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Original Article

Prevalence and Patterns of Peptic Ulcer Disease in an Endoscopic Cohort From Tripoli, Libya: A Retrospective Cross-Sectional Study

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ABSTRACT

Background: Peptic ulcer disease (PUD) is a substantial worldwide health challenge characterized by diverse epidemiological trends. Data on its prevalence in Libya are limited. This study aimed to determine the frequency and demographic correlates of PUD and its subtypes in patients undergoing upper endoscopy in Tripoli, Libya.

Methods: We conducted a retrospective cross-sectional study at Tripoli Central Hospital from January 2023 to June 2024. We analyzed data from 2604 patients who underwent endoscopy for the presence of gastric and duodenal ulcers.

Results: The total prevalence of PUD was 6.6%. Gastric ulcers (GUs) were reported in 3.9%, while duodenal ulcers (DUs) were reported in 2.2%. PUD and its subtypes were more prevalent in men (9.1%) compared to females (4.9%), with a significant male preponderance for DU (OR = 2.60). The prevalence increased with age, reaching its peak in individuals over 70 years (12.7%).

Conclusions: The prevalence of PUD in this Libyan endoscopic cohort was lower than in the majority of Middle East and North Africa nations but equivalent to European rates. In contrast to the worldwide trend, GUs were more prevalent than DUs. These results suggest the significance of local epidemiological research and highlight the need for more exploration of the underlying risk factors within this group. These results underscore the need for local epidemiological studies. However, they are limited by the retrospective design and lack of data on Helicobacter pylori and nonsteroidal anti-inflammatory drug use, precluding analysis of key risk factors.

Key words: Peptic ulcer disease, gastric ulcer, duodenal ulcer, prevalence, Libya, endoscopy

INTRODUCTION

Peptic ulcer disease (PUD) is characterized by a complete erosion of the mucosal lining of the stomach or duodenum, extending through the muscularis mucosa. [1,2] This condition constitutes a significant global health issue, impacting approximately 5% to 10% of the population, with duodenal ulcers (DU) historically exhibiting a prevalence fourfold higher than that of gastric ulcers (GUs). [3,4] The prevalence of PUD increases with age and is more frequent in males. [5–8]

The primary etiological factors are *Helicobacter pylori* infection and the use of nonsteroidal anti-inflammatory drugs (NSAIDs), with additional contributions from stress and genetic factors. [6,8] The disease exhibits a wide range of clinical presentations; around two-thirds of cases are asymptomatic, while symptomatic patients predominantly experience epigastric

pain. [9] Major complications include bleeding, perforation, and gastric outlet obstruction. [10] Management strategies focus on precise diagnosis through endoscopy, acid suppression using proton pump inhibitors, eradication of *H. pylori*, and discontinuation of NSAIDs. [11] The considerable morbidity and mortality linked to PUD highlight its clinical significance. [12]

While global and regional trends are well-documented, epidemiological data from Libya are severely limited, which constrains our understanding of its local impact. [13] Therefore, this study aimed to determine the prevalence of PUD and its subtypes within a specific Libyan population, to analyze their distribution by age and sex, and to investigate whether the established global pattern of DU predominance holds in our local context.

MATERIALS AND METHODS

Study Design and Setting

A retrospective, single-center, cross-sectional study was conducted at the Gastroenterology Endoscopy Unit of Tripoli Central Hospital, a major tertiary referral center in western Libya. The study period spanned 18 months, from January 1, 2023, to June 30, 2024.

Study Population and Sampling

The study population consisted of all consecutive patients referred for diagnostic esophagogastroduodenoscopy (EGD)

during the study period. The participant selection process is summarized in **Figure 1**. All electronic endoscopy reports were screened for eligibility. Inclusion criteria were: (1) having undergone a diagnostic upper gastrointestinal endoscopy, and (2) availability of a complete report documenting patient demographics (age, sex) and endoscopic findings. Exclusion criteria were: (1) a repeated EGD on the same patient within the study period (only the first procedure was included), (2) incomplete reports (e.g., missing age or sex), and (3) procedures that were purely therapeutic without a diagnostic component (e.g., variceal banding for known cirrhosis). A total of 2604 unique patient encounters met the inclusion criteria and formed the final study cohort. The participant selection process is summarized in **Figure 1**.

DATA COLLECTION AND VARIABLES

Data were extracted from the hospital's electronic medical records and endoscopy database into a standardized collection form. The primary outcome was the endoscopic diagnosis of PUD. An ulcer was defined as a distinct mucosal break with a perceptible depth and a diameter of ≥3 mm. PUD was categorized as GU, DU, or concurrent GU and DU. The primary independent variables were age (categorized into groups: ≤20, 21–30, 31–40, 41–50, 51–60, 61–70, >70 years) and sex (male/female). The primary endoscopic indications (e.g., dyspepsia, investigation for anemia, suspected upper gastrointestinal bleeding, gastroesophageal reflux symptoms) were also recorded for descriptive purposes.
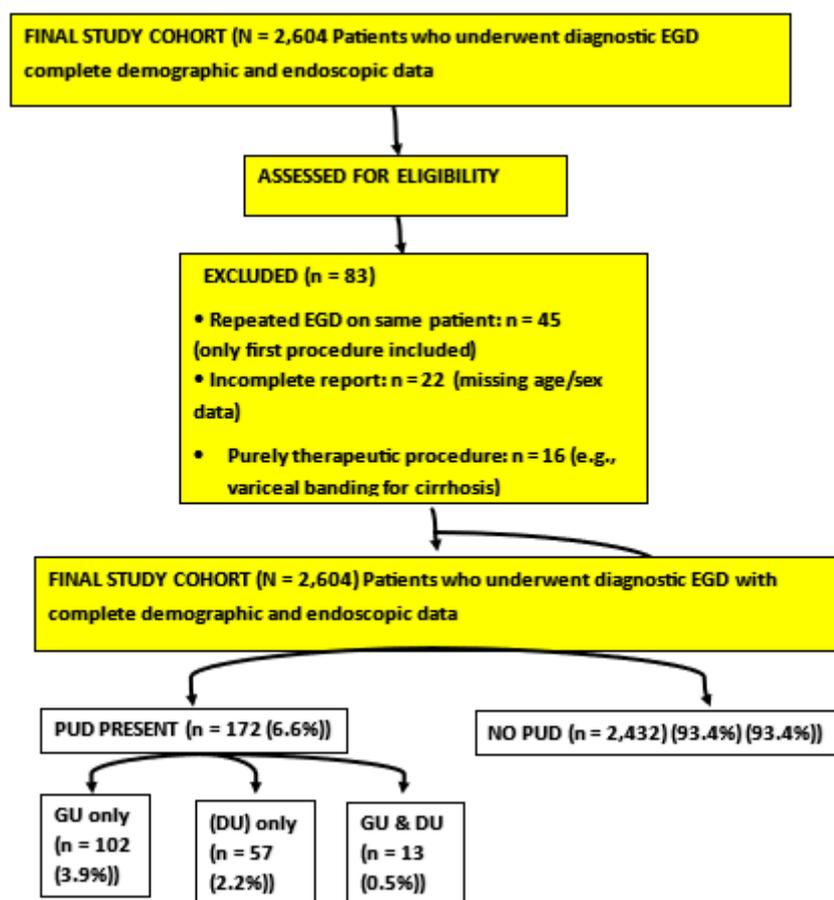

Figure 1: Flow diagram of participant selection. PUD: peptic ulcer disease; GU: gastric ulcer; DU: duodenal ulcer.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 25.0. Descriptive statistics were presented as frequencies and percentages for categorical variables. The overall prevalence of PUD and the subtype-specific prevalences (GU, DU) were calculated with 95% confidence intervals (CI). Associations between categorical variables (e.g., PUD prevalence by sex or age group) were assessed using the Chi-square (χ^2) test. Unadjusted odds ratios (OR) with 95% CIs were calculated to quantify associations. To control for potential confounding, multivariable logistic regression models were performed. Adjusted odds ratios (aOR) for the association of sex with PUD, GU, and DU were calculated, with adjustment for age as a categorical variable. A two-sided P-value of <0.05 was considered statistically significant. Patients with concurrent GU and DU were included in the overall PUD prevalence calculation. However, they were excluded from the subtype-specific comparative analyses (GU vs. DU) to maintain mutually exclusive groups. To control for potential confounding, multivariable logistic regression models were performed. Adjusted odds ratios (aOR) for the association of sex with PUD, GU, and DU were calculated, with adjustment for age as a categorical variable.

Sample Size Consideration

As a retrospective study of a consecutive cohort over a fixed timeframe, a formal prospective sample size calculation was not performed. The selected 18-month period was intended to provide a sufficiently large and recent sample to estimate prevalence with adequate precision, as reflected in the confidence intervals of the primary estimates.

Ethical Considerations

The study protocol was reviewed and approved by the Libyan National Committee for Biosafety and Bioethics (LNCBB; reference number: NCB.019.H.25.15) in June 2024. The requirement for informed consent was waived by the ethics committee due to the retrospective nature of the study, which involved the analysis of pre-existing, anonymized clinical data. All patient data were handled with strict confidentiality in accordance with the principles of the Declaration of Helsinki.

RESULTS

Of the 2604 study participants, 172 were identified with peptic ulcers, yielding an overall prevalence of 6.6% (95% CI, 5.6–7.6).

The spectrum of clinical presentations leading to endoscopy is summarized in **Table 1**. Dyspepsia was the most frequent primary indication, accounting for nearly half of all procedures (48.7%), followed by investigation for anemia (19.2%) and symptoms of gastroesophageal reflux disease (14.1%).

Among these 172 patients, the distribution of subtypes was as follows: 102 (59.3%) had GUs only, 57 (33.1%) had DUs only, and 13 (7.6%) had both subtypes concurrently. In the context of the total study population, this represents a prevalence of 3.9% for GU, 2.2% for DU, and 0.5% for concurrent ulcers (**Figure 2**).

Table 1: Primary indications for upper gastrointestinal endoscopy (N = 2604).

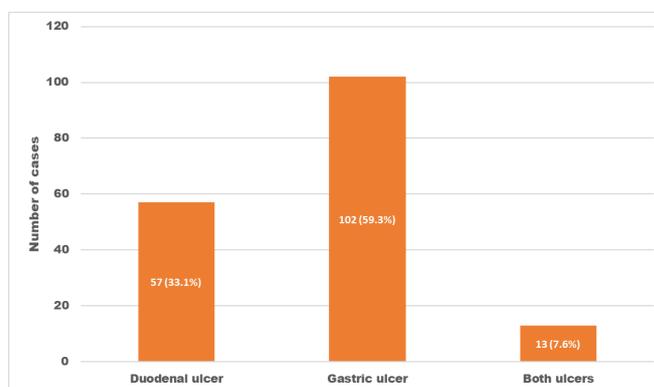| Indication	Number of patients	Percentage (%)
Dyspepsia	1268	48.7
Investigation for anemia	500	19.2
Gastroesophageal reflux symptoms	367	14.1
Suspected upper GI bleeding (e.g., melena, hematemesis)	255	9.8
Follow-up of known pathology	124	4.8
Other (e.g., dysphagia, weight loss)	90	3.5
Total	**2604**	**100**

GI: gastrointestinal.

Figure 2: Distribution of ulcer subtypes among the 172 patients with peptic ulcer disease.

PUD was significantly more prevalent in males (95/1047; 9.1%) than in females (77/1557; 4.9%) (unadjusted OR = 1.92 [95% CI, 1.41–2.62]; P < 0.001). After adjusting for age, the association between male sex and PUD remained significant (adjusted OR [aOR] = 1.93 [95% CI, 1.41–2.64]; P < 0.001). This male predominance was observed for both subtypes. GUs occurred in 5.2% of males (54/1047) compared to 3.1% of females (48/1557; unadjusted OR = 1.71 [95% CI, 1.15–2.54]; P = 0.007). The association was attenuated but persisted after age adjustment (aOR = 1.69 [95% CI, 1.14–2.51]; P = 0.009). Duodenal ulcers demonstrated a stronger male association, with a prevalence of 3.4% in males (36/1047) versus 1.3% in females (21/1557; unadjusted OR = 2.60 [95% CI, 1.51–4.49]; P < 0.001). This association remained robust after controlling for age (aOR = 2.60 [95% CI, 1.51–4.49]; P < 0.001; **Table 2**; **Figure 3**).

The prevalence of PUD increased significantly with age (χ^2 = 32.980; P < 0.001). The highest prevalence was observed in individuals over 70 years (12.7%), followed by the 51 to 60 year age group (8.0%). The lowest prevalence was in the ≤20 years age group (4.1%). This age-associated pattern was statistically significant for both GU (χ^2 = 27.336, P < 0.001)

Table 2: Sex-specific prevalence of peptic ulcer disease (PUD) and its subtypes.

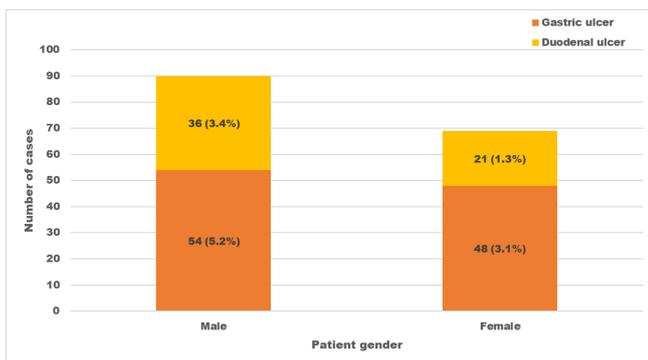| Sex	n PUD/N	PUD prevalence % (95% CI)	GU prevalence % (95% CI)	DU prevalence % (95% CI)
Male	95/1047	9.1 (7.3–11.0)	5.2 (3.8–6.7)	3.4 (2.3–4.8)
Female	77/1557	4.9 (3.8–6.1)	3.1 (2.3–4.0)	1.3 (0.8–2.0)
Total	**172/2604**	**6.6 (5.6–7.6)**	**3.9 (3.2–4.7)**	**2.2 (1.6–2.8)**

CI: confidence interval.

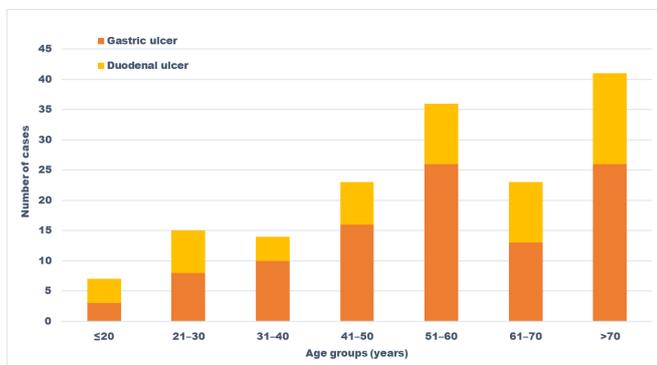**Figure 3:** Distribution of gastric ulcers and duodenal ulcers among males and females.

Figure 4: Distribution of gastric ulcers and duodenal ulcers across patient age groups.

and DU (χ^2 = 13.577; P = 0.035). GU prevalence was highest in patients over 70 (7.9%), while DU prevalence was also highest in this age group (4.5%). **Figure 4** and **Table 3** illustrate the age-specific prevalence.

DISCUSSION

This cross-sectional study of 2604 patients at a tertiary center in Libya found an overall PUD prevalence of 6.6%. A distinctive and key finding was the higher prevalence of GUs (3.9%) compared to DUs (2.2%), a pattern that contrasts with the established global epidemiology. The disease demonstrated a significant male predominance and a clear positive association with increasing age, with the highest burden observed in individuals over 70 years.

The overall PUD prevalence in our endoscopic cohort is lower than rates reported in most studies from the Middle East and North Africa region. [8,14,15] For instance, previous investigations in Libya, though focused on specific sub-populations such as patients with dyspepsia or overt gastrointestinal bleeding, reported substantially higher figures. [16,17] Our finding aligns more closely with prevalence estimates from several European nations. [11,18] This discrepancy may reflect genuine differences in population risk, variations in endoscopic referral patterns and thresholds, or improvements in public health measures and *H. pylori* eradication over time. It underscores that regional and national prevalence estimates cannot be extrapolated and highlights the value of local surveillance.

The reversal of the typical DU>GU ratio is the most notable finding of our study. Globally, DUs have historically been reported to be three to four times more common than Gus. [6,11] Our observed pattern, with GUs being nearly twice as prevalent as DUs, suggests potentially unique interactions of risk factors within this Libyan population. While unusual, a higher GU prevalence has been noted in a few other regional reports, [4,10] indicating this may be a feature of certain geographic or demographic cohorts. We hypothesize that this reversal could be driven by several interrelated factors: a high prevalence of more virulent *H. pylori* strains (e.g., cagA-positive) known to be more strongly associated with gastritis and GU; distinct patterns of NSAID and aspirin consumption, particularly among the elderly; or local dietary or environmental co-factors. This finding is fundamentally hypothesis-generating and points directly to the critical need for etiologically-focused research in this setting.

The demographic associations observed—increasing prevalence with age and male sex—are consistent with the global burden of PUD [19] and reports from diverse geographical settings. [2,4] The stronger male association with DU (aOR = 2.60) compared to GU (aOR = 1.69) in our adjusted analysis aligns with longstanding epidemiological observations. The small subgroup of patients with concurrent GU and DU (n = 13; 0.5%), while not analyzed separately for risk factors, represents a clinically important phenotype often associated with severe or multifactorial disease, warranting careful management.

Clinical and Research Implications

For clinicians in our region, these findings underscore the importance of maintaining a high index of suspicion for PUD, particularly GUs, in patients undergoing endoscopy,

Table 3: Age-specific prevalence of peptic ulcer disease.

Age group (years)	n PUD/N	Prevalence %	95% CI
≤20	8/195	4.1	1.8–8.0
21–30	15/392	3.8	2.1–6.1
31–40	14/400	3.5	2.0–5.8
41–50	23/486	4.7	3.0–7.0
51–60	36/450	8.0	5.7–11.0
61–70	22/350	6.3	4.0–9.5
> 70	42/331	12.7	9.3–16.9
Total	**172/2604**	**6.6**	**5.6–7.6**

especially older males. It reinforces the necessity of a thorough examination of the gastric mucosa and the imperative to pursue definitive diagnostic steps, including testing for *H. pylori* (via biopsy or non-invasive means) and meticulously reviewing NSAID/aspirin use when PUD is identified. For researchers, this study provides a crucial epidemiological baseline. It clearly identifies the priority for future prospective studies that must include systematic data collection on key risk factors: *H. pylori* infection status (and ideally strain typing), detailed medication histories (prescription and over-the-counter NSAIDs, antiplatelets, steroids), and smoking status. Only such targeted research can confirm the observed GU/DU reversal and elucidate its underlying causes.

Limitations

This study has several important limitations that must be considered when interpreting the results. Its retrospective design from a single tertiary center introduces selection bias; our cohort represents a symptomatic or high-risk population referred for endoscopy, and the prevalence estimates are not generalizable to the asymptomatic community. Information bias is possible due to reliance on routine clinical documentation, which lacked standardized reporting on ulcer characteristics (e.g., size, location, bleeding stigmata) and, crucially, on key risk factors. The most significant limitation is the absence of data on *H. pylori* infection, NSAID/medication use, and smoking history. This missing information constitutes a major barrier to replicating the study, explaining the observed associations (particularly the GU>DU reversal), and controlling for critical confounding**.** These gaps fundamentally limit causal inference and are the primary motivation for our call for prospective, etiologically-focused follow-up studies.

CONCLUSIONS

This study provides recent and critical epidemiological data from a Libyan tertiary care cohort, revealing an overall PUD prevalence of 6.6%. Our findings identify a distinct local pattern characterized by a higher prevalence of GUs compared to DUs, a reversal of the well-established global trend. The disease demonstrated a significant male predominance and a clear association with advancing age. These results highlight a unique epidemiological profile for PUD in this setting, underscoring the necessity for region-specific clinical awareness and diagnostic vigilance. The observed reversal in ulcer subtype prevalence points to potentially unique local etiological drivers. To move beyond description and enable causal understanding, future prospective research must prioritize the systematic investigation of key risk factors, particularly *H. pylori* infection status, strain virulence, and patterns of NSAID use.

AUTHORS' CONTRIBUTION

Each author has made a substantial contribution to the present work in one or more areas, including conception, study design, conduct, data collection, analysis, and interpretation. All authors have given final approval of the version to be published, agreed on the journal to which the article has been submitted, and agree to be accountable for all aspects of the work.

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None.

CONFLICT OF INTEREST

None.

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