenge in the absence of national cancer surveillance, as the country l acks a National Cancer Registry Center (NCRC) (Bawazir, 2018)

Esophageal cancer ranks the **sixth** most diagnosed cancer worldwide, and the moralit y incidence of this disease is rapidly growing worldwide (Almatroudi, 2022) ***Gastric Ca ncer, Elwyn C Cabebe, etc***

CHAPTER 3

Research Objectives

General objective:

Determine the Prevalence of gastric cancer in adults' gastric cancer among Yemeni Patients Attending Oncology center AL-Jomhori Hospital in Sana'a city

Specific Objectives:

1. To measure Prevalence of gastric cancer in adults' people in AL-Jomhori oncology center Sana'a-Yemen 2022
2. To assess the attributed risk factors that increase gastric cancer for adults' people.
3. To assess the distribution of gastric cancer according, (age, socioeconomic state, residence, education, H-pylori infection. smoking, chewing qat, diet and others).

CHAPTER 4

Patients and Methods

Study design:

This is a descriptive cross-sectional hospital-based study will be conducted in Oncology center in 6-months AL-Jomhori hospital Sana'a-Yemen.

Study Area:

Oncology and Gastroenterology centers in AL-Jomhori hospital Sana'a-Yemen.

Study Population:

Adult people that be attended Oncology and Gastroenterology centers in AL-Jomhor i hospital in 6-months from October 2022 to March-2023 with confirmed diagnosed a s (Gastric and Gastroesophageal carcinoma)

Inclusion Criteria:

All Adult people attended Oncology and Gastroenterology centers in AL-Jomhori hos -pital Sana'a-Yemen

Exclusion Criteria:

- Yemenis not life in Yemen
- If the diagnostic not confirmed.
- If the patient very ill or refused.
- Less than 18 years old

Variables:

Dependent variable:

Prevalence, Gastric cancer, Esophageal cancer.

Risk factors

independent variable:

Age, Socioeconomic state. Residence Gender H. pylori infection. Smoking, Qat chewi ng Family history of gastric Ca History of gastric surgery.

Sampling:

Sampling Size:

68 patients, that attend and confirm clinical and histopathological as gastric cancer in 6-months from October 2022 to March-2023**.**

Data:

Data Collection Technique and tools

The data will be collected by two ways:

The data will be collected by asking direct closed questions adult patient with confirm ed as esophageal carcinoma who admitted Oncology and Gastroenterology centers in AL-Jomhori hospital Sana'a-Yemen related to gastric cancer epidemiology (For all pa tients a full history was taken including personal data, family history of gastric cancer, data regarding environmental risk factors such as smoking, qat chewing, Patients com plaint, duration of symptoms and findings of complete physical examination

Data will be obtained from a combination of sources, such as outpatient clinic records, medical wards, hematology and histopathology laboratories, endoscopic center, radiol ogical/imaging diagnosis.

Will calculate the questioner was developed and structured by researchers. Then the q uestioner was pre-test among 5 patient who will be admitted to the al jomhori oncolo gy center, validity and consistency of questioner will calculate crombach`s alpha.

Questioner consists of four parts:

Demographic data

Risk factors

Clinical symptom and signs

Histopathological finding.

Data Analysis:

The collected data will be analyzed by computer using the SPSS software program, ve rsion 22. The frequency and distribution e will be calculated, then the chi square test will be performed to asses relation between factors and percent.

P- Value < 0.05-significant

P- Value < 0.001-highly significant

P- Value >= 0.05-nonsignificant. [142]

Ethical Consideration:

- Scientific and ethical approval from 21 September University for medical and applied sciences will be obtained.
- Written consent will be taken in AL-Jamboree oncology center Administrations prior to collection of data
- Research purpose and Objectives will be explained to the participants in clear simple words.
- Participant has right to voluntary Informed consent.
- Participant has right to no harm (privacy and confidentiality using coded questionnaires).

CHAPTER 4

Results

TABLE ١ DEMOGRAPHIC CHARACTERISTICS

Variable	demographic characteristics	Frequency	Percent (%)
Age	≤ 30	4	**5.7%**
	$31-45$	20	**28.6%**
	$46-60$	25	**35.7%**
	≥ 61	21	**30.0%**
	Mean$\pm SD$	**52.64 $\pm$ 13.82**	
Gender	Male	53	**75.7%**
	Female	17	**24.3%**
Residency	Urban	39	**55.7%**
	Rural	31	**44.3%**
Education level	no formal education	36	**51.4%**
	Primary	14	**20.0%**
	Secondary	11	**15.7%**
	university	9	**12.9%**
Date of Diagnosis new or recurrent	new	49	**70.0%**
	recurrent	21	**30.0%**
Total		٢٠	**100%**

The study sample consisted of 70 Yemeni patients with gastric cancer who attended the oncology center at AL-Jomhori hospital in Sana'a and were over 18 years old. The average age of the patients was 52.64 years with a standard deviation of 13.82. The percentage of patients under 30 years old was 5.7%, while the percentage of patients between 31-45 years old with gastric cancer was 28.6%. The highest percentage of patients was over 61 years old and between 46-60 years old, with percentages of 30% and 35.7% respectively. This indicates that the incidence of gastric cancer increases with age. Figure (1) shows the distribution of gastric cancer patients according to the age.

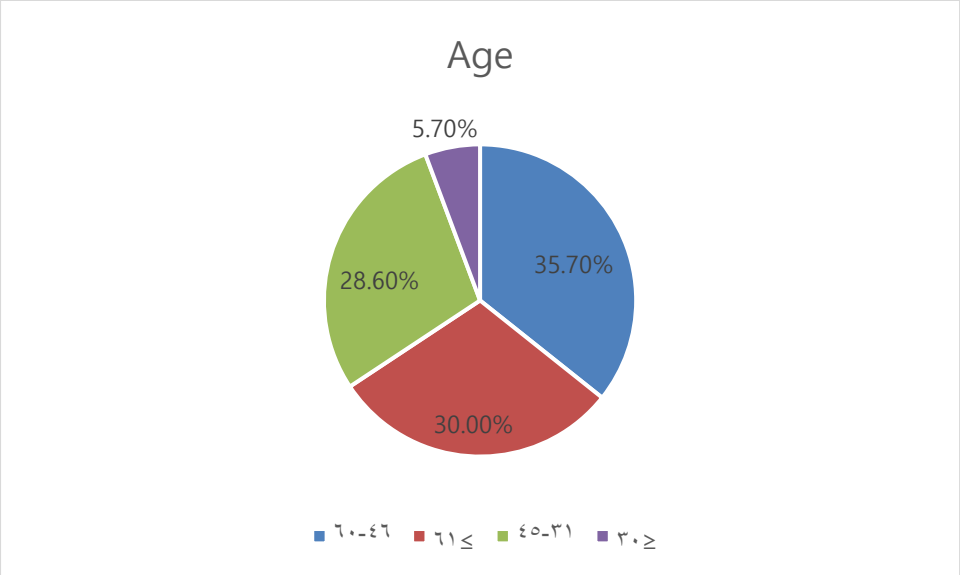


FIGURE 1) DISTRIBUTION OF SAMPLE PER AGE CATEGORY, IN THE AL-JOMHORI HOSPITAL IN SANA'A CITY

The majority of gastric cancer patients in the sample were male, accounting for 75.7% of the total sample, while females accounted for only 24.3%. This finding is consistent with the numerous studies that have shown males to be more susceptible to gastric cancer. Figure (2) displays the distribution of gastric cancer patients per gender.

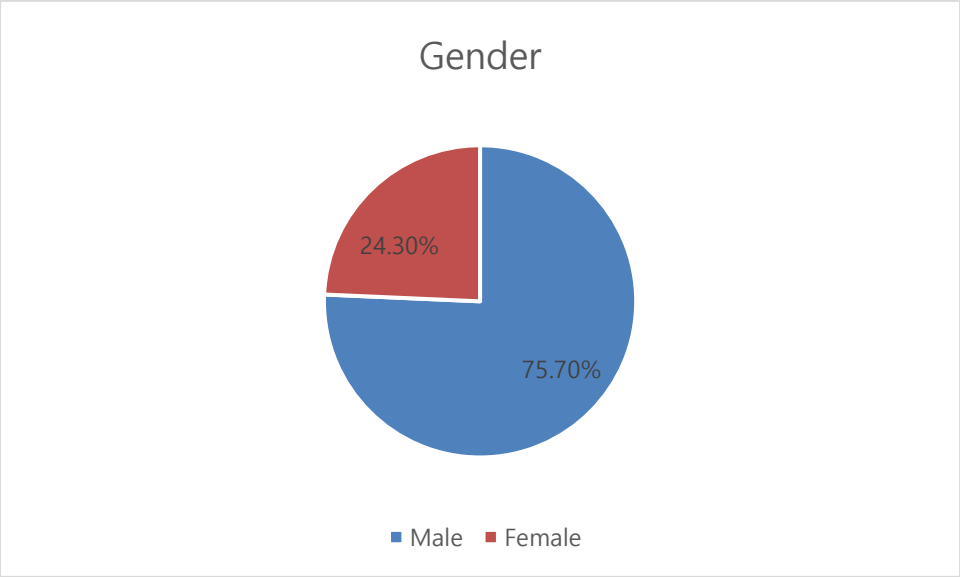


FIGURE 2 DISTRIBUTION OF SAMPLE PER SEX, IN THE AL-JOMHORI HOSPITALS IN SANA'A

As shown in Table (1), the majority of patients with gastric cancer who visited the Cancer Center at the Republican Hospital in the capital city of Sana'a were from the urban areas with 55.7%, while 44.3% of the patients were from the rural areas (see Figure 3).

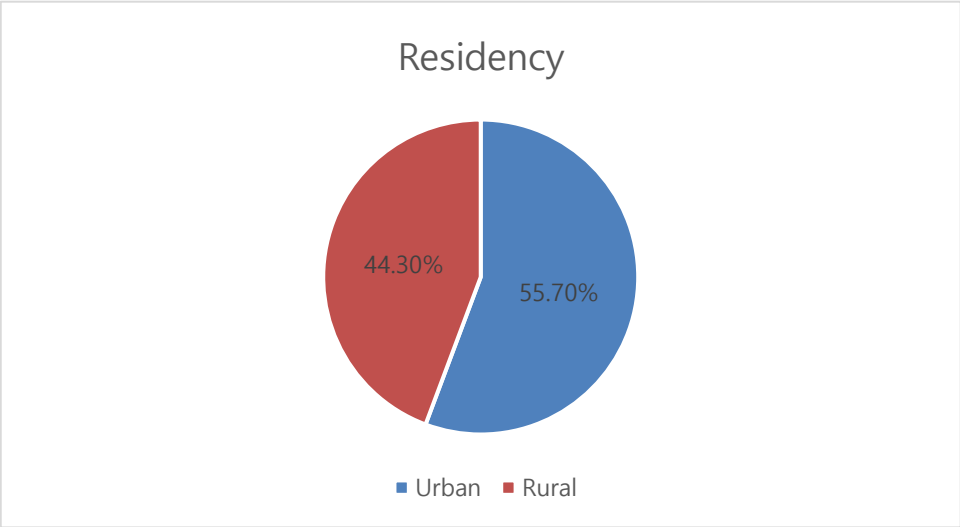


FIGURE 3 DISTRIBUTION OF SAMPLE PER RESIDENCY, IN THE AL-JOMHORI HOSPITALS IN SANA'A

The highest proportion of gastric cancer patients who did not receive any formal education was (51.4%), while 20% received primary education, and 15.7% received secondary education. The lowest proportion of patients had a university-degree with12.9% (refer to Figure 4).

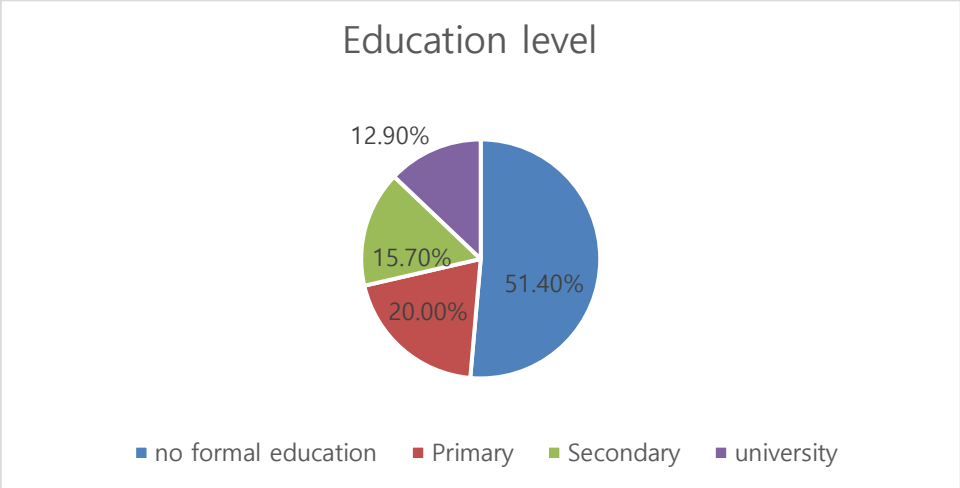


FIGURE 4 DISTRIBUTION OF SAMPLE PER EDUCATION LEVEL, IN THE AL-JOMHORI HOSPITALS IN SANA'A

As shown in figure (5) 70% of the patients were identified as new cases, while 30% were identified as recurrent cases.

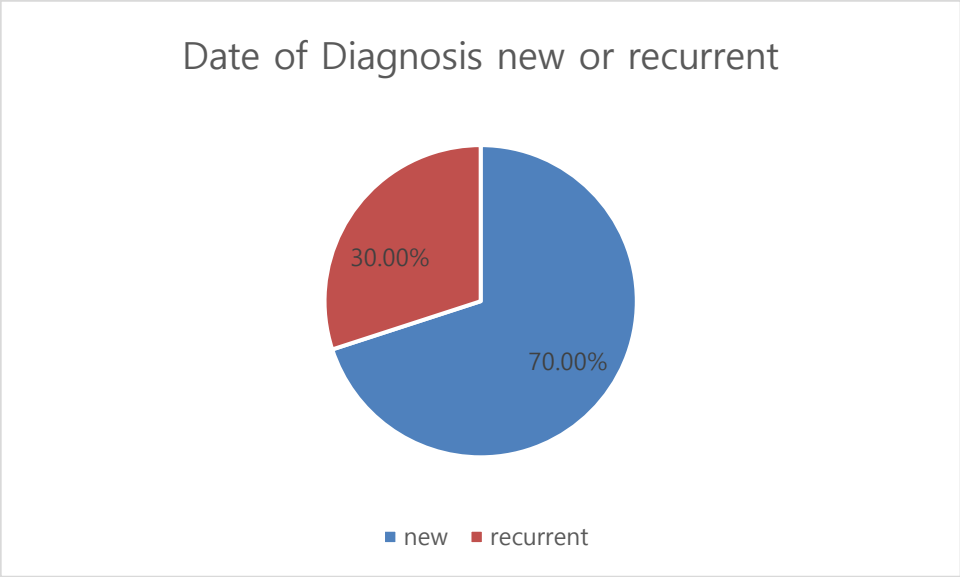


FIGURE 5 DISTRIBUTION OF SAMPLE PER DATE OF DIAGNOSIS (NEW OR RECURRENT), IN THE AL-JOMHORI HOSPITALS IN SANA'A

Environmental Risk Factors for Gastric Cancer

Risk factors related to patient habits (smoking, Shammah chewing, qat chewing)

TABLE 2 PREVALENCE OF RISK FACTORS RELATED TO PATIENT HABITS (SMOKING, SHAMMAH CHEWING, QAT CHEWING)

Factors associated	Yes	No
smoker	38 (54.3%)	32 (45.7%)
Shamma chewre	20(28.6%)	50 (71.4%)
Qat chewre	57 (81.4%)	13 (18.6%)
Other habits	0(0.0%)	70(100%)

According to the table (2), we can see that the most prevalent risk factor among the patients is chewing qat with a percentage of 81.4%. This is a natural result since the habit of chewing qat is highly prevalent in the Yemeni society. Next, is cigarette smoking with a 54.3%, and then Shammah chewing with a 28.6%. Due to the overlap between these factors, the study investigated whether the patient had more than one of these risk factors. The cross-tabulated tables were extracted to clarify the vision regarding the number of risk factors for each patient, and from table (3) and figure (6) we can see that more than 85% of the patients had at least one of the habits that cause stomach cancer. The highest percentage of patients were chewing qat and smoking cigarettes together with a 30%, followed by only chewing qat with a 24.3%, then in the third place came chewing qat, smoking cigarettes, and chewing shammah together with a 21.4%. However, 14.3% of patients did not have any of the habits causing the disease.

TABLE ٣ ENVIRONMENTAL RISK FACTORS OF GASTRIC CANCER

Habits	Frequency	Percent (%)
only smoker	2	2.9%
only Shamma smoker	1	1.4%
only Qat chewre	17	24.3%
smoker and Shamma	0	0.0%
smoker and Qat chewre	21	30.0%
Qat chewer and Shamma	4	5.7%
smoker and Shamma and Qat chewre	15	21.4%
Total Habits	60	85.7%
Non-Habits	10	14.3%

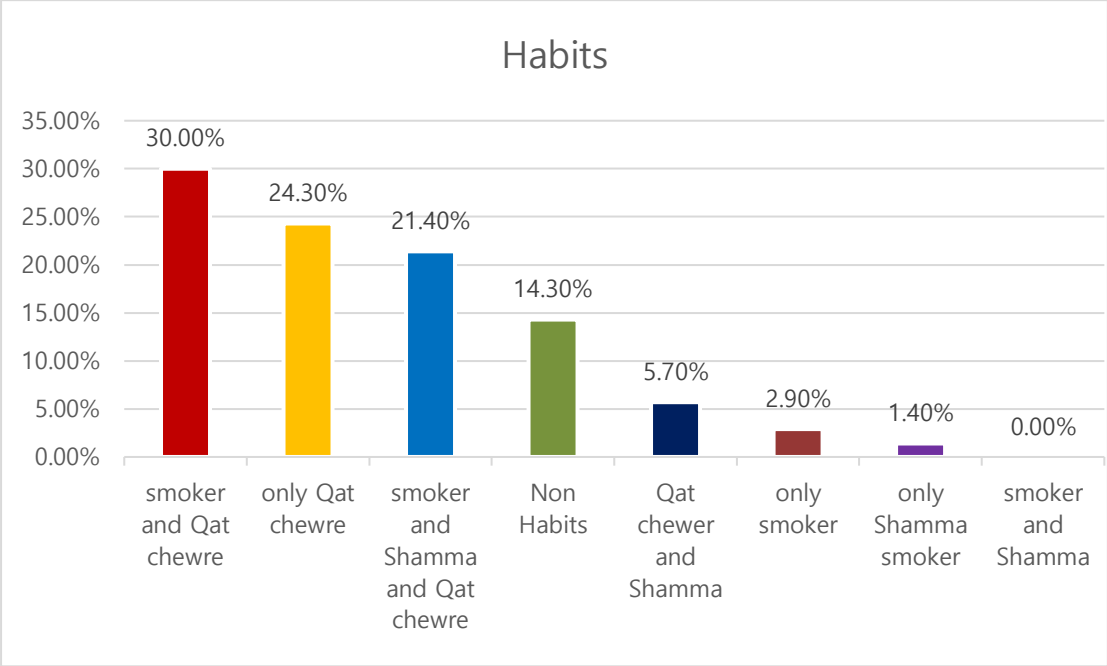


FIGURE 6 DISTRIBUTION OF HABIT FREQUENCY HISTOGRAM

To determine whether there were any differences or relationships between demographic characteristics and risk factors associated with adult gastric cancer, frequencies and chi-square tests were conducted at a significance level of 0.05 for each factor, as shown in the table (4).

TABLE 4 THE RELATIONSHIP AMONG RISK FACTORS (SMOKING, SHAMMA, QAT) AND DEMOGRAPHIC VARIABLES AMONG GASTRIC CANCER PATIENTS

Demographic Variables	Category	smoker			Shammah chewer			Qat chewer		
		No	yes	P-value	No	yes	P-value	No	yes	P-value
Age	≤ 30	2	2	0.6	4	0	0.16	4	0	0.000
	31 – 45	8	12		11	9		1	19	
	46 – 60	14	11		18	7		3	22	
	≥ 61	8	13		17	4		5	16	
Gender	Male	21	32	0.07	35	18	0.078	4	49	0.000
	Female	11	6		15	2		9	8	
Residency	Urban	17	22	0.69	31	8	0.094	7	32	0.881
	Rural	15	16		19	12		6	25	
Education level	no formal education	21	15	0.18	26	10	0.64	10	26	0.17
	Primary	5	9		10	4		2	12	
	Secondary	3	8		9	2		0	11	
	university	3	6		5	4		1	8	
Date of Diagnosis (new or recurrent)	new	25	24	0.17	33	16	0.25	11	38	0.203
	recurrent	7	14		17	4		2	19	

From the previous table, we observe differences that is statistically significant in the degree of qat consumption among patients according to age and gender only, while there was no statistically significant relationship between all demographic variables and environmental risk factors for gastric cancer. Logistic analysis was performed using odds ratio with a 95% confidence interval to identify differences in the prevalence of qat consumption among patients according to age and gender, while the other variables were not included in the analysis as their significance level was less than 0.05.

TABLE 5 THE EFFECT OF AGE AND GENDER ON THE PREVALENCE OF RISK FACTORS (CHEWING QAT)

		Qat chewer			
		OR	95% CI		P-value
			Lower	Upper	
Age Category	≤ 30	.000	.000	.	0.999
	31 – 45	6.81	.600	77.29	0.122
	46 – 60	5.33	.734	38.74	0.098
	≥ 61				
Gender	*Male*	11.91	1.901	74.435	0.008
	Female				

From the previous table, we can observe that the prevalence of the risk factor (qat chewing) is higher among males than females (OR=11.9; 95% CI: 1.9-74.4). This result may indicate a possibility of higher incidence of gastric cancer among males compared to females due to the higher prevalence of the risk factor (qat chewing) among males. Additionally, the prevalence of this risk factor is the highest among the patients in the age group of 31-45 years (OR=6.81; 95% CI: 0.6-77.29), followed by those in the age group of 46-60 years (OR=5.33; 95% CI: 0.73-38.74), while it is lower among patients above 60 years and lower among patients below 30 years, but the significance level was greater than 0.05, indicating no significant statistical relationship or differences in the prevalence of the risk factor (qat chewing) among the different age groups. Therefore, the age does not appear to affect the prevalence of the risk factor of qat chewing.

The Risk Factors Related to The Dietary Habits of Patients:

TABLE 6 THE RISK FACTORS RELATED TO THE DIETARY HABITS OF PATIENTS.

Diet	Yes	No
Consuming spicy foods	44 (62.9%)	26 (37.1%)
Fast Food Diet	28 (40%)	42 (60%)
Consuming Antibiotic Randomly	37 (52.9%)	33 (47.9%)
Eating salted, smoked foods and low in fruits and vegetables	42(60%)	28 (40%)
Eating foods that have not been prepared or stored properly	28 (40%)	42(60%)
Low fruits, vegetables	44 (62.9%)	26(37.1%)

From the previous table, it can be observed that the most prevalent risk factors among cancer patients are (consuming spicy foods) and (fruits, vegetables) with a percentage of over 62%. In the second rank, the risk factor (eating salted, smoked foods and low in fruits and vegetables) was at a percentage of 60%, and in the third rank, (consuming antibiotics randomly) was at a percentage of approximately 53%. On the other hand, the least prevalent risk factors related to dietary habits were (fast food diet) and (eating foods that have not been prepared or stored properly) at a percentage of 40% for each factor.

To explore whether there are any differences or correlation relationships between demographic characteristics and food-related risk factors associated with stomach cancer in adults, the frequencies and chi-square test were extracted at a significance level of 0.05 for each factor as shown in the table (7).

TABLE 7 THE RELATIONSHIP BETWEEN FOOD-RELATED RISK FACTORS AND DEMOGRAPHIC VARIABLES OF CANCER PATIENTS.

Demographic Variables	Diet	Consuming spicy foods			Fast Food Diet			Consuming Antibiotic Randomly		
	Category	No	yes	P-value	No	Yes	P-value	No	yes	P-value
Age	≤ 30	2	2	0.36	2	2	0.64	1	3	0.51
	31 – 45	8	12		10	10		10	10	
	46 – 60	6	19		17	8		14	11	
	≥ 61	10	11		13	8		8	13	
Gender	Male	21	32	0.45	34	19	0.21	27	26	0.26
	Female	5	12		8	9		6	11	
Residency	Urban	16	23	0.45	24	15	0.77	20	19	0.44
	Rural	10	21		18	13		13	18	
Education level	no formal education	16	20	0.096	21	15	0.70	18	18	0.97
	Primary	3	11		8	6		6	8	
	Secondary	6	5		6	5		5	6	
	university	1	8		7	2		4	5	

Date of Diagnosis new or recurrent	new	15	34	0.084	33	16	0.055	24	25	0.64
	recurrent	11	10		9	12		9	12	

Demographic Variables	Diet	Eating salted, smoked foods….			Eating foods that have not been prepared or ...			fruits, vegetables		
	Category	No	yes	P-value	No	yes	P-value	No	yes	P-value
Age	≤ 30	2	2	0.93	2	2	0.34	1	3	0.51
	31 – 45	7	13		11	9		5	15	
	46 – 60	10	15		13	12		11	14	
	≥ 61	9	12		16	5		9	12	
Gender	Male	20	33	0.50	34	19	0.21	19	34	0.69
	Female	8	9		8	9		7	10	
Residency	Urban	20	19	0.03	22	17	0.49	12	27	0.22
	Rural	8	23		20	11		14	17	
Education level	no formal education	17	19	0.50	22	14	0.61	15	21	0.22
	Primary	4	10		10	4		6	8	
	Secondary	3	8		6	5		1	10	
	university	4	5		4	5		4	5	
Date of Diagnosis new or recurrent	new	23	26	0.07	31	18	0.39	19	30	0.67
	recurrent	5	16		11	10		7	14	

The results of table (7) did not show any statistically significant relationships between dietary risk factors associated with stomach cancer and demographic variables of patients, except for one factor which is (Eating salted, smoked foods and low in fruits and vegetables), where a relationship was found with the variable (Residency) in which this factor is more prevalent among stomach cancer patients who live in the rural areas.

Risk Factors Related to Patients' Family History:

The results of table (8) showed that 30% of patients had a past history of gastric surgery, 25.7% of patients had a family history of gastric cancer, and more than 13% of patients had a family history of gastric surgery.

TABLE 8DISTRIBUTION OF FAMILY HISTORY AMONG PATIENTS WITH STOMACH CANCER

	Yes	No
Past history of gastric surgery	21 (30%)	49 (70%)
Family history of gastric cancer	18 (25.7%)	52 (74.3%)
family History of gastric surgery	9 (12.9%)	61 (87.1%)

Risk Factors Associated with Comorbidities:

The analysis results in table (9) showed that 55.7% of gastric cancer patients suffer from helicobacter pylori, 70% suffer from chronic gastritis, 7.1% of patients suffer from gastric polyps, 8.6% of patients suffer from familial syndromes, and 4.3% have been exposed to radiation.

TABLE 9 DISTRIBUTION OF THE COMORBIDITIES AMONG PATIENTS WITH GASTRIC CANCER.

Other disease	Yes	No
Other diseases	**23 (32.9%)**	**47 (67.1%)**
Helicobacter pylori	**39(55.7%)**	**31 (44.3%)**
Chronic gastritis	**49 (70%)**	**21 (30%)**
Gastric polyps	**5 (7.1%)**	**65 (92.9%)**
Familial syndromes	**6 (8.6%)**	**64 (91.4%)**
Radiation exposure	**3 (4.3%)**	**67 (95.7%)**

Symptoms and clinical signs

TABLE 10 DISTRIBUTION OF SYMPTOMS EXPERIENCED BY PATIENTS WITH GASTRIC CANCER.

Symptoms	Yes	No
Indigestion and stomach discomfort.	67 (95.7%)	3 (4.3%)
A bloated feeling after eating	61 (87.1%)	9 (12.9%)
Nausea	65 (92.9%)	5 (7.1%)
Loss of appetite	62(88.6%)	8 (11.4%)
Heartburn	60 (85.7%)	١٠(14.3%)
Blood in the stool	30 (42.9%)	40 (57.1%)
Vomiting	60 (85.7%)	١٠(14.3%)
Weight loss for no known reason	67 (95.7%)	3 (4.3%)
Stomach pain	63(90%)	7 (10%)
Jaundice	23 (32.9%)	47 (67.1%)
Ascites	18 (25.7%)	52 (74.3%)
Trouble swallowing	42(60%)	28 (40%)

Based on the data presented in table (10), the most common symptoms reported by patients in the early stages of gastric cancer were indigestion and stomach discomfort, reported by 95.7% of patients, followed by nausea at approximately 93%, loss of appetite at 88.6%, feeling bloated after eating at 87.1%, and heartburn at 85.7%.

In the advanced stages of gastric cancer, the most common symptoms reported were unexplained weight loss, which was reported by 96% of patients, followed by stomach pain at 90%, vomiting at 85.7%, trouble swallowing at 60%, and blood in the stool at 43%. The least common symptoms reported by patients with gastric cancer were jaundice, reported by approximately 33%, and ascites, reported by less than 26% of patients.

TABLE 11 THE RELATIONSHIP BETWEEN FOOD-RELATED RISK FACTORS AND DEMOGRAPHIC VARIABLES IN GASTRIC CANCER PATIENTS.

Symptoms	Age		Gender		Residency		Education level		Date of Diagnosis (new or recurrent)	
	Chi-Square	P-value	Chi-Square	P-value	Chi-Square	P-value	Chi-Square	P-value	Chi-Square	P-value
Indigestion and stomach discomfort.	2.90	0.41	0.14	0.71	0.64	0.43	1.50	0.68	2.01	0.16
A bloated feeling after eating	3.04	0.39	0.02	0.88	2.10	0.15	2.60	0.45	0.30	0.59
Nausea	2.72	0.44	0.05	0.82	1.29	0.26	2.85	0.42	6.41	0.01
Loss of appetite	2.33	0.51	2.90	0.09	1.36	0.24	9.91	0.02	0.24	0.62
Heartburn	1.73	0.63	0.21	0.65	6.03	0.01	3.90	0.27	0.56	0.46
Blood in the stool	4.76	0.19	0.03	0.87	0.02	0.89	6.20	0.10	0.00	1.00
Vomiting	1.17	0.76	1.57	0.21	1.17	0.28	4.34	0.23	0.00	1.00
Weight loss for no known reason	2.73	0.44	1.01	0.32	0.64	0.43	6.05	0.11	2.01	0.16
Stomach pain	0.98	0.81	1.46	0.23	0.78	0.38	1.74	0.63	0.01	0.93
Jaundice	1.96	0.58	4.11	0.04	0.86	0.35	4.79	0.19	8.02	0.01
Ascites	4.83	0.19	5.36	0.02	1.25	0.26	6.59	0.09	0.91	0.34
Trouble swallowing	2.57	0.46	0.01	0.91	0.04	0.84	3.15	0.37	0.73	0.39

From the previous table, it is evident that the patient's age and residency are independent variables from the apparent symptoms in gastric cancer patients. However, the gender showed a statistically significant relationship with the appearance of Jaundice and Ascites, with a significance level of less than 0.05. The gender of the patient was independent of the other symptoms of gastric cancer. Similarly, a statistically significant relationship was observed between the educational level of the patient and the appearance of Loss of appetite, while the educational level was

independent of the other symptoms of gastric cancer. Furthermore, a statistically significant relationship was observed between the date of diagnosis (new or recurrent) and the appearance of nausea and jaundice, while there was no statistically significant relationship with the other symptoms of the disease.

The logistic regression analysis showed that the probability of the appearance of jaundice and ascites increases when the patient with gastric cancer is female. Also, the probability of the appearance of jaundice increases when the patient's condition is recurrent.

TABLE 12 THE LOGISTIC REGRESSION ANALYSIS AND ODDS RATIO DEMONSTRATED THE EFFECT OF SOME DEMOGRAPHIC VARIABLES ON THE APPEARANCE OF CERTAIN SYMPTOMS RELATED TO GASTRIC CANCER.

Variable \ Symptoms		Jaundice				Ascites			
		OR	95% CI		P-value	OR	95% CI		P-value
			Lower	Upper			Lower	Upper	
Gender	male	3.134	1.011	9.714	0.048	3.82	1.18	12.37	0.025
	Female	Ref				Ref			
Date Of Diagnosis	new	4.606	1.542	13.757	0.006	1.727	0.559	5.34	0.34
	recurrent	Ref				Ref			

Variable \ Symptoms		Loss of appetite			
		OR	95% CI		P-value
			Lower	Upper	
Education level	no formal education	0.06	0.01	0.65	0.02
	Primary	0.15	0.01	1.80	0.14
	Secondary	0.75	0.11	5.11	0.77
	university	Ref			

Variable \ Symptoms		Nausea			
		OR	Lower	Upper	P-value
Date Of Diagnosis	new	0.09	0.01	0.85	0.04
	recurrent	Ref			

The reference category is: yes

The probability of experiencing (Loss of appetite) among stomach cancer patients increases when the patient is uneducated compared to those with a university degree. The probability of experiencing (Nausea) also increases when the patient is (new).

Biopsy for histopathology

Distribution of Cases According to The Results of The Biopsy

TABLE 13 RESULTS OF TISSUE BIOPSY FOR PATIENTS ATTENDING THE ONCOLOGY CENTER AT AL-JUMHORI HOSPITAL IN SANA'A.

Histopathology	Frequency	Percent
Adenocarcinoma	65	92.9%
LYMPHOMA	1	1.4%
Gastrointestinal Stromal Tumor	1	1.4%
Squamous cell carcinomas	1	1.4%
other	2	2.9%
Total	70	100.0%

The results of table (13) show the frequency of various malignant tumors in the stomach among patients with gastric cancer who visited the Oncology Center at Al-Jumhori Hospital in Sanaa as follows: 92.9% are glandular cancers divided into intestinal and diffuse types, 1.4% lymphoma, 1.4% gastrointestinal stromal tumor, 1.4% squamous cell carcinomas, and 2.9% other.

Distribution of Gastric Cancer Patients According to Tumor Type and Location:

TABLE 14 THE DISTRIBUTION OF GASTRIC CANCER PATIENTS ACCORDING TO THE TYPE AND LOCATION OF THE TUMOR.

		Fre-quency	Per-cent
Macroscopic appearance	**Gastric wall thickening**	**50**	**71.4%**
	Gastric mass	**20**	**28.6%**
Topographic distribution of mass in stomach	**Tumor Site Cardia**	**38**	**54.3%**
	Tumor Site Extend Esoph-agus	**22**	**31.4%**
	Tumor Site Fundus	**21**	**30.0%**
	Tumor Site Body	**52**	**74.3%**
	Tumor Site Antrum	**42**	**60.0%**
	Tumor Site Pylorus	**29**	**41.4%**
	Gastric Out Let Narrowing	**13**	**18.6%**
	Tumor Site Duodenum	**6**	**8.6%**

From table (14), 71.4% of cases showed gastric wall thickening while 28.6% had a gastric mass. The distribution of the tumor location in the stomach was such that the most common region for tumor growth was in the body of the stomach, with a percentage of 74.3%, followed by the antrum with 60% and cardiac with 54.3%. The least common region for tumor concentration was the duodenum, with a percentage of 8.6%.

Staging:

Distribution of the gastric cancer patients according to the stage classification of gastric cancer:

The American and European classification, which relies on the TNM system, was adopted, and the results of patient distribution were according to this system as it is shown in the table (15) as follows:

- Primary tumor T: 4.3% of patients (T1 Tumor invades lamina propria, muscularis mucosae, or submucosa), 24.3% of patients (T2 invades muscularis propria), and 48.6% of patients had a primary tumor that penetrates subserosal connective tissue without invasion of visceral peritoneum or adjacent structures. Approximately 23% of patients had a primary tumor that invades serosa (visceral peritoneum) or adjacent structures.
- Lymph node involvement N: 12.9% of patients (N0 regional LN), 21.4% of patients (N1 1-2 regional LN), 38.6% of patients (N2 3-6 regional LN), and 27.1% of patients (7 or more regional LN).
- Distant Metastasis: 72.9% of patient (No Distant Metastasis) , 27.1% of patient (Distant Metastasis).

TABLE 15 DISTRIBUTION OF GASTRIC CANCER PATIENTS ATTENDING AL-JUMHORI HOSPITAL IN SANA'A ACCORDING TO THE STAGE CLASSIFICATION OF GASTRIC CANCER.

Staging		Frequency	Percent
Staging T	T1 Tumor invades lamina propria, muscularis mucosae, or submucosa	3	4.3%
	T2 invades muscularis propria	17	24.3%
	T3 penetrates sub serosal connective tissue	34	48.6%
	T4 invades serosa or adjacent structures	16	22.9%
Nodes Metastasis	N0 regional LN	9	12.9%
	N1 1-2 regional LN	15	21.4%

	N2 3-6 regional LN	27	38.6%
	7 or more regional LN	19	27.1%
distant Metastasis	No Distant Metastasis	51	72.9%
	Distant Metastasis	19	27.1%

Prognostic Features:

TABLE 16 DISTRIBUTION OF GASTRIC CANCER PATIENTS ACCORDING TO PROGNOSTIC FEATURES

Clinical Staging		Frequency	Percent
Valid	Stage1 T1-2, N0, M0	13	18.6%
	Stage2 T1-2-3-4, N1, M0	25	35.7%
	Stage3 T3, N0-1, M0	12	17.1%
	Stage4 T1-2-3-4, N0-1, M0-1	20	28.6%
	Total	70	100.0%

The data in table (16) indicates that 28.6% of patients had Clinical Stage 4 gastric cancer (T1-2-3-4, N0-1, M0-1), 17.1% had Clinical Stage 3 gastric cancer (T3, N0-1, M0), 35.7% had Clinical Stage 2 gastric cancer (T1-2-3-4, N1, M0), and 18.6% had Clinical Stage 1 gastric cancer (T1-2, N0, M0).

Distribution of Cases According to Treatment Management

TABLE 17 DISTRIBUTION OF CASES ACCORDING TO TREATMENT MANAGEMENT

Management	Yes	No
Chemotherapy	٧٠ (100%)	0 (0.00%)
Surgery	10(14.3%)	60 (85.7%)

Radiotherapy	**4 (5.7%)**	**66 (94.3%)**

From table (17): All patients undergo chemotherapy in addition to 14.3% of patients undergoing surgery, and 5.7% receives radiotherapy.

Discussions and conclusion:

In this study, The sample include all patients who visited the oncology center at the Al-Jahori Hospital and were diagnosed with gastric cancer was studied to identify the extent of the spread of risk factors associated with gastric cancer, the symptoms experienced by the patients, as well as the diseases they suffer from. Various techniques were used to diagnose the patients and determine the stage at which cancer had reached in them, as well as the therapeutic techniques prescribed for them.

The majority of patients with gastric cancer were male, accounting for 75.7% of the total sample, while females accounted for the remaining 24.3%. This result is consistent with the findings of many studies that indicate that males are more susceptible to gastric cancer. However, this study showed a higher percentage than the global average of 65%, which may be due to the widespread use of qat among males in Yemen compared to Yemeni females. There was a statistically significant relationship between qat consumption and the gender of the patient.

The results also showed that the incidence of gastric cancer is prevalent among those who have not received any education. In addition, the study found that the incidence of gastric cancer does not depend on the place of residence (urban or rural), with only minor differences observed.

The study found that there are many risk factors for developing cancer, with the most common being chewing qat followed by smoking, and the least common being chewing tobacco. Approximately 86% of the patients had at least one of the habits that many studies have identified as significant risk factors for stomach cancer. The study also revealed that the dietary factors are significant risk factors, with the most common being consuming spicy foods and fruits and vegetables, which account for over 62% of cases, and the risk factor of eating salted, smoked foods and low amounts of fruits and vegetables accounting for 60% of cases.

The results did not reveal a significant prevalence rate related to the family history of the patients, which is consistent with a study conducted by T.K. Gebremedhin et al in 2021. The study also found that the most common disease among stomach cancer patients is chronic gastritis, accounting for 70% of cases, while 55.7% of patients with stomach cancer suffer from helicobacter pylori, indicating that these diseases are risk factors in the spread of stomach cancer.

Symptoms of stomach cancer appeared at high rates among patients, with the most common being indigestion and stomach discomfort, nausea, weight loss for no known reason, and stomach pain. The results also showed a statistically significant relationship between the patient's gender and the appearance of symptoms such as jaundice and ascites. The logistic regression analysis showed that the likelihood of jaundice and ascites increases when the patient with stomach cancer is female.

The imaging results showed that many patients diagnosed in advanced stage of cancer, with approximately 49% reaching stage III, and 23% reaching stage IV, while only a few cases were detected in the early stages. This can be attributed to the lack of screening protecol in Yemen due to its economic decline, shortage of patients in hospitals, and many other reasons, such as a low level of awareness among the community about the risk factors leading to stomach cancer.

Recommendations:

1. Health education programs should be developed to raise awareness about the risk factors associated with gastric cancer, especially among Yemeni men and those with lower levels of education. These programs can emphasize the importance of healthy dietary habits and avoiding habits such as smoking and qat chewing.
2. More research is needed to understand the relationship between qat use and gastric cancer risk in Yemeni men. Studies can explore the biological mechanisms by which qat use may contribute to cancer development and evaluate the effectiveness of interventions to reduce qat use among high-risk populations.
3. Efforts should be made to improve access to diagnostic services, such as endoscopy, for early detection of gastric cancer in Yemen. Screening programs can be developed to target high-risk groups, such as older adults and those with comorbidities such as chronic gastritis.
4. Further research is needed to understand the impact of dietary factors on gastric cancer risk in Yemen. Studies can explore the specific types of foods and nutrients that may be protective or harmful and evaluate the effectiveness of dietary interventions in reducing cancer risk.
5. Intervention programs can be developed to promote healthy lifestyle behaviors, such as regular physical activity and healthy dietary habits, to reduce the risk of gastric cancer in Yemen. These programs can be tailored to the specific cultural

and social contexts of Yemeni communities and can involve collaboration with local healthcare providers and community leaders.

Budget:

Item	Brief description	Cost	Remark
Data collection	**Paper work and collection of data**	**15000 YER**	
Printing	**And reports**	**10OO YER**	
Consultancy fees	**Statistical test and Language proofrea ding**	**20000 YER**	
Transportation, Coordination, researchers		**5000 YER**	
Others	**10% beyond total cost**	**5000 YER**	

Work Plan: Tasks Will Be Performed as Follows:

Time Task	Aug. 2022	Sept. 2022	Oct. 2022	Nov 2022	Dec. 2022	Jan. 2023	Feb. 2023	Mars. 2023	April. 2023
Finalization and approval of proposal									
Literature review									
Obtaining permissions									
Data collection									
Data analysis									
Report writing and submission									

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Appendix I: Location of S anaa:

Appendix 2: map of Al-jomhori hospital