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Endoscopic Evaluation in Patients with Dyspepsia at Komfo Anokye Teaching Hospital, Kumasi, Ghana: A Cross Sectional Study

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Abstract:
Background: This study evaluated the pattern of clinical conditions in patients undergoing Upper Gastrointestinal Endoscopy (UGIE) at Komfo Anokye Teaching Hospital (KATH), Ghana, from January to June 2008, based on clinical features and endoscopic evaluation.
Materials and Methods: This is a hospital based prospective cross-sectional study which included 300 patients (≥15 years) who had dyspepsia for more than four weeks. Participants underwent an UGIE with an Olympus GIF Q260 Esophagogastroduodenoscopy. The clinical and endoscopy based diagnoses were compared and analyzed using Stata Intercooled Version 8.
Results: Of the 300 patients, 65%, 60% and 36.3% had reflux, ulcer and dysmotility like symptoms respectively suggesting that each patient displayed more than one symptom. Most patients presented normal pathological features (56.0%) whilst the rest (44.0%) had overlapping features such as acute gastritis (60.0%), peptic ulcer disease (41%) and esophageal disorders (17%). Gastritis constituted the highest percentage of clinical referral diagnosis (93.85%) and endoscopic diagnosis (20.47%). Among the conditions diagnosed at referral facilities on clinical ground, gastritis had the highest sensitivity level (0.2073) while peptic ulcer disease had the highest level of specificity (0.9750).
Conclusions: The clinical and endoscopic diagnosis in UGI conditions varied widely. Poor concurrence between clinical and endoscopic diagnoses warrants further research. Expansion of the healthcare services is recommended to support diagnosis and facilitate therapeutic measures for UGI disorders in resource limited settings.

Keywords: *Dyspepsia, Diagnosis, Endoscopy, Ghana*

1. Introduction

Dyspepsia is a major public health issue in gastroenterology that often generates high expenditure both in diagnosis and treatment.[1] Given the significant clinical and economic burden imposed by dyspepsia on patients and society, it becomes imperative for health professionals to diagnose the condition at an early stage and manage it appropriately.[2] Additionally, the success rate in the treatment of UGI cases also largely depends on the degree to which the diagnoses are accurate. Although detailed clinical history and physical

examination aid in excluding reasons for dyspeptic symptoms like drugs, lifestyle and dietary factors that are actually non-gastrointestinal, these assessments provide only functional, working diagnoses. The incompetence to arrive at a definitive diagnosis based on symptoms alone can lead to over-recognition of gastro-esophageal reflux disease (GERD) and an under-diagnosis of Helicobacter pylori (H. pylori-related disease).[3]

Moreover, findings based on physical signs and clinical symptoms do not satisfactorily differentiate amongst organic and functional disease.[2] Therefore, endoscopic or radiographic/ultrasound studies are necessary to ensure the appropriate diagnosis. Endoscopy which is considered as the "gold standard" procedure for UGI tract investigation normally facilitates visualization, ultrasonography, biopsies as well as therapeutic procedures including sclerotherapy, gastrostomy and polypectomy. In endoscopy, the accuracy in detection of organic lesions is greater than 95%. However, the high costs, limited availability and invasiveness associated with endoscopy restrict its use for investigation in patients diagnosed with dyspepsia.[4]

The extent, to which clinic-based diagnosis is deemed to be correct in UGI diseases, is of practical significance for healthcare practices, especially in resource limited settings and in the absence of UGIE. [5] Performing endoscopic examinations on all patients with dyspepsia is difficult, coupled with the fact that resources are limited in developing countries, especially in Africa.[5] Bearing in mind the fact that UGIE facilities may not turn out to be widely available in many African countries in the near future, the research questions addressed in this study are critical for improvising healthcare practices in these countries.[5]

This study aims to evaluate the clinical pattern in dyspepsia patients undertaking UGIE based on clinical features (referral diagnosis) and endoscopic evaluation in Ghana. It also gauges the etiological factors and validity of clinic-based diagnosis in dyspepsia patients.

2. Subjects and Methods

2.1. Study Design

A prospective cross-sectional survey was conducted among patients with dyspepsia referred for endoscopy to the Diagnostic Center of the Komfo Anokye Teaching Hospital (KATH), Ghana from January 2008 to June 2008. The KATH hospital is a 1,000 bed entity located in Kumasi in the Ashanti Region of Ghana and is the second largest teaching hospital in the country.

2.2. Participants

All patients with dyspepsia referred for endoscopy at the diagnostic center were invited to participate in the study. Researchers included 300 patients using a non-probability sampling technique (purposive sampling). Inclusion criteria were participants who were fifteen years and above and had dyspepsia for more than four weeks (without serious associated co-morbid conditions e.g. cardio-respiratory disease) prior to enrollment. Participants were categorized into symptomatic and asymptomatic groups based on their presentation of symptoms according to the Rome III diagnostic criteria. Patients who satisfied the Rome III diagnostic criteria for dyspepsia (postprandial fullness, easy satiety, epigastric pain, and/or epigastric burning) were sub-categorized on the basis of their symptoms into ulcer like (epigastric pain and night time abdominal pain), reflux like (epigastric pain and heartburn) and dysmotility like (epigastric pain, postprandial fullness, early satiety and bloating) groups. Patients who did not have the above mentioned symptoms or alarm features (according to American Society for Gastrointestinal Endoscopy guideline) but presented with other gastrointestinal discomfort were included in the study and referred as asymptomatic patients.[4]

2.3. Ethical Clearance

Ethical approval for the study was obtained from the Committee on Human Research Publication and Ethics at the KATH. Informed consent was obtained from each study participant. Consent was also obtained from participants before the endoscopy.

2.4. Conflict of Interest

None

2.5. Study Size

The sample size for the study was calculated using the following formula:

N = Z 2 P (1-P)/ d2 (N = Sample Size, Z = Confidence Level, P = Estimated Prevalence, d = Margin of Error). Assuming 25% estimated prevalence of patients with dyspepsia; using 95.0% Confidence level, 1.96 standard deviations and allowing a 5% (0.05) margin of error, the sample size was calculated as 288.

2.6. Questionnaire

A questionnaire which was pilot tested on five patients and edited, was used for the survey. Researchers administered the final questionnaire to collect data from each of the 300 study participants. The questionnaire documented demographic characteristics of each individual participant like name, identification number, age, sex, occupation, residential address etc. The participants were later tested for blood hemoglobin (Hb) and erythrocyte sedimentation rate (ESR) on the day of inclusion. Tests were carried out at the laboratory with the results recorded in the questionnaire. Endoscopy was carried out after the clinical evaluation. Clinical features (e.g. epigastric pain, heart burn, bloating, belching, pallor, blood pressure, abdominal tenderness etc.), and queries on the use of Aspirin, NSAIDS and herbal preparations were documented. All the participants had been asked to fast for at least six hours prior to the procedure and were advised to take antacids as and when required.

2.7. Endoscopic Procedure

Upper GI endoscopy was performed on each participant under supervision using an Olympus GIF Q260 esophagogastroduodenoscope. Prior to examination of the esophagus, stomach and duodenum, pre-medication was administered in the form of intravenous midazolam 2.5 - 5mg and hyoscine butyl bromide (buscopan) 20mg. Patients were observed for one or two hours in a recovery room after the procedure and were discharged after full recovery. All possible efforts were undertaken to address potential sources of bias during the study.

2.8. Statistical Methods

All data collected were entered into Epi info. Once the correctness of individual questionnaires was validated, data was exported to MS Excel and then to Stata Intercooled Version 8 software for statistical analysis. Normally distributed variables were summarized by their means and standard deviations, median and a range was used for skewed data. Differences in normally distributed continuous variables were compared using Student's t-test. To reject null hypothesis, a probability of 0.05 (2-tailed) was used. Chi squared test was used for the analysis of categorical data. More than two variables were compared using ANOVA. A p value <0.001 was considered statistically relevant when multiple testing was used to interpret the results.

3. Results

3.1. Sociodemographic Characteristics

Out of the 305 patients that were examined for eligibility, 300 were confirmed eligible, and included in the study. Demographic analysis revealed that the study sample included 176 (59.0%) women and 124 (41%) men. People in the 'productive' age groups of 31 - 45 years constituted the largest group of dyspeptics, followed closely by people aged 15 - 30 years. Of the 300 study participants, 215 (71.9%) used non-steroidal anti-inflammatory drugs (NSAIDs), 84 (28.2%) admitted the use of Aspirin whereas, 205 (69.26%) used herbal preparations (TABLE 1).

Categories	Subgroup	Frequency	Percentage
Age Group			
	15-30	82	27.3
	31-45	99	33.0
	46-60	69	23.0
	61-75	45	15.0
	76-90	5	1.7
Sex			
	Male	124	41
	Female	176	59
	Total	300	100.0

Table 1: Demographic Details

3.2. Symptoms

Analysis of symptoms revealed that 65% of the patients had reflux like, 60% had ulcer like and 36.3% had dysmotility like symptoms with each patient displaying one or more symptoms. Some patients also had alarm symptoms: Anorexia - 107 (35.6%), Weight loss - 142 (47.3%), Dysphagia - 35 (11.6%), Hematemesis - 14 (4.6%) and Melena 33(11.0%).

3.3. Blood Examination

Examination of blood samples showed that the mean Hb among male subjects was 13.1 (SD: 2.6) g/dL (range 3.9-18.2g/dL) and among females was 12.0 (SD 1.7) g/dL (range 5.6-19.2g/dL). ESR was high in 46.79% of men < 50 years in comparison to women (18.89%) of the same age group (Reference range: Under 50 years old: Men < 15 mm/hr; Women: < 20 mm/hr). On the contrary, 38.24% of women > 50 years demonstrated elevated ESR levels compared to men aged above 50 years (37.31%) (Reference range: Above 50 years old: Men: < 20 mm/hr Women: < 30 mm/hr).

3.4. Endoscopic Findings

The totals exceed the number of patients because of overlapping of variables. Figure 1 presents the endoscopic findings of study participants (many patients underwent multiple diagnoses) with 168 patients (56.0%) showing normal clinical characteristics while the rest (44%) demonstrated a combination of various pathologies. Among the remaining 132 patients that presented with abnormal pathologies, 60 (45.45%) patients had gastritis, 32 (24.24%) patients had duodenal ulcer and 16 (12.12%) patients had oesophagitis. Among the 300 patients, endoscopic findings pertaining to the stomach were evident in 32% of the patients, with acute gastritis in 60 (20.0%), followed by gastric erosion in 16 (5.33%), gastric ulcer in 13 (4.33%) and gastric tumor in 7 (2.33%) of patients. Duodenal ulcer (10.66%) was the most common clinical finding in duodenal endoscopy, followed by duodenitis (with or without gastritis) (1%). About 5.67% of the patients had esophageal disorders, with esophagitis as the most common finding (5.33%) (Figure 1).

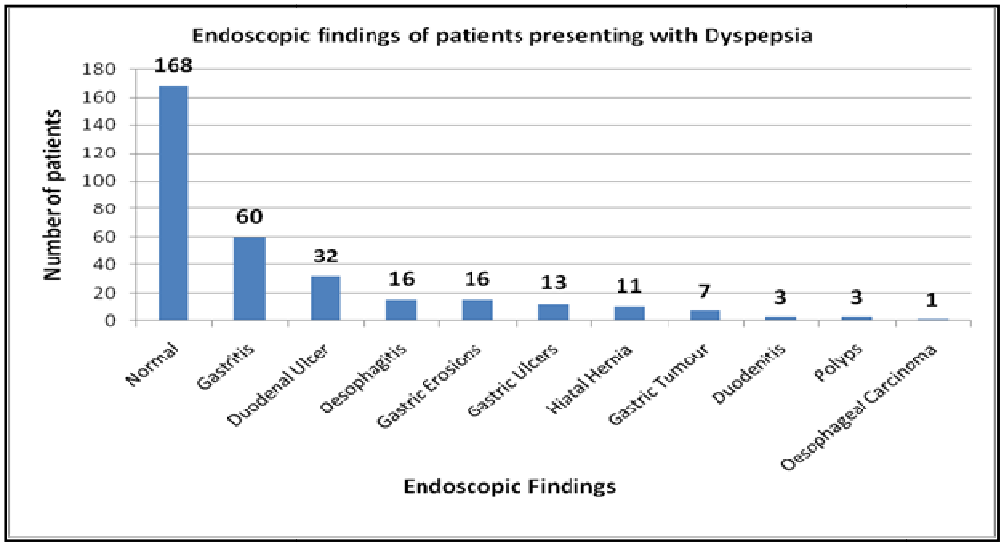

Figure 1: Endoscopic Findings of Patients Presenting with Dyspepsia

3.5. Patient Characteristics based on Endoscopic Findings

Gender assessment revealed that 44.35% (55/124) males and 64.2% (113/176) females displayed normal endoscopic findings while the remaining patients displayed abnormal findings. However, there was no statistically significant difference in endoscopic findings with respect to gender. When the patient population was assessed based on endoscopic findings in people above and below 45 years, results showed that 40% (120/300) of patients below 45 years had normal endoscopic findings as compared to 16% (48/300) in patients above 45 years ($p<0.001$). Although the number of cases with positive endoscopic findings was greater among individuals who used Aspirin or NSAIDS, these findings were not statistically significant (Table 2).

Patients' Characteristics	Normal	Hiatus H	Esog	Eso.C	Gast.E	Gast.U	Gastritis	Gast. T	Duod	D.U.	Polyps	P value
Sex												
Male (124)	55	8	10	1	7	6	30	5	3	17	2	0.006
Female (176)	113	3	6	0	9	7	30	2	0	15	1	
Age												
<45 yrs	120	4	4	1	7	5	30	1	1	14	2	<0.001
>45 yrs	48	7	12	0	9	8	30	6	2	18	1	
Hb												
Low	57	5	9	0	6	5	18	6	1	15	3	0.059
Normal	100	4	7	1	7	8	37	1	2	14	0	
Aspirin Use												
Yes	37	6	7	0	7	5	20	2	1	14	0	
No	130	5	9	1	8	7	40	5	2	17	3	
NSAID Use												
Yes	116	9	12	0	14	11	43	5	2	26	3	
No	51	2	4	1	2	2	17	2	1	6	0	

Table 2: Patients' Characteristics

3.6 Symptoms and Relationship to Endoscopic Findings

Participants who were diagnosed with hiatus hernia, esophagitis, esophageal cancer, gastric erosion, gastric ulcer, gastritis, gastric tumor, duodenitis, duodenal ulcer, polyps in their endoscopic findings were more likely to have an ulcer, reflux or dysmotility like symptoms. But, endoscopic findings revealed that more than one of the three symptoms were seen in several patients suggestive of dyspeptic condition (Table 3).

	Asymptomatic		Ulcer Symptoms (Epigastric pain and night time abdominal pain)		Reflux Symptoms (Epigastric pain and heartburn)		Dysmotility Symptoms or Signs (Epigastric pain, postprandial fullness, early satiety and bloating)	
	n	**%(95 CI)**	**N**	**%(95 CI)**	**n**	**%(95 CI)**	**n**	**%(95 CI)**
Total	43		202		214		125	
Endoscopic Finding								
Absent	19	0.3043-0.5890	99	0.4220-0.5586	114	0.4659 - 0.5984	61	0.4020 - 0.5747
Present	24	0.4110 - 0.6957	103	0.4414 - 0.5780	100	0.4016 - 0.5341	64	0.4253 - 0.5980
Type of Finding								
Esophagitis	3	0.0172 - 0.1929	13	0.0371 - 0.1079	12	0.0314 - 0.0964	8	0.0310 - 0.1230
Peptic Ulcer	4		34	0.1227 - 0.2264	27	0.0877 - 0.1778	17	0.0857 - 0.2080
Gastric	0		10	0.0260 - 0.0898	10	0.0245-0.0849	6	0.0200 - 0.1030
Duodenal	4	0.0312-0.2216	24	0.0806-0.1712	17	0.0495 - 0.1243	11	0.0484 - 0.1522
Neoplasia								
Esophageal Cancer	0		0		1	<0.0001 - 0.0287	0	
Gastric Tumor	0		**7**	0.0155 - 0.0712	6	0.0115 - 0.0612	3	0.0051 - 0.0713
Hiatus Hernia	2	0.0044 - 0.1630	6	0.0122 - 0.0648	8	0.0179 0.0732	5	0.0148 - 0.0926
Gastric Erosion	3	0.0172 - 0.1929	8	0.0189 - 0.0775	8	0.0179 - 0.0732	10	0.0425 - 0.1426
Duodenitis	0		2	0.0004 - 0.0377	2	0.0003-0.0357	3	0.0051 - 0.0713
Polyps	2	0.0044 - 0.1630	1	<0.0001-0.0303	1	<0.0001 - 0.0287	0	
Gastritis	13	0.1851 - 0.4520	32	0.1141 - 0.215	35	0.1197 - 0.2193	18	0.0922 - 0.2170

Table 3: Endoscopic Findings in Asymptomatic Subjects, in Subjects with Dyspeptic Symptoms

Notably, we found that 43 (14.33%) out of the 300 subjects with endoscopic findings did not report any clinically significant symptoms: 13 (21.66%) out of 60 with gastritis, 3 (18.75%) out of 16 subjects with esophagitis, 3 (18.75%) out of 16 with gastric erosions, 2 (18.18%) out of 11 with hiatus hernia and (8.88%) out of 45 with ulcer (including both peptic and duodenal ulcer). The overall prevalence of endoscopic findings in asymptomatic subjects was 55.81 %. Prevalence of endoscopic gastritis, peptic ulcer and esophagitis/ gastric erosion in asymptomatic patients was 30.23%, 9.3 % and 6.9% respectively. Peptic ulcer was found in 12.61% of subjects without dyspeptic symptoms, but with reflux symptoms alone (Table 3).

Significant correlations were found for: ulcer like symptoms against gastric tumor (Pearson chi square =4.77; Pr 0.029); Dysmotility like symptoms against gastric erosions (Pearson chi square =5.00 Pr= 0.025); Dysmotility like symptoms and duodenitis (Pearson chi square = 5.28 Pr = 0.022). There were no other significant correlations between symptoms and endoscopic findings. Interestingly, the percentages of normal findings were identical in the three symptom groups (Table 4).

Subgroups Based on Symptoms	Endoscopic Findings	Pearson chi square	Pr
Ulcer (epigastric pain and night time abdominal pain)	Gastric tumor	4.77	0.029
Dysmotility (epigastric pain, postprandial fullness, early satiety and bloating)	Gastric erosions	5.00	0.025
Dysmotility (epigastric pain, postprandial fullness, early satiety and bloating)	Duodenitis	5.28	0.022

Table 4: Correlation between Symptoms and the Endoscopic Findings of Dyspepsia

Among the conditions diagnosed at referral facilities on clinical ground, gastritis had the highest sensitivity level (0.2073), but the specificity was quite low (0.83). On the contrary, peptic ulcer disease, which had the highest level of specificity (0.9750), had only a sensitivity of 0.0556 while reflux esophagitis had a sensitivity of 0.0615 and specificity of 0.9619 (Table 5).

	Disease Condition	Clinical (Referral)	Definitive Diagnosis (Endoscopic Findings)		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
			Disease Present	Disease Absent				
1	**Peptic Ulcer Disease (300)**	Present	10(3.33%)	170(56.66%)	0.0556	0.9750	0.76920	0.4077
		Absent	3(1%)	117(39%)	CI (2.70% - 9.98%)	CI (92.87% - 99.48%)	CI (46.19% - 94.96%)	CI (35.03% - 46.70%)
2	**Gastritis (293)**	Present	57(19.45%	218(74.40%)	0.2073	0.8333	0.95	0.0644
		Absent	3(1.02%)	15(5.11%)	CI (0.1609 to 0.260)	CI (0.5858 - 0.964)	CI (0.86 0 - 0. 986)	CI (0.0365 - 0. 040)
3	**Reflux Esophagitis (300)**	Present	12 (4%)	183 (61%)	0.0615	0.9619	0.750	0.3556
		Absent	4(1.33%)	101(33.66%)	CI (0.0322 - 0.1050)	CI (0.9053 - 0.9895)	CI (0.4762 - 0.9273)	CI (0.300 - 0. 4143)

Table 5: Relationship between Clinical and Definitive Diagnosis in Upper GI Conditions

4. Discussion

Following the epidemiological approach, we evaluated the practicality and restrictions of clinical diagnosis as well as endoscopy for various UGI conditions by comparing clinical diagnosis with endoscopy based diagnosis.

4.1. Dyspepsia Symptoms

The epidemiology of dyspepsia amongst the general population has not been evaluated as it should be due to the difficulties in excluding organic disease in large numbers of people.

Nevertheless, several studies have examined this in some detail.[6-9] In this study, 65% of the subjects reported reflux like, 60% ulcer like and 36.3% dysmotility like symptoms with each patient presenting more than one type of symptoms. Although, literature on these symptom groups appears lacking, especially in Africa, a study in the US showed that ulcer like dyspepsia was the commonest subgroup (57%), while other symptom subgroups constituted 43%.[10] Unlike the US study, reflux-like symptoms constituted the most common group in our study, implicating a high prevalence of esophagitis and GERD complications. Nonetheless, only 5.3% in this group displayed esophagitis and only one patient had esophageal carcinoma. These findings agree with the research finding that there are reductions in GERD complications in African Americans. The symptoms discussed above can be representative of some of the underlying causes of various other major symptoms. Early stage cancer symptoms are frequently not distinguishable from those of benign dyspepsia and their presence may infer an advanced and often inoperable disease. Alarm symptoms in gastric cancer are imperative to ascertain survival and avoid the mortality due to the disease.[11]

Factually, in dyspeptic patients, the overall prevalence of these symptoms is high whereas in gastro-intestinal cancer the prevalence is very low. In this study, nearly half the patients complained of weight loss (47.3%), and a third of anorexia (35.6%). But, the overall prevalence of tumors was 7%. In general, gastric cancer is diagnosed based on these symptoms as they are of significance for prognosis. Given that dyspeptic and alarm symptoms are not sensitive for detection of malignancies, the presence of these symptoms as selection criteria for endoscopy in gastric cancer patients is not recommended. Although these symptoms have certain descriptive value, evidence that dyspeptic and alarm symptoms depict discrete pathophysiological processes is lacking, making them appear inconsistent as selection criteria. Studies in clinical practice and in the community reflect a large amount of overlap.[12] Dyspeptic symptoms are therefore a relatively poor guide to the origin or nature of any problems in the gut. Patient identification for further investigation to rule out serious structural disease, including peptic ulcer disease or malignancy, is a key concern when it comes to accurate diagnosis, as unaided clinical diagnosis is unpredictable and unreliable.[13]

4.2. Endoscopic Findings

Another major revelation in this study was that most patients with dyspepsia had no important endoscopic lesions (56% displayed normal findings). This is in accordance with past studies that showed that the percentage of normal endoscopy varied from 30 - 40% to 77% in dyspeptic subjects.[14-17] In the present study, the most common abnormal findings reported were gastritis (20%) followed by duodenal ulcer (10.6%) and esophagitis (5.3%). Gastric ulcer cases were reported in 4.3%, gastric tumor in 2.3% and esophageal tumor in one patient. The results of abnormal endoscopic findings were consistent with the findings of similar studies in the past.[16] However, other studies do exist which display variations in the trend for abnormal endoscopic findings.[14,15] Results from past studies show duodenal ulcer with a normal endoscopy ranging from 26.6% to 41%, which differs from our finding that gastritis was most common followed by duodenal ulcer (10.6%).[14,15] A lower rate of gastric cancer (2.3%) is reported in our study compared to past studies (6.2%).[18] These variations can be directly attributed to the endoscopic procedure that led to early detection of cases in our study contrary to other studies that were based on clinical manifestations and diagnosis.

4.3. Patients' Characteristics and Endoscopic Findings

Epidemiologically, there is evidence of several risk factors for dyspepsia. However, risk factors vary in different geographical settings.[7, 9] Although studies report that people aged greater than 45 years have a high preponderance for dyspepsia, these age extremities were predictive of dyspepsia in general.[12] This is in agreement with past literature depicting that patients in higher age groups had an increased threat of organic disease and cancer. The low prevalence of serious lesions in young patients and when probed at a higher detail, female gender, underlying psychological disturbances, environmental/lifestyle habits such as NSAID and Aspirin ingestion appear to be more associated to dyspepsia which appears consistent with prior published data.[7, 9, 10, 18-23] The secular trends and the variation in ulcer rates can be related to environmental factors. The sex ratios can be attributed to cigarette smoking and environmental stress, whereas the duodenal: gastric ulcer ratios may be ascribed to NSAID use. These findings support the concept of heterogeneity in peptic ulceration.[24]

4.4. Symptoms and Relationship to Endoscopic Findings

Although alarm symptoms are considered important in the evaluation of dyspepsia, these symptoms are not sufficiently sensitive to detect malignancies. Our study showed that UGI endoscopic findings were present in about one-quarter of the general population and that about 40 % of subjects with endoscopic findings were asymptomatic. Notably, endoscopic findings were found in about 17 % of subjects without clinically significant symptoms. Because our study used a validated symptoms questionnaire and a larger study sample, the prevalence of esophagitis was almost double the rate reported in the Sorreisa study where, esophagitis was found in 8.1 % and peptic ulcer in 3.7 % of the asymptomatic subjects.[24]

Furthermore, we found that more than half of subjects with dyspeptic symptoms and without alarm symptoms displayed endoscopic findings. These findings contradicted results from a similar study in the United Kingdom, where upper gastrointestinal malignancy was found only in 0.3 % of older patients without alarm symptoms.[25] A similar study reported that only a quarter of subjects with dyspeptic symptoms and without alarm symptoms displayed endoscopic findings (Table 3).[26]

4.5. Correlation between Symptoms and the Endoscopic Findings of Dyspepsia

Comparison of the clinical and UGIE diagnosis revealed a wide variation in the prevalence pattern attributed to many conditions. In case of PUD, the clinical diagnosis rate (59.99%) was much higher than the endoscopic diagnosis rate (4.33%). Similarly, gastritis constituted 93.5% of diagnosis on clinical ground, while it constituted 20.47% on UGIE. This pattern specified poor concurrence between clinical and endoscopic diagnoses. The positive predictive value and low level of sensitivity reported in the study also highlighted the poor association between clinical and UGIE diagnoses. It was possibly a result of a combination of factors such as: the clinical insight/judgment of the individual medical practitioner, which is often subjective, coupled with the limitations inherent in clinic-based judgment as the sole basis for the diagnosis of UGI conditions.

Several limitations of clinic-based diagnosis are highlighted from our findings. Clinical diagnosis is usually non-specific in nature. This is not unanticipated as it can be clinically challenging to differentiate specifically between several manifestations, such as gastritis, acute gastric ulcer, gastro duodenitis or even ulcerated gastric malignancies. In contrast, diagnosis based on UGIE delivers much better clinical details, delivering more precise, accurate and prompt treatment. The diagnosis made on clinical ground does not have the potential to recognize certain conditions like gastric cancer in their early and treatable phases. Also, clinic-based diagnosis can be imprecise in many cases often due to different validity indices as utilized in this study (Table 5).[5]

5. Strengths and Limitations

The main strength of this study was that endoscopy and the validated symptoms questionnaire were directed towards a representative sample of the general population. But, the requirement for an endoscopy procedure potentially skewed sampling of volunteers by preferentially attracting more subjects with symptoms than without and this possible selection bias cannot be side-tracked. Since the study was conducted on patients with dyspepsia referred for endoscopy and the fact that the survey sample was not a probability sample and therefore not representative of all patients with dyspepsia, the study findings have limited generalizability.

6. Conclusion

Although the published data to date support the perception that dyspepsia is common in most populations across the globe, the true epidemiology of dyspepsia amongst the general population has not been evaluated as much due to the problem of excluding organic disease in a large number of individuals. Well-designed population-based studies using a consistent definition of dyspepsia are obligatory to evaluate its precise diagnosis. Also, better information on the frequency of manifestations in asymptomatic individuals, and that of associated risk factors, is essential to improve the early diagnosis of UGID and malignancy, and also to avoid ulcer complications in these populations.

The findings from our study have major implications on the healthcare situation in Ghana and other resource-constrained environments - the poor association between clinical and endoscopy diagnosis strongly highlights the necessity to improve healthcare infrastructure. This study delivers an evidence-based platform for health advocacy in this respect. The use of UGIE to raise diagnosis accuracy would facilitate prompt and accurate treatment as well as reduce morbidity period and mortality. The availability of UGIE would result in cost-effectiveness in case management as the failure rate in treatment resulting from "empirical" non-evidence based approach would decrease.

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any pre specified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	2-3
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3
Bias	9	Describe any efforts to address potential sources of bias - None	-
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	3
		(b) Describe any methods used to examine subgroups and interactions	3
		(c) Explain how missing data were addressed	3
		(d) If applicable, describe analytical methods taking account of sampling strategy	3
		(e) Describe any sensitivity analyses	3
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed	3
		(b) Give reasons for non-participation at each stage	3-4
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	3-6 (Table1)
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	3-6
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	3-6 (Table2,3,4 and 5)
		(b) Report category boundaries when continuous variables were categorized	Table 5
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—e.g. analyzes of subgroups and interactions, and sensitivity analyses	3-6 (Table2,3,4 and 5)
Discussion			
Key results	18	Summarize key results with reference to study objectives	7-8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	7-8
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	7-8
Generalizability	21	Discuss the generalizability (external validity) of the study results	7-8
Ethical approval	22	Ethical approval for the study was obtained from the Committee on Human Research Publication and Ethics at the KATH. Informed consent was obtained from each study participant. Consent was also obtained from participants before the endoscopy.	2
Funding	23	The study was self-funded and the publication was funded by phamax Analytic Resources Pvt. Ltd., Bangalore, India	-
Conflict of interest	24	None	2

Table 6: STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of cross-sectional studies

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