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Original article

Public Awareness of Gastric Cancer Symptoms and Risk Factors: A Cross-Sectional Study from Al-Zawia, Western Libya

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Abstract
Gastric carcinoma continues to be the fourth leading cause of cancer-related mortality globally. Disparity in incidence rates across different geographical regions has been ascribed to environmental factors predominantly, rather than genetic determinants. This study aims to evaluate the level of awareness about the symptoms and risk factors of gastric carcinoma among the general population in Libya, and to identify socio-demographic factors associated with varying levels of awareness. Data for this descriptive cross-sectional study were collected from the general population in Zawia, using a pretested, validated questionnaire. The collected data were analyzed by using SPSS software. The sample comprised 435 individuals, with a slightly higher proportion of females (55.4%) compared to males (44.6%). The majority (59%) were under the age of 40. Overall, 42.7% of participants demonstrated a moderate level of knowledge regarding gastric cancer. The most commonly recognized risk factors were alcohol consumption (82.5%) and smoking (74.9%), while the most frequently identified warning sign was abdominal pain (74%) followed by a loss of weight (71.3%). A statistically significant association was observed between educational level and awareness ($p < 0.001$). Moderate levels of knowledge regarding the risk factors and warning symptoms of gastric cancer were recorded in most of the population in Zawia. especially concerning lifestyle-related risk factors like smoking and alcohol use. However, a knowledge gap persists, particularly for less obvious risk factors (e.g.; partial gastrectomy, blood group, and vitamin B 12 deficiency).
Keywords. Knowledge, Gastric Cancer, Risk Factors, Warning Symptoms, Zawia, Libya.

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Introduction

Gastric carcinoma (GC) continues to be the fourth leading cause of cancer-related mortality globally and ranks as the fifth most commonly diagnosed neoplasm. In the year 2020, this malignancy was responsible for nearly one million newly diagnosed cases, along with an estimated 770,000 fatalities [1]. While the incidence of gastric cancer is relatively lower in North America and substantial portions of Africa, it exhibits a higher frequency in East Asia, Eastern Europe, and South America. This disparity in incidence rates across different geographical regions has been ascribed to environmental factors predominantly, rather than genetic determinants [2]. Moreover, in Libya, 224 new instances of GC were documented in 2022, positioning it as the 12th most prevalent disease within the nation, as reported by the Global Cancer Observatory [3]. A study conducted at the Tripoli Medical Center in 2008 indicated that GC represented the fifth most common malignancy, accounting for 5.5% of cancer cases in males and 5.2% in females [4]. In contrast, a 2012 analysis of cancer cases from the Benghazi Medical Center in eastern Libya indicated that gastric cancer constituted 2.7% of all cancer diagnoses, with an average patient age of 57.6 years; furthermore, the incidence of gastric cancer was significantly elevated in Beida compared to other regions [5,6].

Despite advancements in oncological research and treatment modalities, the prognosis for GC remains grim, primarily attributable to the delayed detection of the disease. There exists a stark contrast in survival rates between early and late-stage diagnoses, with the overall 5-year relative survival rate approximating 36%. Cases identified at a localized stage demonstrate a 5-year survival rate of approximately 75%, whereas patients with metastatic disease have a 5-year survival rate of only about 7% [7].

Although early detection is critical for improving clinical outcomes, it is frequently impeded by insufficient public awareness regarding the symptoms and associated risk factors pertinent to the condition. Major risk factors include Helicobacter pylori infection, advanced chronological age, male gender, tobacco use, genetic susceptibility, dietary habits (such as high consumption of salt and smoked foods), and specific environmental exposures. Regarding its symptoms, GC often presents with non-specific clinical features such as persistent indigestion, unexplained weight loss, and abdominal discomfort. These symptoms are commonly misattributed to less serious conditions like gastritis, peptic ulcers, or functional dyspepsia, leading to delays in diagnosis [7,8].

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Public awareness concerning GC has been the focus of numerous research initiatives, particularly in regions where the disease is prevalent. Research conducted in countries such as Iran, Korea, and China indicates a notable deficiency in public comprehension of the risk factors and warning signs associated with GC [9-11]. Similarly, study performed in Saudi Arabia revealed a lack of knowledge regarding gastric carcinoma.12 As of the present, no studies have been undertaken in Libya to assess public awareness of the warning signs and risk factors associated with gastric cancer. The prevalence of stomach cancer in Libya is little understood, and the general public's perception of the condition is still uncertain. In order to uncover knowledge gaps and guide focused educational efforts, this study aims to assess the population's awareness of gastric carcinoma risk factors and symptoms in West Libya and to identify socio-demographic characteristics correlated with varying degrees of awareness.

Methods

Study design

This is a descriptive cross-sectional study that was conducted among the general population in Zawia city-Libya, between January and June 2025. The sample size was calculated using OpenEpi version 3.01, an open-source epidemiological statistics tool.13 Based on the estimated population of 186.123 inhabitants in Zawia city (World Population Review,2025)14, with a 95% confidence level, 5% margin of error, and an assumed prevalence of 50%, the minimum sample size was determined to be 384 participants. However, a total of 435 participants were included, which further increases the study's precision and reliability. The study population included Libyan adults aged 20 and above who had no prior history of cancer. Participants were recruited from different settings, including Zawia Teaching Hospital, some primary health care centers, and governmental offices within the city, to ensure a diverse representation of the general community.

Study tool

The questionnaire was developed by reviewing existing validated questionnaires from the literature including the work of Wang and colleagues in China (2024) and reported items by Almaghrabi et al (2022).15,16 Every effort was made during the literature review to ensure the content validity of the study instrument. Moreover, various drafts of the questionnaire were individually evaluated by the researcher in order to ensure face validity and practical applicability. A preliminary test was conducted on a representative sample (n = 35) to identify any ambiguities in the questions and to assess whether the data collected would be reliable. Some terms were modified for better clarity after translating the questionnaire into Arabic, the native language of the participants. The data collected during this pilot phase of the study were excluded from the final data analysis. Trained medical students participated in the data collection process.

The questionnaire comprised three sections: Section one: Sociodemographic characteristics, including age, sex, residence, educational level, occupation, monthly income, family history of gastric cancer, family history of other types of cancer, Disease of the upper gastrointestinal system, and Health status. Section two: Identification of risk factors of gastric cancer: in this section participants were asked whether the following items were risk factors of gastric cancer: male sex, older age, H. pylori infection, previous history of gastrectomy, Some types of gastric polyps, Pernicious anemia, consumption of salty diet, smoking, alcoholism, Certain occupations (coal, metal, or rubber industries), Blood group A. Responses included (Yes), (No), (I Do not know), with (Yes) indicating that they identified the items to be risk factors. Section three: Identification of warning symptoms of gastric cancer: participants were asked whether the following items were warning symptoms of gastric cancer: poor appetite, recurrent nausea and vomiting, loss of weight, felling full after eating small amount, abdominal lump, abdominal pain, heart pain or indigestion, blood in stool which might make it looks dark brown or black, feeling tired or weak. Responses included the same optional answers as the previous section. To assess the population's knowledge about risk factors and warning symptoms of gastric cancer. One point was given for each of the factors or symptoms that the participant agreed to (1 score for Yes and 0 score for No, I do not know). The respondents' knowledge was then categorized according to the total scores: high knowledge, 15–21 points; moderate knowledge, 8–14 points; and low knowledge, 0–7 points.

Ethical Approval and Informed Consent

The study was approved by the Libyan Medical Research Center Bioethics Committee prior to data collection, and informed consent was obtained from all participants before their enrollment.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics, including frequencies and percentages, were used to summarize participants' sociodemographic characteristics, awareness of stomach cancer risk factors and symptoms, and levels of knowledge. Chi-square tests of independence were conducted to examine associations between participants' knowledge

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levels and various demographic variables (e.g., age, gender, residence, education level, profession, and monthly income). A significance level of $p < 0.05$ was considered statistically significant.

Results

Demographic social characteristics of the participants:

Table 1 presents the demographic and socioeconomic characteristics of the 435 participants. Females represent a slightly higher proportion (55.4%) compared to males (44.6%). The majority of participants were in the younger age group, with 32.6% aged 20–29 and 26.4% aged 30–39, indicating that over half of the sample (59%) was under 40 years old.

Most participants resided in urban areas (66.7%), and a significant proportion had attained a university degree or higher (81.6%), suggesting a relatively educated population. Regarding occupation, 45.3% were employers, while 15.9% were teachers, and 9.7% worked in healthcare, which may influence their awareness and attitudes toward health-related issues. In terms of economic status, 64.1% reported a monthly income between 1,000-3,000 Libyan Dinars, while only 2.8% earned above 5,000, indicating a predominantly middle-income population. Particularly, 12.2% reported having a family member diagnosed with stomach cancer, while 35.4% reported a history of other cancers in the family. Most participants were healthy, 76.3%, while 29.2% reported having upper gastrointestinal disorders, suggesting a possible gap in health literacy or access to diagnostic services that may contribute to a delayed diagnosis.

Table 1. Demographic, social, and economic characteristics of the participants:

Characteristic	Category	Count	%
Age	20-29	142	32.6
	30-39	115	26.4
	40-49	81	18.6
	50-59	71	16.3
	60 and above	26	6.0
Gender	Male	194	44.6
	Female	241	55.4
Residence	City	290	66.7
	Rural area	145	33.3
Educational level	Primary	8	1.8
	Intermediate	35	8.0
	Secondary	37	8.5
	University or higher	355	81.6
Profession	Employee	197	45.3
	Teacher	69	15.9
	health care provider	42	9.7
	Retired	11	2.5
	Student	67	15.4
	Home wife	35	8.0
	Other	14	3.2
Monthly income	< 1000	103	23.7
	1000-3000	279	64.1
	3000-5000	41	9.4
	> 5000	12	2.8
Is there a family member diagnosed with stomach cancer	Yes	53	12.2
	No	351	80.7
	I don't know	31	7.1
Are there other types of cancer in the family	Yes	154	35.4
	No	254	58.4
	I don't know	27	6.2
Do you suffer from diseases of the stomach or esophagus (such as inflammation or ulcers)	Yes	127	29.2
	No	289	66.4
	I don't know	19	4.4
Health status	Poor	8	1.8
	Average	95	21.8
	Good	332	76.3

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Knowledge about risk factors and warning symptoms of Gastric cancer:

Table 2 represents the participants' knowledge about risk factors of GC, where participants demonstrated high awareness of certain risk factors such as alcohol addiction (82.5%), smoking (74.9%), and gastric polyps (63.0%). Additionally, about half of the respondents recognized older age (55.4%) and Helicobacter pylori gastritis (51.7%) as risk factors of the disease. On the other hand, only 43.4% and 47.6% identified partial gastrectomy and occupational exposures, respectively, as risk factors associated with gastric cancer, indicating moderate public knowledge regarding structural and environmental risk contributors.

Awareness was particularly low for vitamin B12 deficiency and blood group, with only 23.0% and 10.6%, respectively, identifying these as risk factors, while nearly half (48.0% and 67.4%) responded with "I don't know". This suggests a limited understanding of hematologic and genetic predisposition in the population. Misconceptions or uncertainty were also prevalent regarding gender, where nearly half (49.2%) did not know whether being male increases risk, and only 34.7% believed it does. Additionally, dietary factors such as salted food (43.0%) and processed or grilled meats (45.3%) were moderately recognized.

Table 2: Participants' knowledge about risk factors of GC (n=435)

Factors	Category	Count	%
Males	Yes	151	34.7
	No	70	16.0
	I don't know	214	49.2
Older age	Yes	241	55.4
	No	58	13.3
	I don't know	136	31.3
Helicobacter pylori gastritis	Yes	225	51.7
	No	77	17.7
	I don't know	133	30.6
Partial gastrectomy	Yes	189	43.4
	No	112	25.7
	I don't know	134	30.8
Certain benign tumors in the stomach (polyps)	Yes	274	63.0
	No	66	15.2
	I don't know	95	21.8
Vitamin B12 deficiency	Yes	100	23.0
	No	126	29.0
	I don't know	209	48.0
Consumption of salted food (pickled vegetables, salted fish or meat)	Yes	187	43.0
	No	117	26.9
	I don't know	131	30.1
Consumption of processed or grilled meats	Yes	197	45.3
	No	124	28.5
	I don't know	114	26.2
Smoking	Yes	326	74.9
	No	49	11.3
	I don't know	60	13.8
Alcohol addiction	Yes	359	82.5
	No	39	9.0
	I don't know	37	8.5
Some professions (coal, metals, or rubber)	Yes	207	47.6
	No	83	19.1
	I don't know	145	33.3
Blood group	Yes	46	10.6
	No	96	22.1
	I don't know	293	67.4

Table 3 illustrates participants' responses regarding their knowledge of symptoms associated with GC. Overall, the findings reveal varying levels of awareness; the majority of respondents correctly recognized abdominal pain (74.0%), a palpable abdominal mass (71.5%), and fatigue or weakness (70.6%) as potential symptoms. These results indicate a relatively good awareness of obvious or distressing manifestations of gastric cancer.

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Additionally, over half of the participants identified nausea and repeated vomiting (67.1%), blood in the stool (63.2%), and heartburn or indigestion (62.3%) as warning signs. Loss of appetite was also acknowledged by 60.7%, and feeling full after eating small amounts by 53.6%. These findings suggest a moderate understanding of some common gastrointestinal symptoms associated with gastric malignancies. In general, the relatively high frequency of "I don't know" responses ranging from 17.5% to 71.3% across several risk factors reflects gaps in public knowledge. These gaps may hinder early detection efforts, as individuals who are unaware of key symptoms may delay seeking medical attention.

Table 3. Participants' knowledge about warning symptoms of GC

Symptoms	Category	Count	%
Loss of appetite	Yes	264	60.7
	No	58	13.3
	I don't know	113	26.0
Nausea and repeated vomiting	Yes	292	67.1
	No	49	11.3
	I don't know	94	21.6
Weight loss	Yes	310	71.3
	No	34	20.9
	I don't know	91	7.8
Feeling of fullness after a small amount (early satiety)	Yes	233	53.6
	No	78	17.9
	I don't know	124	28.5
A feeling of a mass in the abdomen	Yes	311	71.5
	No	40	9.2
	I don't know	84	19.3
Pain in the abdomen	Yes	322	74.0
	No	37	8.5
	I don't know	76	17.5
Heartburn or indigestion	Yes	271	62.3
	No	57	13.1
	I don't know	107	24.6
Blood in the stool that may appear dark brown or black	Yes	275	63.2
	No	62	14.3
	I don't know	98	22.5
Feeling tired or weak	Yes	307	70.6
	No	35	8.0
	I don't know	93	21.4

Table 4 provides a summary of the knowledge levels among the 435 participant regarding GC, including awareness of risk factors, warning symptoms, from a total of 22 points, the results indicate that 42.7% of participants demonstrated a moderate level of knowledge, followed by 34.5% with a high level, and 22.8% with a low level.

Table 4. Participants' knowledge levels about stomach cancer

Level of knowledge	Count	%
Low	99	22.8
Moderate	186	42.7
High	150	34.5
Total	435	100.0

Association between GC knowledge and socio-demographic data of the participants.

Table 5 explores the relationship between various sociodemographic variables and participants' knowledge levels regarding GC. Chi-square tests were used to examine associations, and several significant findings were observed. Educational level showed a statistically significant association with knowledge level, $x^2 = 28.69$, $p < 0.001$. Participants with university or higher education were substantially more likely to demonstrate high knowledge (31.3%) compared to those with only primary (0.2%) or secondary education (1.1%). Profession was also significantly associated with knowledge, $x^2 = 45.78$, $p < 0.001$. Teachers and health care providers had the highest proportions of participants in the high knowledge category (9.4% and 3.2%, respectively). Monthly income showed a statistically significant but modest association, $x^2 = 15.06$, p

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= 0.020. Those earning more than 3,000 LYD per month were more likely to have high knowledge. In contrast, age (p = 0.053) and gender (p = 0.077) did not reach statistical significance, though trends suggest that younger age groups and females may have slightly better knowledge. Residence (urban vs. rural) also showed no significant association (p = 0.563).

Table 5. Factors associated and knowledge score (sex, Age, residence, level of education, Profession, Monthly income)

Variables	Level of Knowledge						Chi square	P value
	Low		Moderate		High			
	Count	%	Count	%	Count	%		
Age								
20-29	29	6.7	68	15.6	45	10.3	15.358	0.053
30-39	28	6.4	50	11.5	37	8.5		
40-49	18	4.1	36	8.3	27	6.2		
50-59	18	4.1	29	6.7	24	5.5		
60 and above	6	1.4	3	0.7	17	3.9		
Gender								
Male	46	10.6	92	21.1	56	12.9	5.125	0.077
Female	53	12.2	94	21.6	94	21.6		
Residence								
City	68	15.6	127	29.2	95	21.8	1.150	0.563
Rural area	31	7.1	59	13.6	55	12.6		
Educational level								
Primary	4	0.9	3	0.7	1	0.2	28.688	< 0.001
Intermediate	10	2.3	17	3.9	8	1.8		
Secondary	19	4.4	13	3.0	5	1.1		
University or higher	66	15.2	153	35.2	136	31.3		
Profession								
Employee	54	12.4	92	21.1	51	11.7	45.775	< 0.001
Teacher	6	1.4	22	5.1	41	9.4		
health care provider	13	3.0	15	3.4	14	3.2		
Retired	3	0.7	1	0.2	7	1.6		
Student	10	2.3	32	7.4	25	5.7		
Home wife	6	1.4	18	4.1	11	2.5		
Other	7	1.6	6	1.4	1	0.2		
Monthly income								
< 1000	21	4.8	53	12.2	29	6.7	15.058	0.020
1000-3000	68	15.6	118	27.1	93	21.4		
3000-5000	6	1.4	11	2.5	24	5.5		
> 5000	4	0.9	4	0.9	4	0.9		

Discussion

Despite a global decline in incidence, GC continues to rank as the fourth most common cause of cancer-related death worldwide. The geographic range of gastric cancer is extremely broad, with the highest rates observed in East Asian countries such as Japan, South Korea, and China than other parts of the world.2 In Libya, it ranks 12th most frequent disease in the country, according to the Global Cancer Observatory.3 In 2008, reported that gastric cancer constituted 5.5% of cancers in males and 5.2% in females in the western region, whereas in 2012 found that gastric cancer accounted for 2.7% of all cancer cases in eastern Libya.4,5 However, the level of public knowledge about risk factors of gastric cancer has not been studied yet in Libya after a broad search for published articles concerning with disease. The present study is the first large-scale survey conducted in Zawia City, Libya, aimed at assessing public awareness of the risk factors and warning symptoms of gastric cancer. The findings indicate a relatively high level of knowledge about the disease itself; however, public health awareness campaigns still face challenges in effectively raising awareness about the risk factors that could help prevent its occurrence.

Our results showed that the knowledge level of GC varied significantly according to the socio-demographic characteristics of the participants, which were also reported in some previous studies [16,17]. Our results align with Ghanaei et al and Wang et al., who found that women and individuals in the middle age group were significantly more knowledgeable about gastric cancer (p=0.001) [9,15]. This finding could be due to

the fact that women are more likely to be family caregivers, which means they normally have contact with the healthcare system more frequently and have greater access to cancer information. Also, this study reported that highly educated participants and those with high income have good awareness, and this suggests that education plays a crucial role in equipping individuals with health-related knowledge, supporting findings from global literature that links higher education with better cancer awareness [15,18]. Our study reported that 34.7% believed being male is a risk factor, and as well, 55.4% recognized older age as an identifiably non-modifiable risk factor of the disease. These findings are consistent with a study by Wang et al (2024), and Kyle et al (2013), who reported that approximately one-third of respondents recognized these variables as risk factors [15,19].

Moreover, the majority of participants recognized smoking (74.9%) and alcohol addiction (82.5%) as key risks. Additionally, about half of the respondents recognized Helicobacter pylori gastritis (51.7%), while (63%) identified gastric polyps as a risk factor. However, fewer participants recognized partial gastrectomy (43.4%), and occupational exposures 47.6% as risk factors. These results are consistent with findings in other studies as Wang (2024), Pan (2021), and Plummer (2016) [15,20,21]. These findings suggest moderate public knowledge regarding structural and environmental risk contributors.

Furthermore, our study revealed that participants had limited knowledge of disease risk factors especially evident for vitamin B12 deficiency and blood group, with only 23.0% and 10.6%, respectively identifying these as risk factors, while nearly half (48.0% and 67.4%) responded with (I don't know) corresponding with Korean and Iranian populations studies [9,10]. These results indicate that people tend to be more likely to neglect non-modifiable risk factors and highlight selective awareness with significant uncertainty about several clinical and biological risk factors.

A total of 22.8% of participants were found to have a low level of knowledge. Although this indicates a relatively good overall awareness, it is higher than the 14.7% reported in a study conducted among the Saudi population, but lower than the 47% reported in a previous study involving China's general population.16,22 This result can be attributed to the relatively high educational level among participants, with 81.6% having attended college or higher. Nonetheless, while 42.7% of the surveyed Libyan community demonstrated at least moderate knowledge of gastric cancer, a considerable proportion still falls into the low knowledge category, which may hinder efforts toward early detection and prevention, particularly among populations with limited access to health information.

Conclusion

This study provides the first comprehensive assessment of public awareness regarding gastric cancer in Zawia City, Libya, revealing moderate overall knowledge, especially of common risk factors like smoking and alcohol use. However, gaps remain in understanding less visible risks. Socioeconomic factors such as education, income, and occupation were strongly linked to awareness levels. These findings highlight the need for targeted health education campaigns and for integrating gastric cancer awareness into primary care and community programs to support early detection and prevention.

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