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Prevalence of Uncomplicated Erosive and Ulcerative Lesions of the Upper Gastrointestinal Tract in Patients of a Surgical Hospital

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ABSTRACT

INTRODUCTION: In the last decade, patients with various surgical pathologies have been demonstrating an increase in uncomplicated erosive and ulcerative lesions (EULs) of the proximal part of the gastrointestinal tract (GIT). Knowledge of the current prevalence of this pathology has both scientific and practical significance.

AIM: Assessment of the prevalence of uncomplicated EULs in the upper GIT in a multidisciplinary surgical hospital and analysis of factors that determine the structure of the identified prevalence.

MATERIALS AND METHODS: Meta-analysis of 20 clinical studies from eLibrary, PubMed databases from 2010 to 2023 devoted to uncomplicated EULs of GIT, stomach and duodenum.

RESULTS: Based on the examination of 4,337 patients (data of domestic literature sources) and 13,024,812 (data of foreign sources), the prevalence of acute erosive and EULs of the upper GIT ranged from 7.4 to 100% and from 1.7 до 100% respectively. High heterogeneity of samples confirms a wide variation of the incidence of the analyzed kind of lesion both in our country and abroad determined by the influence of various factors, specific to both each patient and the profile of a surgical hospital.

CONCLUSION: The meta-analysis demonstrates a high range of incidence of uncomplicated acute EULs of the proximal GIT, which requires further clarification of the true prevalence of the pathology under study and of other causes that influence the development of destructive pathological alterations.

Keywords: erosions, ulcers, esophagus; stomach; duodenum; upper digestive tract; prevalence; multidisciplinary surgical hospital.

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Распространенность неосложненных эрозивно-язвенных поражений верхних отделов желудочно-кишечного тракта у пациентов хирургического стационара

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АННОТАЦИЯ

Введение. В последнее десятилетие у пациентов с различной хирургической патологией отмечается рост неосложненных эрозивно-язвенных поражений (ЭЯП) проксимального отдела желудочного-кишечного тракта (ЖКТ). Знание актуальной распространенности данной патологии имеет и научное, и практическое значение.

Цель. Оценить распространенность неосложненных ЭЯП верхних отделов ЖКТ в условиях многопрофильного хирургического стационара и проанализировать факторы, определяющие структуру выявленной распространенности.

Материалы и методы. Проведен метаанализ из баз данных eLibrary.ru, PubMed с 2010 по 2023 годы 20 клинических исследований, посвященных неосложненным ЭЯП пищевода, желудка и двенадцатиперстной кишки.

Результаты. На основании обследования 4 337 пациентов (по данным отечественных литературных источников) и 13 024 812 (зарубежных), распространенность острых ЭЯП верхних отделов ЖКТ составила от 7,4 до 100% и от 1,7 до 100% соответственно. Высокая гетерогенность выборок подтверждает, что встречаемость анализируемого вида повреждений широко варьирует в нашей стране и за рубежом, и происходит это под воздействием разных факторов, специфичных как для отдельно взятого пациента, так и профиля хирургического стационара.

Заключение. Проведенный метаанализ демонстрирует высокий диапазон частоты встречаемости неосложненных острых ЭЯП проксимального отдела ЖКТ, что требует дальнейшего уточнения истинной распространенности изучаемой патологии и других причин, влияющих на развитие деструктивных патологических изменений.

Ключевые слова: эрозии, язвы, пищевод; желудок; двенадцатиперстная кишка; верхние отделы органов пищеварения; распространенность; многопрофильный хирургический стационар.

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INTRODUCTION

In recent decades, there has been a clear trend towards an increase in uncomplicated symptomatic erosive and ulcerative lesions (EULs) of the proximal gastrointestinal tract (GIT) [1–4]. One of the main features of this type of injury is the *variety of etiological factors*, in particular, extensive abdominal surgeries, severe wounds and injuries, intake of medical drugs, severe endocrine and somatic diseases [5–9]. In addition, this pathology is often masked by the symptoms of the underlying disease and remains unrecognized [6, 10, 11], leading to a complicated course in 20–60% of cases [9].

Currently, no systematic studies have been conducted to assess the global prevalence of uncomplicated 'stress-related' lesions of the proximal digestive organs in patients of multidisciplinary surgical hospitals. The available data are scattered and uninformative, since they reflect the characteristics of the pathology under study only in a separate group of subjects in a specific surgical hospital.

The **aim** of this study to assesses of the prevalence of uncomplicated EULs in the upper GIT in a multidisciplinary surgical hospital and analysis of factors that determine the structure of the identified prevalence.

MATERIALS AND METHODS

The work was carried out of the Second Military Clinical Hospital of the National Guard Troops of the Russian Federation (Pyatigorsk) and of the Department of Surgery of the Yaroslavl State Medical University (Yaroslavl). The literature sources were searched in the eLibrary.ru and PubMed databases. Twenty clinical studies were selected (14 domestic and 6 foreign; 4,337 and 13,024,812 participants respectively), conducted from 2010 to 2023.

Inclusion criteria: articles describing symptomatic ('stress-related') lesions of the mucous membrane of the gastrointestinal tract in the form of ulcers and erosions.

The following nosologies were taken into account: esophageal erosions (K22.1 according to the International Statistical Classification of Diseases and Related Health Problems, 10th revision), erosions and ulcers of the stomach (K25), erosions and ulcers of the duodenum (K26).

Exclusion criteria: works devoted to the description of only materials and methods of the study, not containing results in the form of quantitative data; systematic reviews (non-primary sources).

When searching, no restrictions were set regarding the type of participants (age and gender characteristics), study design, or study results.

It is accepted to divide symptomatic ulcers into groups by their type (drug-induced, hypoxic, endocrine, stress-related, etc.), however, we deliberately did not try to separately identify etiological factors, but tried to reflect modern trends in the prevalence of gastrointestinal erosions and ulcers in surgical hospitals of various profiles by combining the results of published studies.

The characteristics of the included studies are presented in Tables 1 and 2.

Data analysis was performed using MedCalc® Statistical Software, version 22.009 (MedCalc Software Ltd, Belgium). The proportion method was used. The weighted mean for continuous variables with 95% confidence interval (CI) was assessed. In accordance with the recommendations of the Cochrane Community, statistical heterogeneity was estimated based on I^2 value (%). The lower the value, the more homogeneous the sample data were and, accordingly, the more accurate and reliable was assessment of the effect. Thus, with I^2 value of 0%, the studies were considered homogeneous, with 25%, statistical heterogeneity was assessed as low, with 50%, the studies were statistically considered heterogeneous; heterogeneity of 75% and above was assessed as statistically high.

RESULTS

The total population in the analyzed domestic studies was 4,337 (effect size), 31.742% (95% CI: 30.360–33.149) of them were diagnosed with symptomatic EULs of proximal GIT mucosa. The authors note a specific prevalence of uncomplicated symptomatic erosive-ulcerative lesions of the proximal GIT among patients of a multidisciplinary surgical hospital at different time intervals.

In nine of the presented studies (R.G. Kutateladze et al. (2011) [12], B.S. Zaporozhchenko et al. (2012) [13], S.V. Belova et al. (2014) [14], A.N. Batyrova et al. (2014) [15], O.N. Minushkin et al. (2015) [16], U.M. Pirov et al. (2017) [17], A.A. Marchenko et al. (2017) [18], E.M. Pshukova et al. (2021) [19], I.S. Terekhov et al. (2023) [20]), the incidence rate of acute EULs was higher than the average and amounted to 69.231 (95% CI: 60.028–77.432)%, 63.614 (95% CI: 58.781–68.252)%, 87.857 (95% CI: 81.271–92.765)%, 100.000 (95% CI: 96.973–100.000)%, 34.000 (95% CI: 21.205–48.765)%, 33.333 (95% CI: 25.856–41.484)%, 68.182 (95% CI: 58.619–76.738)%, 50.442 (95% CI: 45.733–55.146)% and 100 (95% CI: 84.563–100.000)% respectively. At the same time, in five other studies (V.V. Duiko et al. (2010) [21], R.M. Shabaev et al. (2015) [22], D.O. Wagner et al. (2016) [23], A.A. Alekseev et al. (2020) [1], A.A. Polyantsev et al. (2021) [24]), 'stress-related' erosive and ulcerative changes were found only in 14.078 (95% CI: 10.207–18.741) %, 21.970 (95% CI: 18.509–25.748)%, 13.793 (95% CI: 3.889–31.664)%, 14.621 (95% CI: 13.03–16.322)%, 7.447 (95% CI: 3.046–14.743)% respectively.

Statistical analysis of domestic studies showed high heterogeneity of samples: I^2=99.13 (95% CI: 98.95–99.28)%, p <0.0001. The random effect of implementation was 50.184 (95% CI: 32.978–67.368)%. Kendall's tau rank correlation coefficient for checking publication bias in clinical and epidemiological studies showed reliable values and was 0.07692, p=0.7016.

Table 1. Characteristics of domestic works included in the study

Authors and year of publication, number of literature source	Sample size	Proportion (%)	95% CI	Weight (%)	
				fixed	random
Kutateladze R.G. et al. (2011) [12]	117	69.231	60.028–77.432	2.71	7.18
Zaporozhchenko B.S. et al. (2012) [13]	415	63.614	58.781–68.252	9.56	7.28
Belova S.V. et al. (2014) [14]	140	87.857	81.271–92.765	3.24	7.20
Batyrova A.N. et al. (2014) [15]	120	100.000	96.973–100.000	2.78	7.19
Minushkin O.N. et al. (2015) [16]	50	34.000	21.205–48.765	1.17	7.01
Pirov U.M. et al. (2017) [17]	150	33.333	25.856–41.484	3.47	7.21
Marchenko A.A. et al. (2017) [18]	110	68.182	58.619–76.738	2.55	7.17
Pshukova E.M. et al. (2021) [19]	452	50.442	45.733–55.146	10.41	7.28
Terekhov I.S. (2023) [20]	22	100.000	84.563–100.000	0.53	6.66
Duyko V.V. et al. (2010) [21]	277	14.079	10.207–18.741	6.39	7.26
Shabaev R.M. et al. (2015) [22]	528	21.970	18.509–25.748	12.16	7.29
Wagner D.O. et al. (2016) [23]	29	13.793	3.889–31.664	0.69	6.80
Polyantsev A.A. et al. (2022) [24]	94	7.447	3.046–14.743	2.18	7.15
Alekseev A.A. et al. (2020) [1]	1,833	14.621	13.034–16.322	42.15	7.31
Total (fixed effects)	4,337	31.742	30.360–33.149	100.00	100.00
Total (random effects)	4,337	50.184	32.978–67.368	100.00	100.00

Note: CI — confidence interval

Table 2. Characteristics of foreign works included in the study

Authors and year of publication, number of literature source	Sample size	Proportion (%)	95% CI	Weight (%)	
				fixed	random
Li Z. et al. (2010) [25]	3,153	17.190	15.888–18.553	0.024	16.74
Kawauchi H. et al. (2013) [26]	57	100.000	93.733–100.000	0.00045	16.57
Huang G. et al. (2015) [27]	69	20.290	11.560–31.693	0.00054	16.60
Sakaguchi M. et al. (2017) [28]	1,749	100.000	99.789–100.000	0.013	16.74
Sakata Y. et al. (2019) [29]	71	54.930	42.662–66.773	0.00055	16.60
Fujimoto S. et al. (2021) [30]	13,019,713	1.700	1.693–1.707	99.96	16.75
Total (fixed effects)	13,024,812	1.707	1.700–1.714	100.00	100.00
Total (random effects)	13,024,812	53.526	9.813–93.973	100.00	100.00

Note: CI — confidence interval

The combined population of foreign studies was 13,024,812 subjects (effect size), of which 1.707 (95% CI: 1.700–1.714)% of patients were diagnosed with symptomatic ('stress-related') erosive and ulcerative lesions of the mucous membrane of the proximal gastrointestinal tract.

In five studies: Z.Li et al. (2010) [25], H. Kawauchi et al. (2013) [26], G. Huang et al. (2015) [27], M. Sakaguchi et al. (2017) [28], Y. Sakata et al. (2019) [29], the incidence rate of acute EULs of the proximal gastrointestinal tract was higher than the average and was 17.190 (95% CI: 15.888–18.553)%, 100.000 (95% CI: 93.733–100.000)%, 20.290 (95% CI: 11.560–31.693)%, 100.000 (95% CI: 99.789–100.000)%, 54.930 (95% CI: 42.662–66.773)% respectively. And only in one study by S. Fujimoto et al. (2021) [30] this indicator was below average — 1.700 (95% CI: 1.693–1.707)% (see Table 2).

Assessment of the statistical significance of the studies conducted by foreign colleagues showed a similar

high heterogeneity of the samples — I^2=99.97 (95% CI: 99.97–99.97)% at p <0.0001, which confirms the statistical heterogeneity of the analyzed works. The random effect of implementation was 53.526 (95% CI: 9.813–93.973)%. The Kendall's tau rank correlation coefficient for checking publication bias in clinical and epidemiological studies showed reliable values and was 0.06667 at p=0.8510.

The above quantitative results of the studies demonstrate true statistical indicators and not significant ones. A brief report of the conducted analytical research is clearly presented in the form of graphic portraits (forest graph and funnel scatter plot).

The studies by E.M. Pshukova et al. (2021) [19], A.A. Marchenko et al. (2017) [18] and U.M. Pirov et al. (2017) [17] demonstrated the true prevalence of uncomplicated EULs of proximal GIT within the mean values. The remaining 11 domestic studies have statistically significant values, however, they do not show normal distribution relative the overall mean of all studies at p <1.0 (Figure 1).

The study by Y. Sakata et al. (2019) [29] demonstrate the true prevalence of uncomplicated EULs of the proximal GIT within the mean values. In the remaining 5 foreign studies, statistically significant values are recorded, however, they do not show normal distribution relative the overall mean of all studies at p <1.0 (Figure 2).

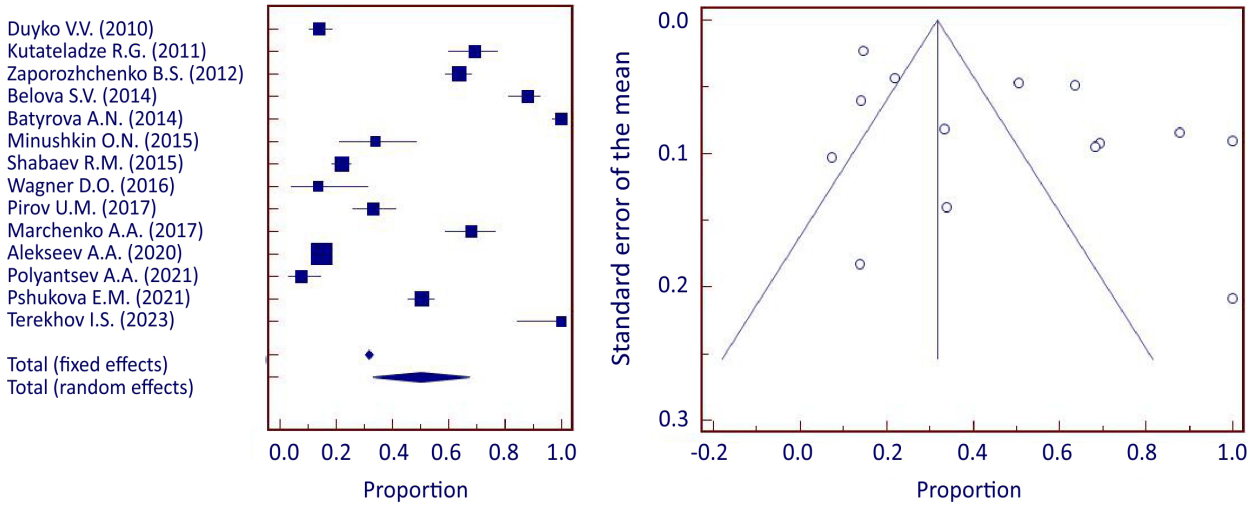

Fig. 1. Forest plot and funnel diagram of indicators of groups included in the studies of domestic authors.

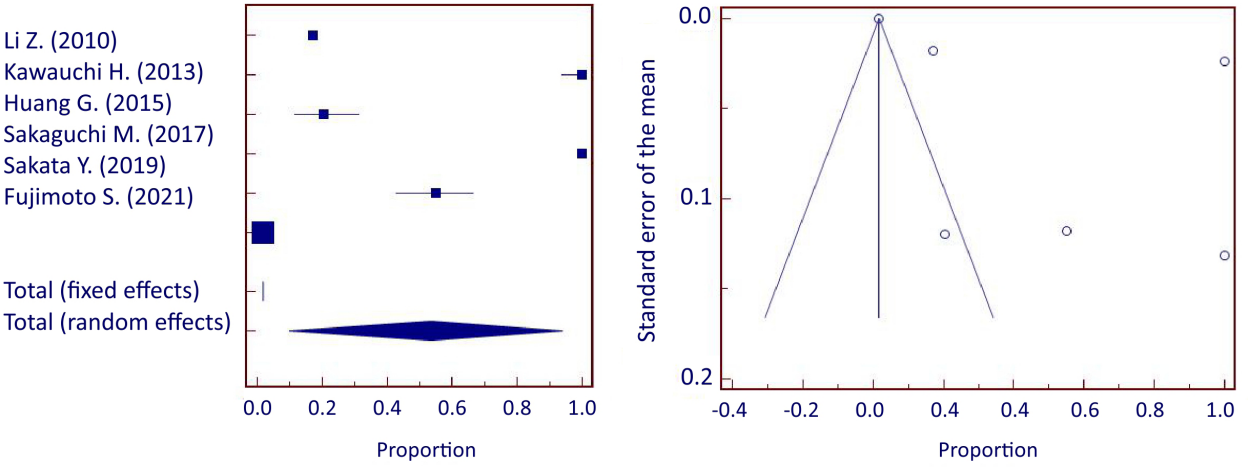

Fig. 2. Forest plot and funnel diagram of the indicators of groups included in the studies of foreign authors.

DISCUSSION

The obtained results reflect a high heterogeneity of samples, which shows not only peculiarities of prevalence of EULs of the proximal GIT in each category of patients of a surgical hospital, but also a baseline health condition, existence of concomitant diseases, and also the severity of organ functional and metabolic disorders with the underlying surgical endotoxicosis and surgical trauma.

An analysis of the incidence of EULs of the gastrointestinal tract taking into account the age, gender and a surgical hospital profile showed predominance of male patients (71.4%) with the mean age 49 to 55 years in trauma hospitals, including those of neurosurgical profile, abdominal, purulent surgery, oncology hospitals, and also among patients in critical conditions in the intensive care unit.

The data obtained are not random and indicate the existence of certain causal factors influencing the prevalence of symptomatic acute EULs. We present the main causal factors underlying the occurrence of EUs of the upper GIT, from the clinical studies by E.M. Pshukova et al. (2021) [19], A.A. Marchenko et al. (2017) [18], U.M. Pirov (2017) et al. [17] and Y. Sakata et al. (2019) [29] with true statistical indicators.

A.A. Marchenko et al. (2017), based on a retrospective study of medical records of 110 patients of the *purulent surgery* department, identified the following causes of the EULs of the upper GIT: recurrent peptic ulcer in history, age over 61, mechanical lung ventilation for more than 48 hours and the amount of the performed surgical intervention.

U.M. Pirov et al. (2017) in their study on an example of 150 patients with *severe brain injury* demonstrated a direct relationship between the identified destructive changes in the gastrointestinal tract and the severity of this injury (33.3%) [17].

The study by E.M. Pshukova et al. (2021), based on 452 morphological studies of *gastrobiopsies* of patients with EULs of the proximal GIT, showed the presence of microcirculation disorders, *H. pylori* (*Hp*), chronic inflammation in such patients, which allowed the authors to make a conclusion about the existence of chronic *Hp*-associated gastritis in this category of patients [19].

Y. Sakata et al. (2019) in the period from 2009 to 2016, based on the *results of endoscopy*, proved the role of age, male gender, medication use, concomitant diseases, need for emergency endoscopy, presence of duodenal lesions, arterial hypertension and impaired renal function in the occurrence of destructive changes in the mucous membrane of the gastrointestinal tract [29].

S. Fujimoto et al. (2021), based on the latest trends in destructive lesions of the gastrointestinal tract presented in a large-scale study in Japan, noted the importance of therapeutic preventive strategies [30].

Summarizing the said above, causes of symptomatic ('stress-related') lesions of the proximal part of the GIT include age, gender, the amount of surgical intervention, severity of injury, mechanical lung ventilation for more than 48 hours, repeated reconstructive surgeries, burdened gastroenterological history (peptic ulcer), *Hp* infection, evident microcirculation disorders and chronic inflammation of the proximal GIT, medication use, coexisting severe somatic pathology directly or indirectly associated with disorders in the hemostasis system. A fundamental role belongs to the absence of preventive measures, in particular, timely diagnosis, eradication therapy for positive *Hp* status and the prescription of proton pump inhibitors for negative *Hp* status.

CONCLUSION

Despite the enormous advances in gastroenterology and modern endoscopy, the prevalence of uncomplicated acute erosive and ulcerative lesions of the proximal gastrointestinal tract varies widely depending on the type of surgical hospital: from 7.4 to 100% according to domestic authors and from 1.7 to 100% according to foreign authors.

A multiplicity of etiological factors requires the attending physician to conduct preventive personalized therapeutic strategies for the pathology under study. Further study of the comprehensive potential impact of other risk factors on the condition of the upper digestive organs is necessary to prevent the development of such lesions and select the optimal treatment option.

ADDITIONAL INFORMATION

Author contributions. L.A. Ushaeva — collection and processing of data, writing the text; D.V. Zavyalov — concept and design of the study, editing; L.B. Shubin — concept and design of the study, statistical analysis of materials, editing; I.N. Staroverov, Yu.V. Chervyakov, S.N. Pamputis — editing. All authors approved the manuscript (the publication version), agreed to be responsible for all aspects of the work, ensuring proper consideration and resolution of issues related to the accuracy and integrity of any part of it.
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Data availability statement. The editorial policy regarding data sharing does not applicable to this work, and no new data were collected or created.
Generative AI. Generative AI technologies were not used for this article creation.
Provenance and peer-review. This work was submitted to the journal on its own initiative and reviewed according to the usual procedure. Two external reviewers, a member of the editorial board and the scientific editor of the publication participated in the review.

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