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Predictors of Clinically Significant Findings and Diagnostic Yield in Upper and Lower Gastrointestinal Endoscopy: A Tertiary-Center Study

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Abstract

Background: Endoscopy has become a cornerstone of gastrointestinal (GIT) diagnosis and therapy, but there is limited evidence on the patterns of endoscopic practice and outcome predictors in Iraqi patients. ***Objectives***: To describe GIT endoscopic indications and findings in Iraqi adults, determine independent predictors of clinically significant findings in both esophagogastroduodenoscopy (OGD) and colonoscopy, and compare the results of the diagnostic procedures and indications. ***Methods***: This was a retrospective cross-sectional study involving 705 adults who had an endoscopy at Baghdad Teaching Hospital (January 2019 to January 2022). The diagnostic yield was computed by procedure and indication. Reporting was done as per the STROBE guidelines. ***Results***: OGD accounted for 572 procedures (81.1%); epigastric pain/dyspepsia was the leading indication (43.2%), and gastritis was the most frequent finding (47.3%). The most frequently requested indication for colonoscopy (n=133) was bleeding per rectum 75(56.3%), and 37% were normal. On logistic regression, independent predictors of significant OGD findings were age ≥50 years (p=0.004), male sex (p=0.043), and hematemesis (p=0.006). For colonoscopy, age ≥50 years (p=0.031) and IBD evaluation (p=0.043) were independent predictors. The diagnostic yield was significantly higher in OGD (p=0.001*).* ***Conclusions*:** Endoscopy of the upper gastrointestinal tract has a higher diagnostic yield than colonoscopy, which reflects a selected disease burden. Age predicts findings; male sex, hematemesis, and inflammatory bowel disease improve yield, supporting risk-based referral and triage.

***Keywords*:** Colonoscopy; Diagnostic yield; Esophagogastroduodenoscopy; Gastrointestinal endoscopy; Predictors.

مؤشرات النتائج ذات الدلالة السريرية والعائد التشخيصي في تنظير الجهاز الهضمي العلوي والسفلي: دراسة في مركز ثالثي

الخلاصة

الخلفية: أصبح التنظير ركيزة أساسية في تشخيص وعلاج الجهاز الهضمي، لكن هناك أدلة محدودة حول أنماط ممارسة التنظير ومؤشرات النتائج لدى المرضى العراقيين. **الأهداف**: وصف مؤشرات ونتائج تنظير الجهاز الهضمي لدى البالغين العراقيين، وتحديد المؤشرات المستقلة للنتائج ذات الدلالة السريرية في كل من تنظير المريء و الاثني عشري (OGD) وتنظير القولون، ومقارنة نتائج الإجراءات التشخيصية والدواعي. **الطرائق**: دراسة مقطعية بأثر رجعي شملت 705 بالغين خضعوا للتنظير في مستشفى بغداد التعليمي (يناير 2019-يناير 2022). تم حساب العائد التشخيصي من خلال الإجراءات والإشارة. تم إجراء التقارير وفقا لإرشادات STROBE. **النتائج**: شكل OGD 572 إجراء (81.1٪)؛ وكان الألم فوق المعدة/عسر الهضم هو المؤشر الرئيسي (43.2٪)، وكانت التهاب المعدة هو الاكتشاف الأكثر شيوعا (47.3٪). كان المؤشر الأكثر طلبا لتنظير القولون (n=133) هو نزيف المستقيم 75٪ (56.3٪)، و37٪ كانوا طبيعيين. في الانحدار اللوجستي، كان المتنبئون المستقلون لنتائج OGD المهمة هو العمر ≤50 سنة (p=0.004)، الجنس الذكوري (p=0.043)، والقيء الدموي (p=0.006). بالنسبة لتنظير القولون، كان العمر ≤50 سنة (p=0.031) وتقييم مرض الأمعاء الالتهابي (p=0.043) مؤشرا مستقلا. كان العائد التشخيصي أعلى بشكل ملحوظ في OGD (p=0.001). **الاستنتاجات:** التنظير الداخلي للجهاز الهضمي العلوي له عائد تشخيصي أعلى من تنظير القولون، مما يعكس عبء مرض محدد. العمر يتنبأ بالنتائج؛ الجنس الذكري، والقيء الدموي، وأمراض الأمعاء الالتهابية تحسن الإنتاجية، مما يدعم الإحالة والفرز القائم على المخاطر.

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INTRODUCTION

Endoscopy has essentially improved gastrointestinal (GIT) medicine, as it allows the direct visualization of the mucosa, sampling of tissues, and therapeutic treatment [1]. Esophagogastroduodenoscopy (OGD) is suitable in the diagnosis and treatment of upper GIT disorders [2], while colonoscopy is still the gold standard in detecting polyps and cancer of the colon [3]. Well-known OGD indications are dysphagia, GIT hemorrhage, peptic ulcer disease, and treatment-resistant gastroesophageal reflux disease (GERD) [4,5]. Colonoscopy is advised in the screening of colorectal cancer, lower GIT bleeding, inflammatory bowel disease (IBD) monitoring, and the assessment of iron deficiency anemia [6,7]. Recent guidelines suggest screening at the age of 45 in average-risk individuals and earlier screening of individuals with a family history of neoplasia [8]. The epidemiological profile of Iraq, characterized by the high prevalence of Helicobacter pylori, the use of NSAIDs, dietary patterns, psychosocial

stressors, and high infectious disease burden, probably defines the range of GIT pathology [9,10]. However, currently available Iraqi endoscopy data are mostly descriptive, such that the frequency distributions have been reported without analytical measures of outcome predictors and diagnostic efficiency. This situation limits the establishment of evidence-based referral criteria and prevents the best use of limited endoscopy resources. To our knowledge, this is the first Iraqi study to combine diagnostic yield analysis with multivariate logistic regression of both OGD and colonoscopy to a greater level than descriptive reporting, a risk-stratification model that can be applied to clinical use. The objectives were to: 1) characterize OGD and colonoscopy indications and findings at a major Baghdad tertiary center; 2) identify independent demographic and clinical predictors of clinically significant findings for each procedure; and 3) quantify and compare diagnostic yields across procedures and indications. These data address a critical gap in the Iraqi gastroenterology literature and provide an evidence base for locally adapted endoscopy referral guidelines.

METHODS

Study Design and Setting

This study was designed, conducted, and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies [11]. The study was a retrospective cross-sectional study conducted at the Endoscopy Unit of Baghdad Gastroenterology and Hepatology Center, Baghdad Teaching Hospital between January 2022 and January 2022.

Study population

All adults (≥18 years) who underwent OGD or colonoscopy during the study period were eligible. Data were extracted from endoscopy reports. The final cohort comprised 705 patients (572 OGD; 133 colonoscopy).

Data Collection

Demographic (age, sex), clinical (indication, symptom duration, comorbidities), procedural (type, referral source), and outcome (endoscopic findings, biopsy results when available) data were abstracted by two investigators independently; discrepancies were resolved by consensus.

Outcome Definitions

Clinically significant endoscopic findings were defined as pathology carrying direct diagnostic, therapeutic, or prognostic implications. For OGD: esophageal varices, gastric/duodenal ulcers, gastric/esophageal masses, Barrett's esophagus, and severe erosive esophagitis. For colonoscopy: colonic polyps, colorectal masses, IBD, and solitary rectal ulcers. Normal mucosa, mild non-specific gastritis (OGD), and isolated internal hemorrhoids (colonoscopy) were classified as non-significant. Diagnostic yield was the proportion of procedures revealing ≥1 clinically significant finding.

Equipment

OGD: OLYMPUS® EVIS EXERA III GIF-HQ190; colonoscopy: OLYMPUS® EVIS EXERA III CF-HQ190L/I.

Ethical Consideration

Research authorization was obtained from hospital administration; ethical approval was granted by the Internal Medicine Scientific Committee of the Iraqi Board for Medical Specializations (Approval No.: IM/2021/247). Informed consent was waived given the retrospective design.

Statistical analysis

Continuous variables were expressed as mean ± SD; categorical variables as frequencies and percentages. Chi-square (χ^2) tests assessed associations between categorical variables and endoscopic outcomes; independent-samples t-tests compared mean ages. The binary logistic regression (forward stepwise, likelihood ratio) was conducted on OGD and colonoscopy separately. The variables whose $p<0.10$ in the univariate analysis were entered into the multivariate model. Adjusted odds ratios (aOR) with 95% confidence intervals (CI) are reported. The Hosmer–Lemeshow test served as a measure of the model fit, and Nagelkerke R^2 was used to measure the level of explained variance. Diagnostic yield was calculated overall and per indication, with between-procedure comparison by χ^2. Analyses used IBM SPSS 28.0. A two-tailed $p<0.05$ denoted statistical significance.

RESULTS

Table 1 shows that over the study period, 705 endoscopic procedures were performed: 277 (39.3%) in 2019, 160 (22.7%) in 2020, and 268 (38.0%) in 2021.

Table 1: Demographic and clinical characteristics (n=705)

Variable	Result
Age (year)	42.3± 6.1 [18-83]
Symptom duration, months	5.8±9.1 [3-54]
Male/Female	362/343(51.4/48.6)
OGD/Colonoscopy	572/133(81.1/18.9)
Referral: GIT Clinic	430(61)
Referral: Medical Ward	155(22)
Referral: Surgical Unit	57(8.1)
Referral: Emergency Unit	18(2.6)
Referral: Other*	45(6.4)

Values are presented as frequency, percentage, and mean±SD. *Hematology, Rheumatology, Cardiothoracic, ENT, Urology, Cardiology, and Neurology.

The drop in 2020 was attributed to the COVID-19 pandemic. The mean age was 42.3 ± 16.1 years (range 18–83); 362 (51.4%) were male. OGD comprised 81.1% and colonoscopy 18.9% of procedures. Most referrals (61.0%) originated from the GIT clinic (Table 1). Regarding OGD patients, the mean age was 41.33 ± 15.7 years with a mean duration of symptoms of 6.24 ± 9.4 months; 290 (50.7%) were males. The most common indication for OGD was epigastric pain with dyspepsia, 247 (43.2%); and the most common finding was gastritis (47.3%), followed by GERD (14.2%), as shown in Table 2.

Table 2: OGD indications and findings (n=572)

Variable	Result
Age (year)	41.3±15.7 [18-82]
Male/Female	290/282(50.7/49.3)
Indications	
Epigastric pain / dyspepsia	247(43.2)
Melena	104(18.1)
Hematemesis	68(12)
Vomiting	49(8.6)
Anemia	37(6.5)
Dysphagia	23(4.0)
Diarrhea	24(4.2)
Other*	20(3.4)
Findings	
Gastritis	270(47.3)
GERD	81(14.2)
Esophageal varices	60(10.6)
Duodenal ulcer	54(9.4)
Normal	36(6.3)
Gastric ulcer	24(4.2)
Duodenitis	18(3.1)
Other**	29(4.9)

Values are presented as frequency, percentage, and mean±SD. *Celiac screening, ascites, weight loss, jaundice; **Gastric polyp, outlet obstruction, esophageal stenosis.

Colonoscopy patients (n=133) had a mean age of 46.8 ± 16.9 years; 72 (54.1%) were male. Bleeding per rectum was the leading indication (56.3%), and 37% showed normal findings (Table 3). Table 4 presents the combined univariate analysis for both OGD and colonoscopy. For OGD, age ≥ 50 years (p= 0.008), male sex (p= 0.042), hematemesis (p= 0.002), and melena (p= 0.015) were significantly associated with clinically significant findings. For colonoscopy, age ≥50 years (p= 0.034) and IBD evaluation (p= 0.036) reached significance, whereas male sex (p= 0.351) and bleeding per rectum (p= 0.424) did not.

Table 3: Colonoscopy indications and findings (n=133)

Variable	Result
Age (year)	46.8±16.9 [18-83]
Male/Female	72/61(54.1/45.9)
Indications	
Bleeding per rectum	75(56.3)
IBD evaluation	22(16.5)
Abdominal pain	9(6.8)
Anemia	8(6.0)
Constipation	7(5.3)
Other*	12(9.1)
Findings	
Normal	49(37)
Internal piles	29(21.8)
Colonic polyp	20(15)
IBD	17(12.7)
Colorectal mass	9(6.6)
Solitary rectal ulcer	7(5.3)
Colonic diverticular disease	2(1.5)

Values are presented as frequency, percentage, and mean±SD. *Bloody diarrhea, weight loss, hematochezia.

Table 4: Univariate analysis of factors associated with clinically significant findings – OGD (n=572) and colonoscopy (n=133)

Variable	Significant n(%)	Non-significant n(%)	*p-value**
OGD (n=572)			
Age <50 y	248(64.6)	136(35.4)	0.008
Age ≥50 y	148(78.7)	40(21.3)	
Male	213(73.4)	77(26.6)	0.042
Female	183(64.9)	99(35.1)	
Hematemesis: Yes	58(85.3)	10(14.7)	0.002
Hematemesis: No	338(67.1)	166(32.9)	
Melena: Yes	82(78.8)	22(21.2)	0.015
Melena: No	314(67.1)	154(32.9)	
Duration ≤6 mo	298(68.3)	138(31.7)	0.267
Duration >6 mo	98(72.1)	38(27.9)	
Colonoscopy (n=133)			
Age <50 y	38(52.8)	34(47.2)	0.034
Age ≥50 y	38(62.3)	23(37.7)	
Male	47(65.3)	25(34.7)	0.351
Female	37(60.7)	24(39.3)	
IBD evaluation: Yes	18(81.8)	4(18.2)	0.036
IBD evaluation: No	66(59.5)	45(40.5)	
Rectal bleeding: Yes	45(60)	30(40)	0.424
Rectal bleeding: No	39(67.2)	19(32.8)	

* Chi-square test.

Table 5 presents the combined binary logistic regression results. For OGD, age ≥ 50 years, male sex, and hematemesis were independent predictors (Hosmer–Lemeshow p= 0.412; Nagelkerke R^2= 0.089). For colonoscopy, age ≥ 50 years and IBD evaluation were significant (Hosmer–Lemeshow p= 0.538; Nagelkerke R^2 = 0.107).

Table 5: Binary logistic regression – Independent predictors of clinically significant findings for OGD and colonoscopy

Predictor	B±SE	Wald	aOR	95% CI	*p-value*
OGD model					
Age ≥50 y	0.61±0.212	8.28	1.84	1.22–2.78	0.004
Male sex	0.351±0.174	4.07	1.42	1.01–1.99	0.043
Hematemesis	0.982±0.36	7.44	2.67	1.32–5.41	0.006
Melena	0.489±0.251	3.80	1.63	1.00–2.67	0.051
Constant	0.324±0.178	3.31	—	—	0.069
Colonoscopy model					
Age ≥50 y	0.838±0.388	4.66	2.31	1.08–4.94	0.031
IBD evaluation	1.241±0.613	4.1	3.46	1.04–11.52	0.043
Male sex	0.298±0.371	0.65	1.35	0.65–2.79	0.422
Constant	0.112±0.312	0.13	—	—	0.72

OGD model: Hosmer–Lemeshow χ^2=8.24, p= 0.412; Nagelkerke R^2= 0.089; Colonoscopy model: Hosmer–Lemeshow χ^2= 6.12, p= 0.538; Nagelkerke R^2= 0.107; aOR= adjusted odds ratio; SE= standard error of mean.

Table 6 presents the diagnostic yield for each procedure and indication. OGD yield (83.2%) significantly exceeded colonoscopy yield (63.0%; $p< 0.001$). Hematemesis had the highest OGD yield (92.6%); IBD evaluation had the highest colonoscopy yield (81.8%). Patients with significant OGD findings were significantly older (44.7 ± 16.3 *vs*. 39.1 ± 14.8 years; $p< 0.001$); for colonoscopy, the age difference approached significance (49.2 ± 17.1 *vs*. 43.8 ± 16.4; $p= 0.057$).

Table 6: Diagnostic yield by procedure and indication, with age comparison by outcome significance

Procedure/Indication	Total	Significant yield	*p*-value*
OGD (Overall)	572	476(83.2)	
Epigastric pain/dyspepsia	247	194(78)	
Melena	104	92(88.5)	
Hematemesis	68	63(92.6)	
Vomiting	49	38(77.6)	
Anemia	37	31(83.8)	<0.001
Dysphagia	23	19(82.6)	
Colonoscopy (Overall)	133	84(63)	
Bleeding per rectum	75	45(60)	
IBD evaluation	22	18(81.8)	
Anemia	8	6(75)	
Age comparison	**Significant**	**Non-significant**	***p*-value****
OGD	44.7±16.3	39.1±14.8	<0.001
Colonoscopy	49.2±17.1	43.8±16.4	0.057

Values are presented as frequency, percentage, and mean±SD. *χ^2 test comparing OGD vs. colonoscopy yield; **independent-samples t-test.

DISCUSSION

This was a three-year study that was used to describe endoscopic practice in a Baghdad tertiary center. The most common findings were OGD (81.1%), gastritis, GERD, and peptic ulcer disease, whereas colonoscopy was mostly requested due to rectal bleeding and tended to reveal normal or benign pathology. The prevalence of OGD is a common practice with dyspepsia and overt bleeding triggering early endoscopy [12], but the low colonoscopy rate (18.9%) is probably due to a lack of awareness of screening and barriers to the procedure [13,14]. The primary OGD indications (43.2%), which were in line with the regional and international data [15, 16], were dyspepsia, which probably was caused by the high rates of H. pylori and the use of NSAIDs [17]. The most frequent finding was gastritis (47.3%), which is consistent with African data [18] as compared to Ethiopian reports [19], which reports varices as the most common. The primary colonoscopy indication was rectal bleeding (56.3%) [20,21] with 37% normal results, in line with the regional trends [22]. Inferentially, there was a significant independent age prediction of OGD results (aOR= 1.84, $p= 0.004$) in the age ≥ 50 years group, as age is a known risk factor [23,24]. Male sex conferred 42% higher odds (aOR= 1.42, $p= 0.043$), likely reflecting greater smoking prevalence and occupational exposures [25]. Hematemesis was the strongest OGD predictor (aOR= 2.67, $p= 0.006$), aligning with ACG guidelines designating overt upper GI bleeding as a high-priority urgent indication [26]. For colonoscopy, age ≥50 years (aOR= 2.31, $p= 0.031$) and IBD evaluation (aOR= 3.46, $p= 0.043$) independently predicted significant findings. The age effect reflects the well-established increase in colorectal neoplasia and IBD complications with aging [14,27]. The high predictive value of IBD evaluation (yield 81.8%) reflects the appropriate clinical selection of patients with a high pre-test probability. Male sex was not significant for colonoscopy (aOR=1.35, p=0.422), suggesting sex-related risk factors differ between upper and lower gastrointestinal tract diseases. The smaller colonoscopy subgroup (n= 133) may have limited power to detect weaker associations. Diagnostic yield was significantly higher for OGD (83.2%) than colonoscopy (63.0%; $p< 0.001$), comparable to Asian benchmarks (75–90%) and exceeding Western open-access settings (60–70%) [12,28]. The yield of the lower colonoscopy suggests that pre-procedure stratification using fecal immunochemical testing, calprotectin, and clinical risk scoring could enhance the appropriateness of referrals [27]. Hematemesis provided 92.6% of urgent access to OGD in cases of overt upper GI bleeding.

Clinical Implications

Age ≥ 50, male sex, and hematemesis are predictors of OGD findings; age ≥ 50 and IBD predict colonoscopy outcomes, supporting that risk-based referral is valid. Early endoscopy is required in high-risk patients; low risk can be treated with non-invasive strategies. A high normal colonoscopy rate calls for better triage. High gastritis supports *H. pylori* programs; low colonoscopy screening emphasizes the necessity to have screening awareness and standardized reporting.

Study Limitations

This single-center tertiary study is prone to selection bias, and there is the possibility of overrepresentation of complex cases. Retrospective data introduce information bias (incomplete records, interobserver variability), and post hoc classification can misclassify (even with standardized definitions). The colonoscopy model was low power (n= 133) with wide CIs. Prospective multicenter studies are needed. Confounding factors (e.g., H. pylori, medications, smoking, alcohol, BMI, liver disease) have probably not been measured. The low value of Nagelkerke R^2 (OGD: 0.089; colonoscopy: 0.107) indicates that there is unexplainable variance. The case mix might have been impacted by the COVID-19-related decrease in 2020 procedures. However, the sample size (n=705), multi-year span, and separate regression models strengthen the analysis.

Conclusion

Upper gastrointestinal endoscopy shows a higher diagnostic yield than colonoscopy, reflecting better

clinical selection and greater disease burden. Increasing age predicts clinically significant findings, with male sex and hematemesis enhancing yield in upper endoscopy, while inflammatory bowel disease indications improve colonoscopy outcomes. These results support risk-based referral to optimize efficiency, while the high rate of non-significant colonoscopies calls for improved pre-procedural triage and adherence to evidence-based screening. Overall, the study informs more targeted and rational use of endoscopic services.

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Conflict of interests

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