

Factors Associated with the Applicability of EPAGE (European Panel on the Appropriateness of Gastrointestinal Endoscopy) and the Suitability of Indications for Eso-Gastroduodenal Endoscopy in a West African Country

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How to cite this paper: Okon, J.B., Ake, F., Diakite, M., Kouadio, O.K. and Kone, A. (2021) Factors Associated with the Applicability of EPAGE (European Panel on the Appropriateness of Gastrointestinal Endoscopy) and the Suitability of Indications for Eso-Gastroduodenal Endoscopy in a West African Country. *Open Journal of Gastroenterology*, 11, 173-183.

<https://doi.org/10.4236/ojgas.2021.1110018>

Received: July 13, 2021

Accepted: October 12, 2021

Published: October 15, 2021

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Abstract

Background: EGDF's reference examination for exploring the digestive tract has seen steadily increasing demands over the past few years. The exam can be expensive and often poorly tolerated. Its prescription must take the cost/benefit and its relevance into account. The EPAGE criteria were developed to allow the appropriate selection of endoscopic procedures. **Objective:** To determine the factors associated with the applicability and appropriateness of the EGDF indications by the EPAGE criteria in our context in order to limit the number of inadequate EGDFs. **Material and Method:** Prospective cross-sectional study on the applicability of EPAGE (European Panel on the Appropriateness of Gastrointestinal Endoscopy) and the relevance of the indications for Eso-Gastro-Duodenal Fibroscopy (EGDF) according to the criteria of the EPAGE in two large public hospitals located in the central region of Ivory Coast over a period of 8 months from September 2019 to May 2020. The following parameters (age, sex, history and comorbidities of the patient, the indication of EGDF, the qualification of the prescriber, the EPAGE situation, the relevance of the indications according to EPAGE, the result of the EGDF) were collated classified into judgment criteria and analyzed via the site <https://www.epage.ch/> depending on whether the indication was appropriate, uncertain or inappropriate. The difference was significant for a value of $p \leq 0.05$. **Results:** This was 1010 EGDF. The indications for EGDF were epigastralgia, gastrointestinal haemorrhage, testing for PHT signs, heartburn, vo-

miting, dysphagia, chest pain, anemia, control, tumor assessment. The result of EGDF was normal (14.9%), non-significant lesions (47.5%) and significant lesions (37.6%). EPAGE was applicable in 93.8% of patients, and the indications for EGDF were considered appropriate in 54.2% of cases. The EPAGE criteria were significantly applicable and appropriate in cases of epigastralgia, digestive haemorrhage, heartburn, and vomiting but not applicable for the search for signs of PH, for non-significant lesions and for 1/3 of gastric cancer. Significant lesions predominated in patients with appropriate indications ($p < 0.001$), whereas some significant lesions had uncertain indications. **Conclusion:** In our context, the EPAGE criteria could constitute a useful tool for the diagnostic profitability of EGDF. The indications deemed appropriate are statically associated with significant lesions and advanced age. But EPAGE must be adapted to our indications and cannot replace the reasoning of the practitioner when faced with the suspicion of significant lesions.

Keywords

EPAGE, EGDF, Indications, Relevance, Ivory Coast

1. Introduction

Eso-Gastro-Duodenal Endoscopy (EGDF) is the gold standard for exploring the digestive tract allowing in addition to the samples the realization of the therapeutic gestures [1]. The demands for EGDF have increased steadily over the past few years [1], due to its non-invasive nature and especially its superiority over other methods of investigating diseases of the upper digestive tract. However, the procedure is expensive for a population with a low standard of living, with a rare risk of complications, and the examination is unpleasant for some patients [2]. Therefore, the relevance of EGDF's indications is crucial to improve profitability and reduce waiting lists. Thus, a group of European workers sets up clinical situations known as EPAGE 1 criteria (European Panel on the Appropriateness of Gastrointestinal Endoscopy), revised in 2010 (EPAGE 2) in order to allow appropriate selection of endoscopic procedures [2]. Since the advent of EPAGE, several studies have been carried out to assess the relevance of the indications for EGDF by EPAGE and their associations to significant lesions in Europe [3] [4] [5], North Africa [6] [7] [8]. This work shows a certain correlation between the EPAGE criteria with the presence of significant endoscopic lesions allowing the rationalization of its prescription. However, these EPAGE criteria would apply in our context and would make it possible to efficiently and effectively select the indications for EGDF capable of diagnosing significant digestive lesions. And there are many factors that could influence the applicability and performance of EPAGE. However, very few studies in Black Africa particularly in Ivory Coast (West Africa) have evaluated the factors associated with the evaluation of the practice of EGDF using the EPAGE software. The general objective of our study was

therefore to determine the factors associated with the applicability and suitability of the EPAGE criteria for the practice of EGDF in a low-income country in order to limit the number of inadequate endoscopic examinations.

2. Material and Method

This was a prospective study that took place in two large public hospitals located in the central region of Ivory Coast over a period of 08 months from September 2019 to May 2020 (the University Hospital Center de Bouake and Saint Joseph Catholic Hospital in Moscati in Yamoussoukro). All patients of any age and sex were included in the study who were admitted for an EGDF at these two centers and who gave their informed consent. Course of the study: For each patient included, we conducted an interview and then compiled a medical file. In this medical file, the following parameters were collected and studied: The age of the patient, the sex of the patient, the history and the comorbidities of the patient, the indication of EGDF, the qualification of the prescriber, the applicability of the EPAGE, the relevance of the indications according to EPAGE, the result of the EGDF. All these parameters have been grouped into judgment criteria and confounding factors. Two main outcomes have been identified: the applicability of the EPAGE criteria according to the indications of the EGDF; the indications of the act constituted the motive or the reasons having motivated the request of the EGDF. These indications were confronted with seven (7) clinical situations predefined by the EPAGE criteria via the site <https://www.epage.ch/> which made it possible to conclude whether the EPAGE criteria were applicable or not depending on the compatibility of the EGDF indications. The clinical situations are predefined by the panel. The relevance of the EGDF indications according to the EPAGE criteria: secondarily depending on whether the indication was applicable, always via the site <https://www.epage.ch/> the different situations were informed and the EPAGE tool was responsible for analyzing them and then “assess the relevance of the applicable indication that was deemed appropriate, uncertain or inappropriate to perform EGDF for the patient concerned. The secondary endpoints were defined by the results of digestive endoscopy which were classified into three groups: normal EGDF without visualized lesion; EGDF with insignificant lesions (the following lesions were considered non-significant: uncomplicated hiatus hernia, non-erosive gastritis, non-erosive duodenitis, non-erosive esophagitis) and EGDF with significant lesions (the following lesions were considered insignificant: erosive esophagitis, VO, esophageal stenosis, EBO, megaesophagus, Mallory Weiss lesion, erosive gastritis, gastric ulcer, gastric cancer, PH gastropathy, angyodysplasia, duodenal ulcer, esophageal cancer, esophageal ulcer, erosive duodenitis, duodenal cancer, polyp). The following were considered to be confounding factors: The age of the patients (grouped by age groups of 10 years), the sex of the patients (corresponding to the male or female gender), patient history and the EGDF prescribing agent (these were general practitioners, hepato-gastroenterologists, digestive surgeons, cardiologists, pulmonol-

ogists, nurses, midwives and all other prescribers).

3. Data Entry and Statistical Analysis

Quantitative variables were expressed as mean with standard deviation and extreme values. Qualitative variables were represented by their proportions. The comparison of two quantitative variables was made by examining their difference at 0 using Student's t test. The comparison of two qualitative traits was made by the chi-square or chi-square test with Yates correction or Fisher's exact test when the conditions for applying chi-square were not met. The difference was significant for a value of $p \leq 0.05$.

4. Ethical Considerations

The confidentiality of the information collected was scrupulously preserved by assigning an anonymous number to each patient and was used for computer data entry.

5. Results

During the study period 1010 upper digestive endoscopies were selected, including 410 EGDF performed at Moscati hospital in Yamoussoukro and 600 EGDF at Bouake University Hospital Center. These were 475 men and 535 women, a ratio of 0.89 with an average age of 45.1 years ranging from 10 to 85 years. The main providers of EGDF were general practitioners, interns, nurses and gastroenterologists in 64.8%, 16.3%, 8% and 6.4% respectively. The indications for EGDF are summarized in **Table 1**. They were dominated by epigastralgia in 72.3% of cases.

Regarding EGDF results, EGDF was normal in 14.9% of cases. The lesions were significant and non-significant in 37.6% and 47.5% of cases, respectively. Not-significant lesions (480) included not-erosive esophagitis (2.5%), uncomplicated hiatus hernias (2%), not-erosive gastropathies (39.6%), and not-erosive duodenitis (3.5%). Endoscopic lesions are summarized in **Table 2**.

Table 1. Distribution of 1010 EGDF according to the indications.

Indications	Numbers (n)	Percentage (%)
Epigastralgia	730	72.3
Gastrointestinal bleeding	95	9.4
Sign search PH	65	6.4
Pyrosis	45	4.5
Vomiting	35	3.5
Others indications	40	4.0
Total	1010	100

Others indications: dysphagia, chest pain, anemia, control, tumor assessment.

Table 2. Distribution of significant EGDF lesions.

Significant lesions	Numbers (n)	Percentage (%)
Significant lesions	380	37.6
Gastric and duodenal ulcer	190	18.8
Erosive gastropathy	65	6.4
Esophageal varices	40	4.0
Gastric polyp	20	2.0
Gastric cancer	15	1.5
Duodenitis erosive	15	1.5
Erosive oesophagitis	15	1.5
Esophageal cancer	10	1.0
Others lesions*	10	1.0
Insignificant lesions	480	47.5
Not erosive gastropathy	400	39.6
Not erosive duodenitis	35	3.5
Not erosive oesophagitis	25	2.5
Uncomplicated hiatus hernia	20	2.00

*Schatzky ring; PH gastropathy.

5.1. Factors Associated with the EPAGE Situation (Applicable/Not Applicable)

L'EPAGE was applicable in 93.8% of patients, and indications for EGDF were considered appropriate in 54.2% of cases when EPAGE was applicable (**Table 3**). The EPAGE criteria were applicable in all cases of epigastralgia ($p = 0.0001$), gastrointestinal haemorrhage, heartburn, and vomiting and not applicable in all cases looking for signs of PH ($p = 0.001$).

The applicability of EPAGE was significantly related to patient gender, gastroenterologists and general practitioners as prescribers, epigastralgia and the search for signs of PH for the indication of EGDF. The criteria were applicable in cases of gastropathy (0.007), esophagitis ($p = 0.040$) and oesophageal varices, but oesophageal varices were significantly not applicable in 75% of cases (0.0001) (**Table 4**).

5.2. Factors Associated with the Relevance of the Indications according to EPAGE

The indications for EGDF deemed appropriate according to EPAGE were significantly more observed in patients over 50 years ($p = 0.0001$). The sex of the patients was not associated with the relevance of the indications according to the EPAGE criteria. The relevance of the indications for EGDF according to the EPAGE criteria was not associated with the prescribing agent of EGDF. The indications for epigastralgia were only appropriate in 43.8% of cases. The indications for gastrointestinal bleeding were all considered significantly appropriate. Regarding the results of the EGDF and the relevance of the indications according

Table 3. Distribution of the different situations and relevance of EGDF indications by EPAGE.

EPAGE	Numbers (n)	Percentage (%)
Applicable	940	93.8
Appropriate	510	54.2
Uncertain	155	16.5
Inappropriate	275	29.3
Not applicable	70	6.9
Total	1010	100

Table 4. Distribution of factors associated with the applicability of EPAGE criteria.

	EPAGE		P
	Not applicable n (%)	Applicable n (%)	
Age ≤ 50 years	45 (9)	610 (93.1)	0.96
<50 years	25 (7)	330 (93)	0.96
Sexe feminine	15 (2.8)	520 (97.2)	0.004
Male	55 (11.6)	420 (88.4)	0.004
Prescribers			
-General practitioner	5 (1)	485 (99)	0.001
-Gastroenterologist	25 (38.5)	40 (61.5)	0.0001
Indications of the EGDF			
-Epigastralgia	00 (00.0)	730 (100)	0.0001
-Upper gastrointestinal bleeding	00 (00.0)	95 (100)	0.371
-Search signs of PH	65 (100)	00 (00.0)	0.001
-Pyrosis	00 (00.0)	45 (100)	1.00
-Vomiting	00 (00.0)	35 (100)	1.00
Insignificant endoscopic lesions			
-Not erosive gastropathy	5 (1.2)	395 (98.8)	0.007
-Not erosive esophagitis	10 (40)	15 (60%)	0.040
Significant lesions endoscopic			
-Gastric and duodenal ulcer	00 (00.0)	170 (100)	0.133
-Esophageal varices	30 (75)	10 (25)	0.0001
-Gastric polyp	5 (00.0)	20 (100)	1.000
-Gastric cancer	5 (33.3)	10 (66.6)	0.195
-Esophageal cancer	0 (0.0)	10 (100.0)	1.000

to EPAGE, the indications of the EGDF were statistically appropriate in the event of lesions found on the EGDF; lesions significant in 67.2% of cases ($p = 0.020$) and non-significant in 46.6% of Cases ($p = 0.011$). Among the non-significant lesions, the non-erosive gastropathies had an appropriate indication in 51.9% of the cases significantly ($p = 0.040$). Significant lesions had no statically relevant

Table 5. Distribution of factors associated with the relevance of EPAGE.

	EPAGE			P
	Inappropriate n (%)	Uncertain n (%)	Appropriate n (%)	
Age ≤ 50 years	270 (44.3)	150 (24.6)	190 (31.1)	0.0001
>50 years	5 (1.5)	5 (1.5)	320 (97)	0.0001
Sexe feminine	165 (30.8)	80 (15)	290 (54.2)	0.835
Male	190 (40)	55 (11.6)	230 (48.4)	0.835
Prescribers				
-General practitioner	155 (32)	75 (15.5)	255 (56)	0.693
-Gastroenterologist	5 (12.5)	10 (25)	15 (62.5)	0.529
Indications of the EGDF				
-Epigastralgia	265 (36.3)	145 (19.9)	320 (43.8)	0.0001
-Upper gastrointestinal bleeding	00 (00.0)	00 (00.0)	95 (100)	0.0001
-Pyrosis	05 (11.1)	00 (00.0)	40 (88.9)	0.095
-Vomiting	00 (00.0)	05 (14.3)	30 (85.7)	0.176
Insignificant endoscopic lesions	215 (36.4)	100 (16.9)	275 (46.7)	0.011
-Not erosive esophagitis	10 (50)	5 (25)	5 (25)	0.040
Significant lesions endoscopic	55 (17.2)	50 (15.6)	215 (67.2)	0.020
-Gastric and duodenal ulcer	30 (17.6)	20 (11.8)	120 (70.6)	0.105
-Esophageal varices	00 (0.00)	00 (0.00)	10 (100)	0.426
-Gastric polyp	00 (0.00)	5 (25)	15 (75)	0.013
-Gastric cancer	00 (0.00)	00 (0.00)	10 (100)	0.426
-Esophageal cancer	00 (0.00)	00 (0.00)	10 (100)	0.426

indications according to EPAGE apart from gastric polyps ($p = 0.013$) (**Table 5**).

6. Discussion

The patients admitted for endoscopy in this study were young adults, predominantly female, like those in the African and Asian literature [9] [10] [11] [12]. Epigastralgia was the main indication as in most African series [9] [13]. In fact, abdominal pain in general and epigastralgia in particular constitute the first reasons for consultation in gastroenterology. In addition, when faced with epigastralgia, the request for EGDF is easy, yet epigastralgia can be indicative of numerous digestive and extra-digestive ailments [14]. Upper gastrointestinal bleeding and testing for endoscopic signs of portal hypertension were the second and third indications for EGDF after epigastralgia, respectively. These indications were also found by Lawson in Togo [15]. The largest providers of EGDF were general practitioners (64.8%), hepato gastroenterologists represented only 6.4% of prescribers. These results are similar to those of Sombier *et al.* in Ouagadougou [10] where 45.1% of prescribers of EGDF were general practitioners against 18.2% of gastroenterologists. The high prevalence of normal examinations in our

series and those of the African literature could be explained by the probable role of digestive parasitoses, colopathies and pancreatic disorders [12] [16] [17]. EGDF was pathological in 85.1% of cases, inflammatory gastropathies were by far the most frequent lesions (39.6%). These lesions were the most found in comparable proportions by several African authors [13] [16].

They can be caused by infection with *Helicobacter pylori*, a bacteria common in developing countries. The role of *Helicobacter pylori* infection in the genesis of various gastroduodenal pathologies such as gastritis, peptic ulcer, Mucosa-Associated Lymphoid Tissue (MALT) lymphoma and gastric adenocarcinoma is currently proven [18].

Regarding the applicability and relevance of the indications according to EPAGE, EPAGE was applicable in 93.8%. This applicability of the EPAGE criteria for EGDF has been found by authors from West and North Africa [4] [6] [7] [8] with applicability rates varying from 84.5% to 98.8%. When EPAGE was applicable, the relevance of the indication was deemed appropriate, uncertain, and inappropriate in 54.2%, 16.5%, and 2.3% of cases, respectively. In Mali, the indication was appropriate in only 5.5% of cases. Appropriate indication rates in West Africa are lower than those observed in North Africa [6] [7] and in the West [4] where the appropriate indication rate varied between 70% and 90%. Regarding the factors associated with the relevance of the indications for EPAGE, in our present study the appropriate indications were observed in more than 90% of cases in patients aged over 50 years significantly ($p = 0.0001$). This result is consistent with that of Madjouli *et al.* [19] in Morocco who found appropriate indications in the older population (65 years vs 34.5 years $p = 0.0001$). Several African studies have confirmed the diagnostic profitability of EGDF in the elderly where the significant lesions were greater [20] [21]. In our study, the EPAGE criteria were applicable in all cases of epigastralgia. However, their relevance was deemed appropriate and inappropriate in 43.8% and 36.3% of cases, respectively. In practice, epigastralgia is the expression of digestive and extradiagnostic pathologies with a high prevalence of IFD in women [14]. Sabbek found dyspepsia as the main inappropriate indication in his study and in another study in Mali, epigastralgia the first reason for EGDF was inappropriate in 59.83% according to EPAGE [8] [22]. This high rate of indication of inappropriate EGDF could be improved by the training of prescribing agents and the establishment of national guidelines for endoscopic procedures as was the case in European countries, [5] [23] and Asia [24]. Upper gastrointestinal bleeding is one of the warning signs of the digestive tract requiring an emergency EGDF. In the study by Ennaifer *et al.* [7] carried out in Tunisia, alarm symptoms were more frequent in the appropriate group than in the inappropriate group (36.6% vs 6%; $p = 0.0001$). In our study, upper gastrointestinal bleeding was observed exclusively in the group of patients with appropriate indications. (100% vs 0.0% $p = 0.0001$). In our present study, the appropriate indications were more found in the group of hepato-gastroenterologists and interns with respective rates of 62.5% and 67.9%. These results

agree with those of Majdouli *et al.* [19] who found an appropriate indication rate significantly higher at 90.2% ($p = 0.001$) in the hepato-gastroenterologist group. An important objective of our work was to seek an association between the relevance of the indications and the lesions found during EGDF. Of the 1010 EGDFs performed, 37.6% were normal, 47.5% found non-significant lesions and 47.5% significant lesions. In the event of significant lesions, EPAGE was applicable in 96.9% of cases and its relevance was appropriate in 67.2% of cases against 17.2% (inappropriate) and 15.6% (uncertain), significantly ($p = 0.020$). These results agree with those of Fernandez-E *et al.* [23] who in a previous study found a significantly higher diagnostic yield for appropriate endoscopies (30% vs 7%, $p < 0.001$). In the event of peptic ulcer disease, the EPAGE criteria were applicable in all cases and the relevance of the indications was deemed appropriate in 70.6% against 11.8% (uncertain) and 17.6% (inappropriate) but not significantly. Erosive gastritis was more observed in the group of appropriate indications (61.5% versus 23.1% (uncertain) 15.4% (inappropriate) but not significantly. These results are close to those of Kaliszan *et al.* [3] who found higher proportions of peptic ulcer and erosive gastritis in patients with appropriate indications with no significant link. Our study reported 25 cases of cancer including 10 esophageal and 15 gastric. EPAGE was applicable in all cases of esophageal cancer and in 10 cases out of 15 for gastric cancers, *i.e.* 66.67%. Cancers in which EPAGE was applicable all had appropriate indications. These results are similar to certain studies [3] [7] [19]. However, Sabbek *et al.* [22] found in his study cases of confirmed neoplasms in patients with inappropriate indications.

EPAGE may appear as a tool for standardizing the indications for digestive endoscopy, like other studies which recommend uniform and structured reports for better results [25]. However, this standardization of criteria poses a problem because of the language barrier of our predominantly rural populations, which in some cases constitutes a limiting factor for the explanation of certain items of the EPAGE criteria. Hence the need to develop criteria specific to our cultures and customs.

7. Conclusion

The EPAGE criteria are applicable in our African context. The indications deemed appropriate are statically associated with significant lesions and advanced age. However, certain significant lesions such as gastric cancers, ulcers gastric and duodenal, and esophageal varicose have indications that are not applicable according to EPAGE. The EPAGE criteria could be a useful tool for the diagnostic cost-effectiveness of EGDF. But they must be adapted to our epidemiological contexts. EPAGE cannot replace the reasoning of the practitioner in all cases when faced with the suspicion of a serious lesion such as cancer.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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