

Predictive value of alarm features in diagnosing upper gastrointestinal malignancies among dyspeptic patients: A cross-sectional study in Ethiopia

Wudassie Melak¹, Wassihun Asmare^{2*}, Abate Bane¹, Mengistu Erkie¹

¹Department of Internal Medicine, Addis Ababa University, College of Health Sciences, Addis Ababa 1000, Ethiopia. ²Department of Internal Medicine, Howard University Hospital, Washington DC 20060, USA.

*Corresponding to: Wassihun Asmare, Department of Internal Medicine, Howard University Hospital, 2041 Georgia Ave NW, Washington DC 20060, USA. E-mail: negawass@yahoo.com.

Author contributions

Wudassie, M., Wassihun, A., Abate, B.: writing the original draft; resources; methodology; project administration; supervision. Wassihun, A., Abate, B., Mengistu, E: methodology, project administration Wassihun, A., Abate, B.: software, resources, data curation, and visualisation. Wassihun, A., Abate, B., Mengistu, E: supervision, project administration, writing review, and editing; All authors read and approved the manuscript.

Competing interests

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Abbreviations

GI, Gastrointestinal; UGI, upper gastrointestinal; AMC, Adera Medical Centre; CT, Computed topography; CI, Confidence Interval; ENT, Ear-Nose-Throat; EGD, Esophagogastroduodenoscopy; NPV, Negative Predictive Value; PUD, Peptic Ulcer Disease; PPV, Positive Predictive Value; SEF, Significant Endoscopic Findings; TASH, Tikur Anbessa Special Hospital; UGI, Upper Gastrointestinal.

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Abstract

Objective: The study aimed to determine the overall predictive value of alarm features in diagnosing upper Gastrointestinal (GI) malignancies and significant endoscopic findings among patients undergoing elective Esophagogastroduodenoscopy (EGD) at Tikur Anbessa Special Hospital (TASH) and Adera Medical Centre (AMC). **Methods:** It was an institution-based cross-sectional study conducted on patients undergoing elective endoscopy for an upper GI complaint from July to September 2022. Data was collected from patient charts, and biopsies were taken for histologic confirmation. The study assessed the association of alarm symptoms and signs with significant upper gastrointestinal (UGI) endoscopic findings and malignancies. **Results:** 142 patients were selected, with an average age of 48.35 and 52.1% being male. Epigastric pain was the most common reason for an endoscopy. 62% of patients had at least one alarm feature, the most common being unexplained weight loss and UGI bleeding. The study found a strong association between the presence of alarm features, significant endoscopic findings, and UGI malignancies. The pooled sensitivity and specificity of any alarm feature for any significant finding were 79% and 64.9%, respectively, and for malignancy, 100% and 39.7%, respectively. The presence of the alarm feature was associated with an increase of 6.801 in the odds of developing SEF and an increase of 4.199 in the odds of developing malignancy. **Conclusions:** UGI alarm symptoms and signs like an abdominal mass, persistent vomiting, dysphagia, and UGI bleeding are predictive of significant endoscopic findings and malignancies. Hence, EGD should be done and suspicious lesions should be biopsied early, regardless of gender, age, or duration of symptoms.

Keywords: alarm symptoms; dyspepsia; endoscopy; gastric cancer; PUD; esophageal cancer

Introduction

Estimates for the percentage of people in wealthy countries who suffer from digestive problems range from 10% to 30%. These signs may include early satiety, upper abdominal discomfort, burning sensations, and post-meal fullness emotions. To be deemed dyspepsia, these symptoms must be severe enough to interfere with everyday activities, occur at least three days a week for the previous three months, and last for at least six months. Both primary care physicians and specialists frequently encounter this problem; however, in the majority of instances, no underlying organic or metabolic cause can be identified, hence it is categorised as a functional gastrointestinal disorder [1].

Certain clinical characteristics, called “alarm features” or “red flags,” may indicate the presence of serious gastrointestinal disease, including cancer, and require immediate endoscopy [2]. These include sudden dyspepsia in older people, certain symptoms like trouble swallowing, vomiting, or weight loss at any age, or the start of dyspepsia in a person with a known cancer risk factor like Barrett’s oesophagus, pernicious anaemia, or a history of peptic ulcer surgery [3]. Not investigating patients with these alarm features can lead to delays in cancer diagnosis. Gastric cancer is one of the most common types of cancer worldwide, and according to the World Health Organisation, cancer is the leading cause of death before age 70 in 91 out of 172 countries [4]. Stomach cancer remains a significant global health issue, causing over 1 million new cases in 2018 and an estimated 783,000 deaths, making it the fifth most commonly diagnosed cancer and the third leading cause of cancer-related deaths [5].

The main risk factor for stomach cancer is infection with the bacterium *Helicobacter pylori*, which is responsible for almost 90% of cases of noncardiac gastric cancer [6–9]. While the prevalence of *H. pylori* infection is associated with an increased incidence of stomach cancer, other factors, such as diet, also play a role [10]. Consuming salty foods, eating few fruits, drinking alcohol, and actively smoking are all known risk factors for stomach cancer [11, 12].

With 572,000 new cases and 509,000 cancer-related deaths in 2018, esophageal cancer is the sixth most frequent disease in terms of incidence and mortality. This suggests that esophageal cancer is the primary cause of 1 in 20 cancer deaths worldwide [13–16]. With a 2 to 3 fold variation in incidence and fatality rates between men and women, as well as across various locations, the majority of cases affect males. Esophageal cancer is the sixth most common cancer-related cause of death in nations with higher Human Development Index scores, while males also have greater rates of the disease [17–21]. Esophageal cancer is very prevalent in various countries in Eastern and Southern Africa. For instance, it is the top cause of cancer mortality among Kenyan males, while Malawi has the highest incidence rates worldwide for both men and women. Additionally, patients in Ethiopia with stomach cancer are more likely to come from the capital city than those with esophageal cancer, which is more common among patients from various locations [5, 6]. The highest rates are seen in Eastern Asia, notably in China and Mongolia, which are among the top 5 globally. Eastern Africa has the third-highest incidence rates among men [6].

The bulk of Ethiopia’s population, which was estimated to be 109 million in 2018 [22–24], lives in rural regions and is dependent on subsistence farming. Primary hospitals, health clinics, and satellite health posts provide primary care throughout the nation. General hospitals provide secondary care, while specialty hospitals provide specialised treatment [22]. The referral system may be horizontal between facilities that offer comparable services or vertical between levels of care. 2017 research found that 60% of Ethiopia’s disability-adjusted life years were accounted for by communicable, maternal, neonatal, and nutritional disorders; 33% by non-communicable diseases; and 8% by injuries [7]. The population has a high prevalence of dyspepsia [8]. Guidelines recommend early endoscopy in dyspeptic patients over the age of 55 who have alarming

symptoms [9]. There aren’t many data on endoscopy and endoscopic findings in Ethiopian patients with warning signs; therefore, it’s not yet obvious whether to heed or adjust such advice.

Endoscopy access is severely limited in eastern sub-Saharan Africa, including Ethiopia, despite a high burden of gastrointestinal disease [10]. On top of that, there is a late referral of patients to the endoscopy service providers due to health care-related and patient-related factors. Health-related problems include the inability to identify the disease with the earliest symptoms and signs, a lack of awareness about the use of endoscopy, or simple negligence. Patient-related factors include finances, living in a remote area, and being unaware of the consequences. These will impact early diagnosis [24–27]. A delay in the referral system, lack of transportation from rural areas, financial constraints, and the poor health-seeking behaviour of most of the population lead to late diagnosis and intervention, resulting in poor outcomes or fatal complications [11, 12]. Both the public’s understanding of cancer and the availability of early detection methods are lacking in underdeveloped nations. As a result, patients frequently receive a cancer diagnosis in its advanced or deadly stages. The lack of diagnostic tools and treatments like radiation and chemotherapy in these countries further complicates the issue of caring for these people [6].

Identifying clinical signs and symptoms that indicate a potentially serious underlying disease in patients with upper GI complaints is an important step in addressing patients’ delayed presentations, who would otherwise be managed before the disease progressed to a life-threatening stage.

So far, there has been no study done in Ethiopia to assess to what extent the red flags could help identify patients with significant UGI pathologies. Some African studies have yielded mixed results, with age and weight loss being predictive of upper GI malignancies. However, whether the duration of symptoms affects disease stage has not been assessed in the literature. Age above 55 has also been shown to be a risk factor for patients with new-onset dyspepsia, whereas this is untrue in our case as a significant number of patients present before the stated age [13–15].

Method

Study area, design, and period

This research, which was conducted from July 2018 to September 2022, is a prospective observation of individuals who have decided to have an endoscopy for dyspepsia symptoms at a hospital that specialises in delivering cutting-edge medical treatment and instruction. The study is multicenter and was conducted at TASH and AMC. All patients who underwent EGD for upper GI complaints from July 1, 2018, to September 30, 2022, at the TASH GI unit and AMC endoscopy units were our source population. All patients with EGD who had a complaint of dyspepsia and alarm symptoms at the TASH GI unit, the AMC, and the Tor hailoch General Hospital (THGH) endoscopy units during the study period were eligible.

The TASH Gastroenterology Unit was established in 1979. The unit currently has nine full-time senior staff, five fellows, seven trained nurses, and other supportive staff. The unit manages the training entrance with three functional scope stations and provides both diagnostic and therapeutic EGD and colonoscopy three times per week on a regular basis. It is open seven days a week for emergency procedures, including duty hours. The unit provides an outpatient clinic service three times per week and has an inpatient ward. It provides multiple consultation services from different units in the department, including ICUs and interdepartmental consultation, mainly from the obstetrics and gynaecology department. The GI unit accepts patients from all over the country through a referral format provided by the respective hospitals for the various services provided in the unit.

Adera Medical Centre (AMC) was established in 2008. It is located on Bole Road, close to the Addis Ababa Museum. It was founded as a pioneer in therapeutic endoscopy by Professor Abate Bane and associates, a consultant internist and gastroenterologist. It is equipped

with endoscopy suits for both diagnostic and therapeutic procedures, outpatient and inpatient units for different disciplines, including services in gastroenterology/hepatology, general surgery, ENT, neurology, orthopaedics, and oncology, as well as advanced molecular labs, CT scans, fibro scans, sonography, and other imaging.

Sample size determination and procedure

The Burderer formula is used to determine the sample size. Shetty et al. [28] published similar research from India. They found that 22.3 percent of patients with alarm symptoms had malignancy, with an overall sensitivity of 92% and a specificity of 81.2% for predicting malignancy [22, 29–31].

Based on the formula, the sample size is generated using a web-based calculator, as shown in Table 1. The level of statistical significance is set at a 95% confidence interval (CI) with a 5% likelihood of error (α). The 10 percent non-response rate is chosen based on the chronic nature of the disease and the prevailing social impact that it imposes.

Significant endoscopic findings

Includes any finding deemed to be pathologic or abnormal and to which the patient's symptoms can be ascribed. It includes the endoscopically proven diagnosis of esophageal stricture, esophagitis, mucosal ulceration, mucosal erosion, hiatal hernia, gastric ulcer, gastropathy, demonopathy, duodenal ulcer, and gastric outlet obstruction.

This is a description of a group of symptoms that are thought to be dyspepsia-related. These symptoms include difficulty feeling full after eating and a burning sensation in the upper stomach that occur frequently enough to interfere with daily activities and have been present for at least three days per week for the past three months over the course of at least six months.

Data collection tools and procedures

This study examines a cohort of patients who have presented with symptoms including postprandial fullness, early satiety, and epigastric pain and burning, which have significantly impaired their daily functioning. These symptoms have persisted for a minimum of three days per week over the course of the past three months, with an onset occurring at least six months ago. The study documents data pertaining to the patients' concurrent medication usage, potential substance dependencies, anthropometric measurements (height and weight), body mass index, as well as any additional symptoms that could potentially signify a more severe ailment, such as anaemia, substantial weight reduction, abdominal masses, cervical lymph node enlargement, persistent emesis, gastrointestinal bleeding, dysphagia, and a familial cancer history. All patients will have an endoscopic technique known as an esophagogastroduodenoscopy (EGD) conducted by proficient medical practitioners. This operation entails the use of a camera to visually inspect the interior of the stomach, and any regions of concern will be subjected to a biopsy and subsequent microscopic examination to ascertain the presence of cancerous cells. The data collectors received a two-day training session that covered the objectives of the study, strategies for data extraction, and coding procedures. Data was acquired from many sources, including the TASH, AMC, THGH GI, and Pathology divisions. Prior to the commencement of the study, the data extraction format underwent testing. A preliminary examination was conducted on a subset comprising 10% of the minimum required sample size of endoscopic reports, which were subsequently excluded from the research. The necessary adjustments were implemented in accordance with the findings from the pre-test evaluation. The existence or absence of critical parameters indicated in the data extraction format was evaluated in the endoscopic report of each eligible patient and afterwards recorded by the data collectors.

The supervisor ensured that each form was accurately completed and that data entry was executed according to the established plan. The data collection period spanned from July 1, 2021, to September 30, 2022.

Table 1 Generated using web-based calculator

Factors for diagnostic test evaluation	Frequency
Expected Sensitivity	0.92
Expected Specificity	0.812
Prevalence of disease (p)	0.223
Precision ($\pm$ expected)	0.10
Confidence level 100 ($1-\alpha$)	95
Expected dropout rate	10
Sample size for sensitivity, n_{sen}	127
Sample size for specificity, n_{spec}	76
Final sample size (largest), n	127
Final sample size (with 10% dropout), n_{drop}	142

Data processing and analysis

In this study, individuals undergoing elective EGD—a surgery to inspect the upper digestive tract—will be watched in the future for symptoms including upper stomach pain or discomfort, feeling full immediately after eating, and upper stomach burning. It will run from July 2018 to September 2022 at a facility that focuses on instructing and caring for patients with difficult medical issues. The study will document pertinent details about the patient's health, such as the prescription drugs they are using, any addictions they may have, their height, weight, and body mass index, as well as any additional symptoms that could point to a serious condition, like anaemia, significant weight loss, or a family history of cancer. The patient's upper digestive system will be examined using EGD as part of the investigation, and if any worrisome lesions are discovered, several biopsies will be taken. Statistical software will be used to evaluate the data, and descriptive statistics will be used to show the results. For upper gastrointestinal disorders, the diagnostic accuracy of several parameters, including age, sex, and specific symptoms, will be evaluated using logistic regression analysis.

Logistic regression models were used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for sex, age group, and each warning symptom. We used histology, which is the gold standard for diagnosing UGI cancers, to figure out the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of each alarm characteristic, both on its own and as a whole, based on this cutoff point. The results of basic descriptive statistics were presented as frequency tables. Categorical data were compared using χ^2 test or Fisher's exact test, where appropriate. *P*-values less than 0.05 were considered significant.

Results

Sociodemographic characteristics

From July 1 to September 30, 2022, a total of 142 patients underwent gastroscopy, 40 at AMC and 102 at TASH.

Men accounted for the majority of cases, 74 (52.1%), as shown in Figure 1. Eighty-six (60.6%) were married, and 52.8 percent were from Addis Ababa, with Oromos and Amhara ethnic groups accounting for 21.1 and 11.3 percent, respectively, as shown in Table 2. The mean age of study participants at the presentation was 48.35 ($\pm$ 2.97), with a range of 15–88 years and a median age of 50 years (see Figure 2). The mean BMI was 22.24 ($\pm$ 0.70), the median was 22, and the majority of participants (47.9%) ranged from 18.5 to 25.

Clinical presentation of patients

Epigastric pain was present in 45.1%, followed by postprandial discomfort and dysphagia with a frequency of 46 (32.4%) and 22 (15.5%), respectively. 51 (35.9%) of patients reported having the symptom for more than a year, as shown in Table 3.

One third of patients presented after having symptoms for over a year, as shown in Figure 3. A chi-squared test revealed no link between the alarm features and the duration of symptoms.

The reported type of *H. pylori* is *H. pylori* stool antigen and serum antibody testing only. The *H. pylori* test is negative in the majority of patients (107, or 75.4%), and stool antigen and serum antibody tests were positive in 24 (16.9%) and 11 (7.7%) of patients, respectively, as

Expected sensitivity:	0.92
Expected specificity:	0.812
Prevalence of disease (p):	0.223
Precision ($\pm$ expected):	0.10
Confidence level $100(1 - \alpha)$:	95 %
Expected dropout rate:	10 %
Calculate Reset	
Sample size for sensitivity, n_{sen} =	127
Sample size for specificity, n_{spec} =	76
Final sample size (largest), n =	127
Final sample size (with 10% dropout), n_{drop} =	142

Figure 1 Distribution of cases seen at TASH and AMC

Table 2 Sociodemographic characteristics of patients seen at TASH and AMC (September 2022)

Variable	Parameter	Frequency	Percent
Age group	< 18	6	4.2
	18-25	14	9.9
	26-40	38	26.8
	41-50	21	14.8
	51-65	41	28.9
	> 65	22	15.5
Gender	Male	74	52.1
	Female	68	47.9
Residence	Addis Ababa	64	45.1
	Amhara	14	9.9
	Oromia	29	20.4
	SNNP	13	9.2
	Tigre	8	5.6
	Somali	7	4.9
	Other	7	4.9
Marital status	Married	86	60.6
	Single	37	26.1
	Divorced	9	6.3
	Widow	10	7.0
Educational status	Cannot W/R	28	19.7
	Can only W/R	10	7.0
	Primary education	35	24.6
	Secondary education	41	28.9
	Tertiary education	28	19.7
Religion	Orthodox	78	54.9
	Muslim	34	23.9
	Protestant	28	19.7
	Other	2	1.4
Occupation	Unemployed	74	52.1
	Government Employee	32	22.5
	Private Employee	23	16.2
	Entrepreneur	13	9.2
BMI	< 18.5	35	24.6
	18.5-24.9	68	47.9
	25-29.9	32	22.5
	30-34.9	5	3.5
	35 and above	2	1.4

shown in Figure 4.

Eighty-eight (68%) of the patients with upper GI symptoms had at least one alarming symptom. As shown in the figure below, weight loss and melena were the two most prevalent alarming symptoms. Most patients presented.

Alarm signs were identified in 65 (45.8%) of patients, among whom anaemia was identified in 41 (63.1%). 57 (40.1%) people mentioned having a history of GI disease, 33 (57.8%) of whom reported having PUD, and 13 (22.8%) could not recall the precise diagnosis they had. PPIs were the most commonly prescribed drugs for presumed patient complaints, which the patients took prior to presentation: 70 (49.3%),

followed by ASA 8 (5.6%), antibiotics 8 (5.6%), and NSAIDs 3 (2.1%), as shown in Figure 5.

Also, 37 (26.1%) of the patients said they had had H. pylori in the past and had been treated with triple therapy. Of these, 15 (34.9%) reported complete improvement, 13 (30.2%) improved with early symptom recurrence, 9 (20.9%) stopped treatment for different reasons, and 4 (9.3%) did not get better at all. 80 (56.3%) people reported having known chronic medical conditions, with hypertension (29, 20.4%) and diabetes (20, 14.1%) being the most prevalent diagnoses, then renal disease (9, 6.3%), allergic rhinitis (5, 3.5%), migraine headache (4, 2.8%), and HIV (4, 2.8%). Less than 2% of

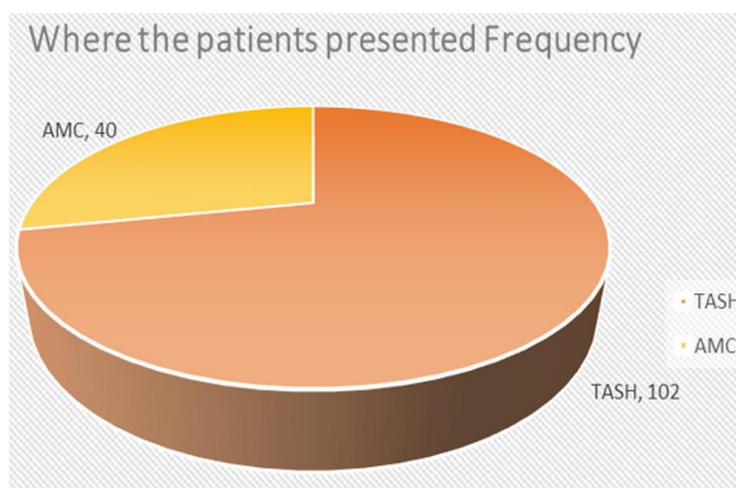


Figure 2 Distribution of age seen at TASH and AMC

Table 3 Frequency of main complaints according to gender at TASH and AMC 2022

Main complaint of the patient	Sex of the respondent			
	Male		Female	
post prandial discomfort	33	44.60%	13	19.10%
Epigastric pain	23	31.10%	41	60.30%
odynophagia	6	8.10%	3	4.40%
dysphagia	12	16.20%	10	14.70%
Primary site workup	0	0.00%	1	1.50%
Total	74	52.10%	68	47.90%

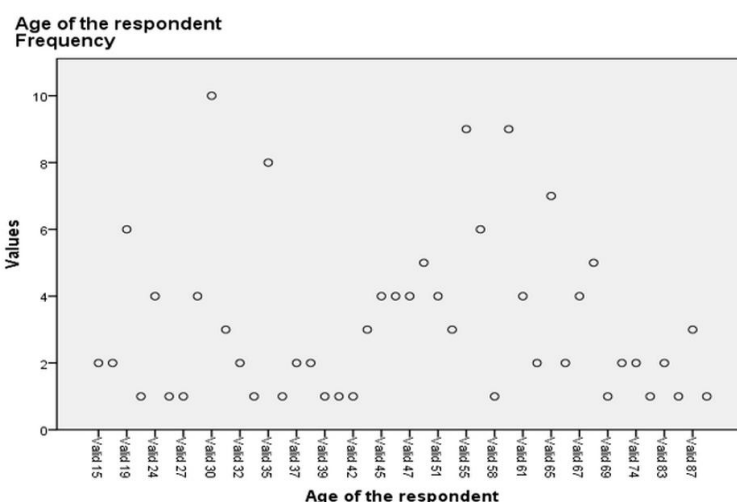


Figure 3 Duration of upper GI symptoms seen at TASH and AMC (July-September 2022)

patients reported having cardiac disease, ovarian mass, or bone disease.

The majority of patients, 128 (90.1%), denied having ever smoked a cigarette. where 83 (58.5%) of the patients have never ingested alcohol. Only five (3.5%) people described daily alcohol intake.

Endoscopic findings

The most frequent endoscopic finding was normal EGD in 37 (26.1%), as depicted in Table 4. Significant findings were reported in 105 (73.9%) patients, among whom esophagitis accounted for the

most frequently identified lesion, 22 (20.9%), followed by gastropathy and duodenal ulcers with a frequency of 13.4 (13.4%) and 8.5 (11.4%), respectively. There is a strong association between the presence of alarm features and significant endoscopic findings.

Biopsies were obtained for 37 (26.1%) patients with a presumed endoscopic diagnosis to rule out malignancy or an inflammatory or infectious condition. Out of these, 26 (70%) were confirmed to have malignancy of the stomach or oesophagus, as shown in Table 5.

There is a strong association between the presence of alarm features

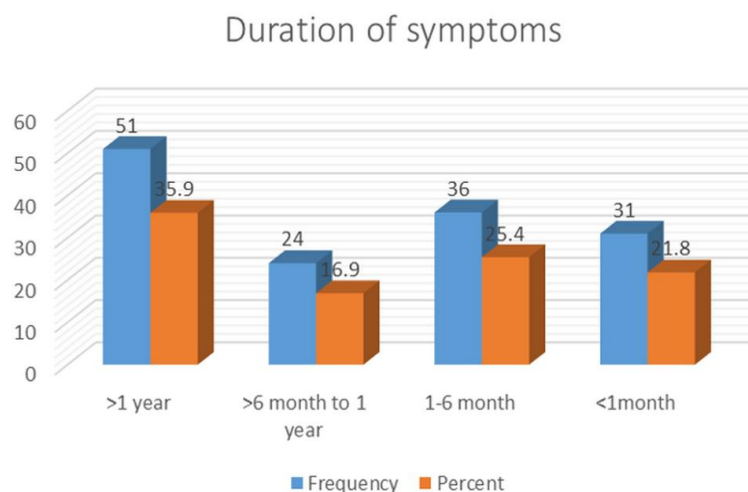


Figure 4 Distribution of H pylori test result

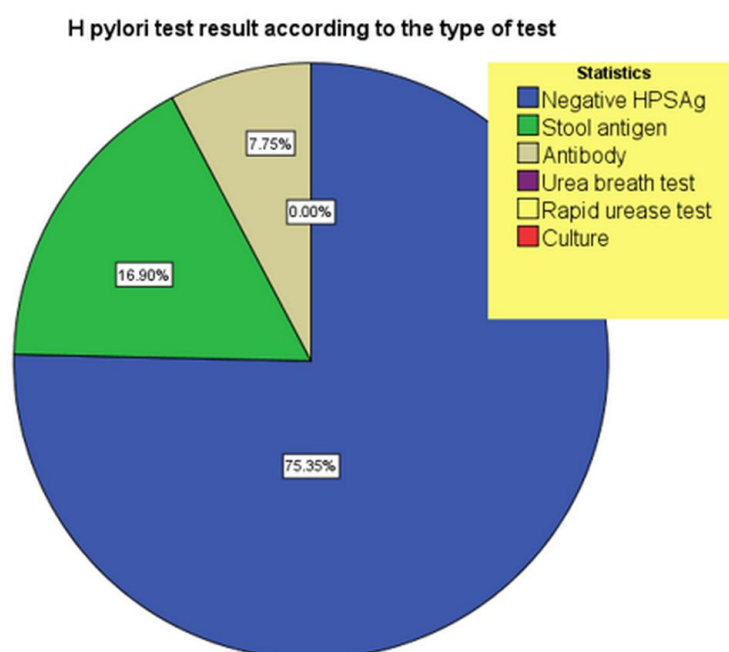


Figure 5 Distribution of alarming signs reported at TASH and AMC (July-September 2022)

Table 4 Type of Endoscopic findings reported at TASH and AMC (July-September 2022)

No.	Type of Endoscopic finding	Frequency	Percent	From Abnormal findings (%)
1	Normal	37	26.1	-
2	Esophagitis	22	15.5	20.9
3	Gastropathy	19	13.4	18.1
4	Dudenal ulcer	12	8.5	11.4
5	Esophageal mass	11	7.7	10.5
6	Gastric mass	10	7.0	9.5
7	Esophageal stricture	8	5.6	7.6
8	Duodenal deformity	6	4.2	5.7
9	GOO	6	4.2	5.7
10	Hiatal Hernia	6	4.2	5.7
11	Gastric ulcer	4	2.8	3.8
12	Gastric polyp	1	0.7	1.0
	Total	142	100.0	100

Table 5 Type of histologic findings reported at TASH and AMC (July-September 2022)

Histologic findings	Frequency	Percent
Esophagitis	8	21.6
SCC of the esophagus	7	18.9
gastric adenocarcinoma	7	18.9
Gastritis	4	10.8
Adenocarcinoma of the esophagus	4	10.8
GIST	4	10.8
Atrophic gastropathy/gastritis	2	5.4
other	1	2.7
Total	37	100

Table 6 Malignancy detected in relation to whether alarm features were present or absent, at TASH and AMC (July-September 2022)

		Malignancy detected			
		Yes	%	No	%
Having alarm symptoms	yes	23	16.19	65	45.77
	no	3	2.11	51	35.92
Having Alarm Signs	yes	21	14.79	44	30.98
	no	5	3.52	72	50.71

Table 7 Significant endoscopic findings detected in relation to whether alarm features were present or absent, at TASH and AMC (July-September 2022)

		Significant Endoscopic Finding			
		Yes	%	No	%
Having alarming symptoms	yes	76	53.52	12	8.45
	no	29	20.42	25	17.61
Having Alarming signs	yes	57	40.14	8	5.63
	no	48	33.81	29	20.42

Table 8 The sensitivity, specificity, PPV, and NPV values of different variables in identifying significant endoscopic findings (July-September 2022)

NO.	Variable affecting outcome	Sensitivity %	Specificity %	PPV %	NPV %
1	Short Duration of symptom below 6 months	53.3	73.0	84.8	35.5
2	duration below 12 months	70.5	51.4	80.4	38.0
3	Presence of all alarm features collectively	79.0	64.9	86.5	52.2
4	Presence of any alarm signs collectively	54.3	78.4	87.7	37.7
5	Presence of any alarm symptoms collectively	72.4	67.6	86.4	46.3
6	Weight loss	34.3,	81.1	83.7	30.3
7	GI bleeding	24.8	94.6	92.9	30.7
8	Dysphagia	6.7	97.3	87.5	26.9
9	Persistent vomiting	4.8,	100.0	100.0	27.0
10	Anemia	38.1	86.5	88.9	33.0
11	Abdominal mass	8.6	100.0	100.0	27.8

Table 9 List of various variables' performance in predicting GI malignancy

NO.	Variable affecting outcome	Sensitivity %	Specificity %	PPV %	NPV %
1	Short Duration of symptom below 6 months	69.2	58.6	27.3	89.5
2	duration below 12 months	80.8	38.8	22.8	90.0
3	Presence of all alarm features collectively**	100	39.7	27.1	100
4	Presence of any alarm signs collectively	80.8	62.1	32.3	62.1
5	Presence of any alarm symptoms collectively	88.5	44	26.1	94.4
6	Wt loss	34.6	70.7	20.9	82.8
7	GI bleeding	42.3	85.3	39.3	86.8
8	Dysphagia	7.7	94.8	25	82.1
9	Persistent vomiting	0	95.7	0	81
10	Anemia	65.4	75.9	37.8	90.7
11	Abdominal mass	11.5	94.8	33.3	82.7

and the presence of malignancy as shown in Table 6 and Table 7.

Sensitivity tests and correlations

The pooled sensitivity and specificity of any alarm feature for any significant finding are 79% and 64.9%, respectively; the PPV and NPV are 86.5% and 52.2%, respectively; and the 4.8/72.4%, 51.4/100%, 80.4/100%, and 26.9/46.3% for individual alarm symptoms are shown in Table 8 and Figure 6.

The pooled** sensitivity and specificity of any alarm feature for UGI malignancy are 100% and 39.7%, respectively, while the PPV and NPV for individual alarm signs were 0/88.5%, 38.8/95.7%, 0/39.3%, and 62.1/94.4%, as shown in Table 9.

Logistic regression

Logistic regression was performed to determine how the presence of alarming features and signs affects a patient's probability of developing GI malignancy. A total of 142 patients were included in the analysis. The model explained 26.9 percent of the variation in developing malignancy and correctly classified 83.1 percent of cases. The presence of an alarm sign was associated with an increase of 4.199 ($P = 0.016$, $OR = 4.199$) in the odds of developing malignancy. The presence of an alarm symptom was also associated with an increased tendency to develop malignancy ($OR = 3.582$, $P = 0.08$).

Logistic regression was also performed to determine how the presence of alarming symptoms and signs affects the patient's probability of having significant endoscopic findings (Figure 7). A total of 142 patients were included in the analysis. The model explained 36.8 percent of the variation in having SEF and correctly classified 81.7 percent of cases. The presence of an alarm symptom increased the likelihood of developing SEF by 6.801 ($P = 0.000$, 95% CI, 2.588–17.873). SEF was associated with a shorter duration of symptoms (less than a month); $OR = 0.047$, $P = 0.000$; 95% CI, 0.09–0.253 (Figure 8).

AUROC for age and malignancy is determined to be 0.773, 95% CI (0.661–0.886), indicating moderate malignancy predictive accuracy for age.

Discussion

The majority of participants in this research were over 50 years old, and there were about the same numbers of men and women. The results of research from Nigeria, Denmark, the UK, and Indonesia [3, 9, 23, 27, 29] are comparable to these. Overweight is less prevalent when compared to the other studies, where it is becoming a problem in many developing countries like Nigeria [9], and this may be due to the more frequent vegetable and fruit intake compared to that of a western lifestyle.

Similar to the findings of a study performed in India, the study discovered that the most often reported symptoms among dyspeptic patients were a burning feeling in the upper stomach, discomfort after eating, and trouble swallowing [22]. There were more females than males with epigastric pain and more males than females with postprandial discomfort, dysphagia, and odynophagia. In other studies, the most common findings were repeated vomiting and dysphagia [23].

It has been well documented that dyspepsia is common worldwide, and it remains the most common reason for GI consultations and an indication for EGD [8, 9, 21]. Sixty-two percent and 45.8% of our patients had at least one alarming symptom or sign, respectively. This is consistent with the findings of other studies [9, 30]. Some studies, however, have reported a low prevalence [23]. A multitude of variables, including variances in patient demographics, genetics, food preferences, and environmental circumstances, may contribute to the variability in alarm features.

According to the study, patients' frequent alarm behaviors may be a result of delayed medical care and poor health habits. This might involve treating early symptoms with alternative medicines and OTC medications, which can result in difficulties that develop into alarm

flags. The bulk of the study's participants were over 50, which lends credence to this notion.

Other unsettling signs and symptoms were noted in this study, including a decline in red blood cell count, significant weight loss without apparent cause, difficulty swallowing, a lump in the stomach, and upper gastrointestinal tract bleeding, which can manifest as dark-coloured stools or bloody vomiting. This is similar to what has been reported from Nigeria and Denmark [23, 29]. The majority of patients, 128 (90.1%), denied smoking cigarettes, and only 5 (3.5%) described daily alcohol intake. This is in contrast to what is found in the studies from Canada [21].

A 73.9% endoscopic diagnostic yield was obtained based on the fact that 26.1% of patients exhibited normal endoscopic results. Similar reports have been made from Gondar (83.4%) and Nigeria (71.4%; [9, 15, 22]), although this is different from a study from the UK, where 73% of endoscopies were found to be normal. The increasing usage of PPI by 49.3% of the patients at the time of the diagnostic EGD may have had an impact on our study's findings. Esophagitis and gastropathy were the most common serious endoscopic abnormalities in our patients. Although it was not present in our research individuals (24.6%), this finding may be related to the high prevalence of *Helicobacter pylori* in the nation, which was estimated to be 52.2% [31]. This may be due to the high prevalence of PPI use before and at the time of endoscopy.

Other significant endoscopic findings in this study are duodenal and gastric peptic ulcers, esophageal cancer, gastric cancer, esophageal stricture, duodenal deformity, GOO, hiatal hernia, and gastric polyp. Similar patterns have been described with variable frequency in studies from India, China, and Nigeria [2, 8, 22].

In this study, alarm features were associated with significant endoscopic findings and UGI malignancies. The same is true of Chinese and Iranian studies [2, 26]. Reports from Nigeria contrast our findings [9].

In our investigation, it was discovered that any concerning symptoms, including weight loss, GI bleeding, dysphagia, persistent vomiting, anaemia, and abdominal bulk, were strong predictors of major endoscopic results. Alarm characteristics showed a low predictive value for an underlying malignancy [21, 25], in contrast to our analysis, and dysphagia was the sole predictor with a good predictive value in several other investigations [2, 32]. Such variations could have been brought on by various patient traits as well as the regional frequency of stomach cancer. In contrast to the study from Denpasar, Indonesia [27], a significant proportion of patients in our case were present before the indicated age [13–15], so age above 55 was not significantly related to greater malignancy [33].

The alert characteristics' combined sensitivity and specificity for any serious endoscopic discovery were modest. Compared to the results of other studies [9, 21, 25], which showed that alarm features were not good at predicting upper gastrointestinal cancer, the pooled sensitivity of alarm features for malignancy was high in our study. The sensitivity for substantial endoscopic abnormalities and cancer was > 94% for abdominal mass, dysphagia, prolonged vomiting, and upper gastrointestinal haemorrhage.

Biopsies have only been done on a quarter of patients to rule out cancer, inflammatory, or infectious conditions. Of those, 70% had confirmed cancer of either the stomach or the oesophagus, giving our study subjects an 18.31% prevalence of cancer, which is the same as a study from India [22]. This shows a higher prevalence of malignancy compared to the study done at the University of Udayana/Sanglah Hospital, Denpasar, which shows a 5.13 percent prevalence [27]. An association was confirmed between the presence of alarm features and malignancy of the UGI tract.

The limitations of the study include a small sample size due to financial constraints, inadequate *H. pylori* testing for patients on PPI, and a lack of histological confirmation for gastropathy, which may have resulted in misinterpreting the findings and missing early signs of cancer. On the other hand, the strengths of the study include thorough data collection with complete history, laboratory, and radiology records, thanks to its prospective nature. The diagnosis of

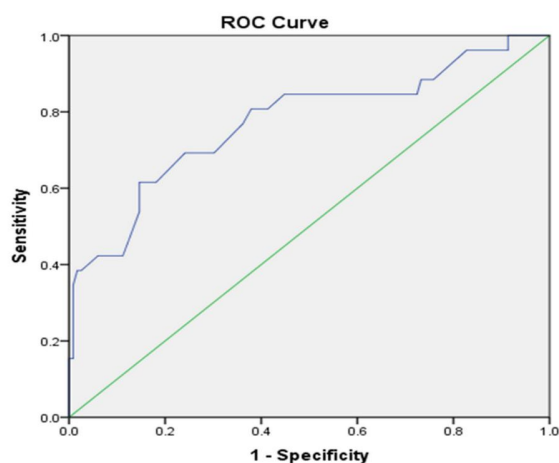


Figure 6 Sensitivity analysis

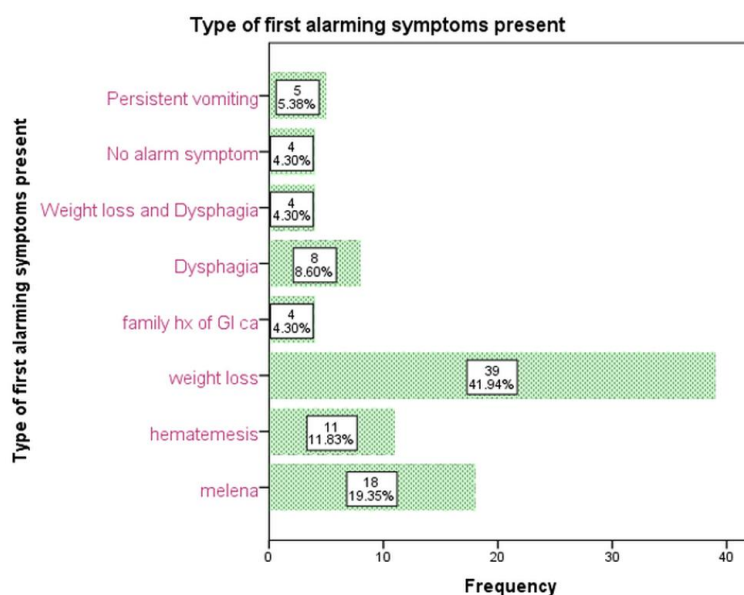


Figure 7 A figure showing an area under receiver operating characteristics curve of 0.773

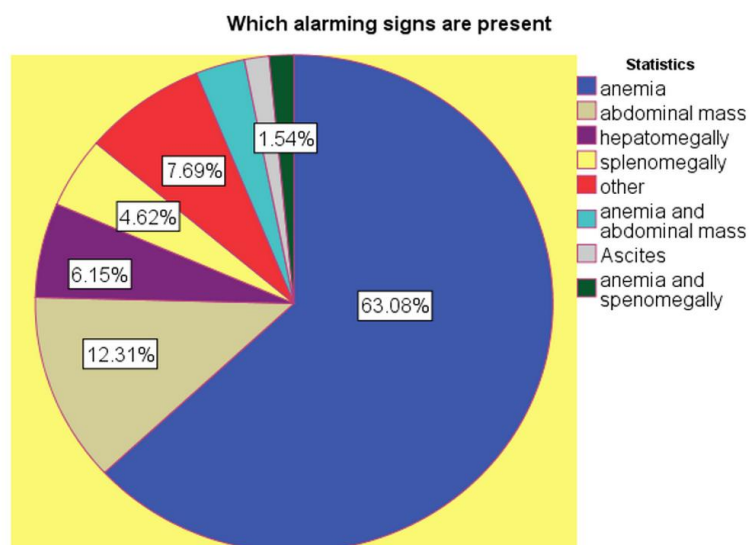


Figure 8 Statistics of Endoscopic findings reported at TASH and AMC (July-September 2022)

cancer was also confirmed through proper documentation of histology.

Conclusion

The study found that dyspepsia, weight loss, dysphagia, and upper GI bleeding are the most prevalent alarm signs in adults over 50 with upper GI symptoms. Duodenal ulcers, gastritis, and esophagitis are the most frequent endoscopic findings. However, if a patient has an abdominal mass, prolonged vomiting, dysphagia, or upper GI bleeding, they should be referred for an endoscopy right away, as these symptoms are highly specific for SEF and GI cancer. The sensitivity of alarm signs for any major endoscopic result is modest at 79%.

In Ethiopia, people with upper gastrointestinal symptoms like an abdominal mass, long-term vomiting, trouble swallowing, or upper gastrointestinal bleeding should be sent right away for an endoscopy. This is because they are likely to have serious upper gastrointestinal problems like esophagitis, squamous cell carcinoma of the oesophagus, and gastric adenocarcinoma. This study found that the two most common alarm symptoms among patients with upper GI symptoms were weight loss and GI bleeding. Symptoms lasting up to one year had a sensitivity of 70.5% and 80.8% for SEF and UGI malignancies, respectively.

Ethical Considerations

The Addis Ababa University College of Health Sciences and Adera Medical Centre's Ethical Review Board provided their approval, and the relevant body was approached for a waiver of permission. The IRB approved the study because of its importance. The name and other forms of personal identification were left out to ensure confidentiality.

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