

Gastritis: identifying determinants for complication prevention. An analysis carried out from cases of an Italian surgical pathology laboratory

Gastrite: identificare i determinanti per la prevenzione delle complicanze. Un'analisi condotta su casi provenienti da un laboratorio italiano di patologia chirurgica

Sara Biasion,¹ Stefania Erra,² Carlotta Bertolina,¹ Riccardo Mazzucco,³ Giovanni Angeli,² Elia Ranzato,⁴ Marinella Bertolotti,¹ Antonio Maconi¹

¹Research Training Innovation Infrastructure, Research and Innovation Department (DAIRI), Azienda Ospedaliero-Universitaria SS. Antonio e Biagio e Cesare Arrigo, Alessandria; ²Surgical Pathology Laboratory, Santa Rita Clinic, Monza Polyclinic, Vercelli;

³Research and Innovation Department, Azienda Sanitaria Locale, Alessandria; ⁴Dipartimento di Scienze e Innovazione Tecnologica (DiSIT), University of Piemonte Orientale, Alessandria, Italy

Key words: surgical pathology, gastritis, gastric alterations, risk determinants, quality of life.

ABSTRACT

Background: because of the impact of gastritis on patients' quality of life and the importance of accurate diagnosis to identify potential precancerous lesions related to them, we evaluated the determinants that could most influence the risk of gastritis development and gastric mucosa alterations.

Materials and Methods: gastric biopsies performed from September to November 2023 were collected. Univariate and multivariate logistic regression models were used to identify determinants of gastritis, gastric mucosa alterations and gastrectomy (sleeve). Results of logistic model were presented as Odds Ratio (OR) with a 95% Confidence Interval (CI) and corresponding p-value.

Results: univariate and multivariate logistic analysis showed an increase in odds of gastritis development related to age, while the increase in odds of gastric alterations was also related to gender. Male gender and age ≥ 65 decreased the odds of receiving a gastric resection (sleeve).

Conclusions: recognizing determinants having a greater impact on gastritis and gastric alterations development is imperative, to identify people who are most at risk, so that preventive population interventions can be evaluated.

Background: a causa dell'impatto della gastrite sulla qualità della vita dei pazienti e dell'importanza di una diagnosi accurata per identificare potenziali lesioni precancerose ad essa correlate, abbiamo valutato i determinanti che potrebbero influenzare maggiormente il rischio di sviluppo della gastrite e le alterazioni della mucosa gastrica.

Materiali e Metodi: sono state raccolte biopsie gastriche eseguite da settembre a novembre 2023. Sono stati utilizzati modelli di regressione logistica univariata e multivariata per identificare i determinanti di gastrite, alterazioni della mucosa gastrica e gastrectomia (*sleeve*). I risultati del modello logistico sono stati presentati come *Odds Ratio* (OR) con un Intervallo di Confidenza (IC) al 95% e il corrispondente p-value.

Risultati: l'analisi logistica univariata e multivariata ha mostrato un aumento delle probabilità di sviluppo della gastrite in relazione all'età, mentre l'aumento delle probabilità di alterazioni gastriche era legato anche al sesso. Il sesso maschile e l'età ≥ 65 anni hanno diminuito le probabilità di ricevere una resezione gastrica (*sleeve*).

Conclusioni: è imperativo riconoscere i determinanti che hanno un maggiore impatto sullo sviluppo della gastrite e delle alterazioni gastriche, al fine di identificare le persone più a rischio, in modo da poter valutare gli interventi preventivi a livello di popolazione.

Introduction

Gastritis, although still greatly underestimated nowadays, is one of the most common noncancerous inflammatory diseases worldwide.

The term "gastritis" defines a broad spectrum of histological lesions which are characterized by the occurrence of inflammatory cells inside gastric mucosa.¹ Gastritis' typical clinical symptomatology

refers to dyspeptic syndrome in both acute and chronic forms. Histologic diagnosis of gastritis requires biopsy sampling by gastric endoscopy, an invasive examination that assumes the knowledge of well-defined clinical indications.²

Globally, the prevalence of gastritis results to be very high: for example, in developing countries, 50.8% of the population suffer from this condition, while, in developed countries, 34.7% of the population had health problems due to gastritis.³⁻⁵

The main causes of its development include substance use, smoking, eating spiced food, anxiety and stress.^{3,6} This disorder can lead over time to the onset of severe cancer diseases, which can even be life-threatening if not treated properly.⁷

Many risk factors are involved in the gastritis development. The main ones include the intake of medications (such as Non-Steroidal Anti-Inflammatory Drugs, NSAIDs, steroid therapies, anti-cancer therapies, antidepressants), diet and lifestyles (especially smoking and alcohol abuse, sedentary behavior, and unhealthy diets).⁸⁻¹² Physical and emotional stress, infections (especially *Helicobacter pylori*), other conditions such as bile reflux, and autoimmune disorders also represent risk factors for the onset of gastritis.^{13,14}

Because of the wideness of risk factors and its development cause, measures to prevent excess irritation of gastric mucosa are possible.

Concerning food intake, slow mastication at meals is recommended, avoiding too large meals and lying down at least two hours later than a meal.¹⁵ There are also foods for which it is recommended to limit consumption, such as those rich in fat, spicy or very salty, as well as fried foods, citrus and acidic fruits, chocolate, tomatoes and other acidulous vegetables. Moderate intake of coffee, tea, carbonated drinks in general, juices and alcohol are recommended among drinks.¹⁶

Gastritis histological diagnosis can be established through the SYDNEY classification, whose name is due to the World Congress of Gastroenterology held in Sydney in 1990. It is based on endoscopic classification of the gastric mucosa and is useful in classifying gastritis according to topography, type and degree of severity.¹⁷ However, this system does not provide prognostic guidance useful for routine diagnosis.

In addition, exists a specific staging for gastritis, proposed in 2005, defined as Operative Link on Gastritis Assessment (OLGA), which by assessing the degree and extent of atrophy allows the identification of a subgroup of patients with higher-risk precancerous lesions who require increased surveillance.¹⁸

Gastritis can impact patients' quality of life significantly, especially when symptoms are severe and recurrent. Physical symptoms (heartburn, abdominal pain, nausea, throwing up, and a full feeling after eating), reduced ability to ingest food (with appetite reduction or early feeling of satiety),¹⁹ severe emotional impact (causing stress, anxiety, depression, or irritability) can be observed.²⁰ In addition, high costs associated with therapies, pharmacological, medical examinations, diagnostic tests, and lifestyle changes must be considered. All of this can extensively impact patients' quality of life.

Besides being very impactful on daily quality of life, gastritis can also represent precancerous conditions.²¹ Indeed, the persistent presence of *Helicobacter pylori* (H.P.) can lead to lymphoma development,²² while persistence of intestinal metaplasia in the stomach glands can result in invasive adenocarcinomas of varying histotypes.²³ For this reason, it is essential to perform regular gastric screenings and keep a close attention on any symptoms that can be correlated with a gastric problem.²⁴

Most importantly, patients with gastritis should receive appropriate treatment in order to better manage their symptoms and improve their quality of life. This may include changes in daily habits, drug therapies to reduce gastric inflammation, and treatments to manage stress and anxiety relating to the disease. In addition, emotional support and education on ways to manage the illness can be pivotal in improving quality of life for patients with gastritis.

Materials and Methods

From all the biopsy samples collected at the Surgical Pathology laboratory of Santa Rita Clinic in Vercelli, from September 1 to November 30 2023, only gastric ones were selected to assess gastritis incidence in a Pathologic Anatomy service that collects most of the regional case series.

Demographic data (age, gender) and clinical characteristics such as types of gastritis, occurrence of *H. pylori*, gastric mucosa alterations and vertical gastric resection (sleeve) intervention were collected for each patient.

Age was reported as mean and Standard Deviation (SD). Categorical variables were summarized as counts and percentages.

Separate univariate and multivariate logistic regression models were used to identify determinants of gastritis, gastric mucosa alterations and stomach vertical gastric resection (sleeve). In the multivariate logistic regression models, different subsets of variables were included as covariates: in the model explaining the probability of having gastritis, only demographic variables, such as age (≥ 65 or < 65 years) and gender, were included as covariates; in the logistic model used to identify determinants of the presence of gastric mucosa, variables included in the regression are: demographic variables, having H.P. infection and occurrence of gastritis; finally, in the model explaining the probability of stomach vertical gastric resection (sleeve), gender and gastritis were considered in the regression. Results of logistic models were presented as Odds Ratio (OR) with a 95% confidence interval and corresponding p-value. A two-tailed p-value < 0.05 was considered statistically significant. Analyses were performed using STATA 18.

Results

From 2066 biopsy samples collected between September 1 to November 30, 2023, 524 of them (25.4%) were gastric biopsies.

The most frequent gender was female (64.9%). The mean age of patients was 54.5 years (SD 15.5), with a higher mean age in men (55.9) compared to women (53.8). 144 patients aged ≥ 65 years.

Gastritis was diagnosed in 410 patients, accounting for 78.2% of the overall gastric resection biopsy we received. Most gastritis was diagnosed in individuals aged < 65 years, while the most frequently occurring gender was female (64.9%).

Chronic type gastritis was the most frequently diagnosed in both genders. Gastric mucosa alterations occurrence, such as polyps, intestinal metaplasia, Barrett's esophagus or neoplasia was observed in 107 patients, 82 of whom with gastritis. H.P. was detected in 73 active or multiple histotype gastritis (active and atrophic), with a prevalence of infection in women (64.4%).

Finally, 167 of gastric resection biopsy (31.9%) were from sleeve gastrectomy of which 108 had gastritis. Sleeve gastrectomy was most frequently performed by women (77.2%) (Table 1).

The univariate logistic regression model that assessed the association of gastritis in relation to gender and age (Table 2), showed that being 65 years old or older increases the odds of gastritis (OR 3.65, $p < 0.001$). This result is confirmed in the multivariate logistic regression (OR 3.71, $p < 0.001$).

Results of the univariate and multivariate models for the evaluation of vertical gastric resection are shown in Table 3. From both models, it resulted that male gender reduces the odds of receiving gastric resection surgery (OR 0.43, $p < 0.001$), as well as the presence of gastritis (OR 0.33, $p < 0.001$) (Table 3).

The results of the last univariate and multivariate logistic models, used to identify determinants of alterations in the gastric mucosa, are shown in Table 4. The univariate logistic model showed an increased odds in male patients (OR 1.60, $p=0.03$) and in those

aged ≥ 65 years (OR 2.86, $p<0.001$). However, the multivariate logistic model confirmed that only being ≥ 65 years old increases the odds of having alterations in the gastric mucosa (OR 2.94, $p<0.001$) (Table 4).

Table 1. Patients' demographic and clinical characteristics.

Characteristics	Overall (n=524)	Men (n=184)	Women (n=340)
Age (mean \pm SD)	54.5 (± 15.5)	55.9 (± 16.5)	53.8 (± 15.0)
Gastritis			
Active	88 (16.8%)	28 (15.2%)	60 (17.7%)
Atrophic	18 (3.4%)	4 (2.2%)	14 (4.1%)
Chronic	255 (48.7%)	90 (48.9%)	165 (48.5%)
Multiple histotype	49 (9.4%)	22 (12%)	27 (7.9%)
No gastritis	114 (21.7%)	40 (21.7%)	74 (21.8%)
Gastric mucosa alterations			
Yes	107 (20.4%)	47 (25.5%)	60 (17.7%)
No	417 (79.6%)	137 (74.5%)	280 (82.3%)
<i>Helicobacter pylori</i>			
Yes	73 (13.9%)	26 (14.1%)	47 (13.8%)
No	451 (86.1%)	158 (85.9%)	293 (86.2%)
Sleeve			
Yes	167 (31.9%)	38 (20.7%)	129 (37.9%)
No	357 (68.1%)	146 (79.3%)	211 (62.1%)

SD, Standard Deviation.

Table 2. Univariate and multivariate logistic regression for gastritis.

	Univariate OR	95% CI	p-value	Multivariate OR	95% CI	p-value
Gender						
Female	1 (ref)	0.65-1.55	0.99	1 (ref)	0.57-1.38	0.59
Male	1.00			0.89		
Age						
<65	1 (ref)	1.97	<0.001	1 (ref)	2.00-6.87	<0.001
≥ 65	3.65			3.71		

OR, Odds Ratio; CI, Confidence Interval.

Table 3. Univariate and multivariate logistic regression for sleeve.

	Univariate OR	95% CI	p-value	Multivariate OR	95% CI	p-value
Gender						
Female	1 (ref)	0.28-0.65	<0.001	1 (ref)	0.26-0.63	<0.001
Male	0.43			0.41		
Gastritis						
No	1 (ref)	0.22-0.51	<0.001	1 (ref)	0.21-0.49	<0.001
Yes	0.33			0.32		

OR, Odds Ratio; CI, Confidence Interval.

Table 4. Univariate and multivariate logistic regression for gastric mucosa alterations.

	Univariate OR	95% CI	p-value	Multivariate OR	95% CI	p-value
Gender						
Female	1 (ref)	1.04-2.47	0.03	1 (ref)	0.92-2.23	0.12
Male	1.60			1.43		
Age						
<65	1 (ref)	1.84-4.46	<0.001	1 (ref)	1.85-4.68	<0.001
≥ 65	2.86			2.94		
Gastritis						
No	1 (ref)	0.54-1.48	0.65	1 (ref)	0.40-1.21	0.20
Yes	0.89			0.70		
<i>H. pylori</i>						
No	1 (ref)	0.38-1.42	0.36	1 (ref)	0.42-1.67	0.61
Yes	0.74			0.84		

OR, Odds Ratio; CI, Confidence Interval.

Discussion

Gastritis should not be underestimated as it is a very common disorder in the population, which can evolve into more serious, sometimes even life-threatening conditions.¹ However, in order to obtain a correct diagnosis, proper communication and interaction between surgeon performing the sampling and pathologist is imperative.²

Furthermore, it is also important to remember that gastritis diagnosis is both clinical and histological. For this reason, the pathologist needs to always be supplied with adequate clinical information for the interpretation of endoscopic and histologic findings; lacking this knowledge, some cases are not easily interpreted, making it difficult to give a correct diagnosis.

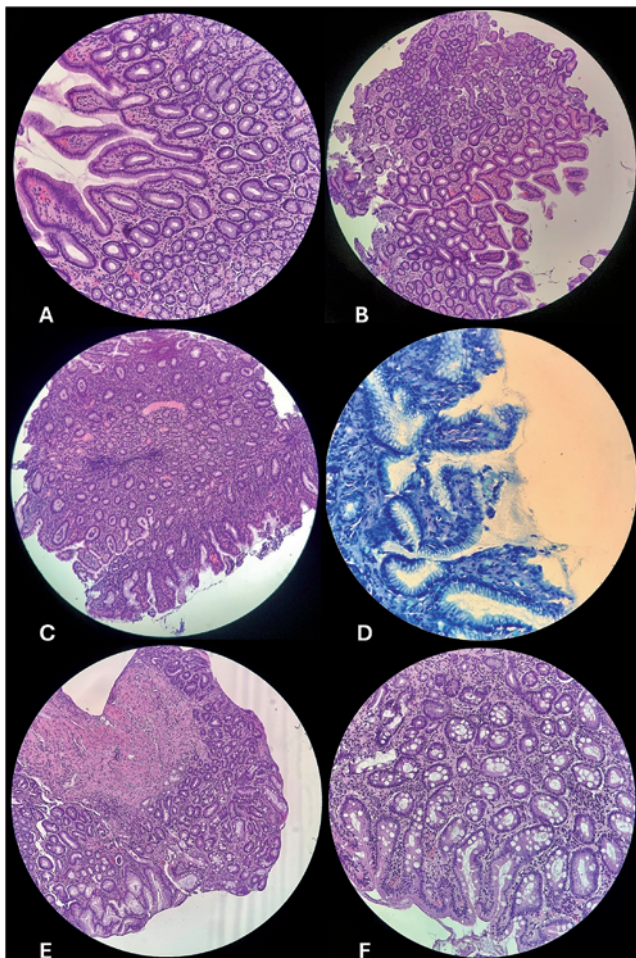


Figure 1. Histological section of gastric mucosa. A) healthy gastric mucosa at 100X magnification, hematoxylin-eosin staining; B) quiescent chronic gastritis at 100X magnification, hematoxylin-eosin staining; C) active gastritis at 40X magnification, hematoxylin-eosin staining; D) active gastritis associated with *Helicobacter pylori* (H. P.) infection, 400X magnification, giemsa staining; E) atrophic gastritis at 40X magnification, hematoxylin-eosin staining; F) atrophic gastritis with metaplasia magnification 200x, EE.

Gastritis is often underestimated, so the patient's symptoms or sampling sites are not well specified; this can be a source of trouble in understanding the patient's clinical setting and thus in the accuracy and completeness of histopathologic diagnosis. Like any disease of major incidence in the population, gastritis would also benefit from setting up a screening program in selected age groups aimed at early detection of inflammatory alterations in preclinical phase. A population-based surveillance program aimed at preventing atrophic gastritis and early detection of active H.P.-related gastritis would be determinant in the reduction of crippling gastrointestinal diseases, as well as gastric adenocarcinoma. Finally, adopting a healthy lifestyle and proper eating habits can help to manage, or even prevent, gastritis.

Whereas gastric biopsy examination represents one of the most frequent pathologic samples reaching a pathologic anatomy laboratory, it would be useful to develop reproducible histopathologic reports so as to help physicians in defining strategies for the prevention of gastric diseases.

This is because gastritis can also develop precancerous forms over time, as well as being very impactful on the quality of daily life. The persistent occurrence of *H. pylori* can lead to lymphoma, while the persistence of intestinal metaplasia in the stomach glands can result in invasive adenocarcinomas of different histotypes. For this reason, it is essential to perform regular gastric screenings and monitor any symptoms that can be correlated with a gastric issue (Figure 1).

Finally, it is relevant to consider obesity's incidence in the population;²⁵ in our case series, about 32% of the gastric samples that came to our laboratory were related to obese patients, who underwent stomach corpus reduction surgery (sleeve gastrectomy) to limit its volume in order to precede satiety.

This finding is very impactful and turns out to be a real social problem since people nowadays are tending to have increasingly sedentary lives and have improper eating habits, affecting gastric alteration development, with serious complications.²⁶

Conclusions

It is critical for patients with gastritis to receive appropriate treatment in order to best manage their symptoms and improve their quality of life. This may include changes in daily habits, drug therapies to reduce gastric inflammation, and treatments to manage stress and anxiety related to the disease. In addition, emotional support and education on ways to manage the disease can be pivotal in improving gastritis patients' quality of life.

References

- Sipponen P, Maaros HI. Chronic gastritis. *Scand J Gastroenterol* 2015;50:657-67.
- Azer SA, Awosika AO, Akhondi H. Gastritis. 2024. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK544250/>
- Feyisa ZT, Woldeamanuel BT. Prevalence and associated risk factors of gastritis among patients visiting Saint Paul Hospital Millennium Medical College, Addis Ababa, Ethiopia. *PLoS One* 2021;16:e0246619.
- Pedroso Toscano E, Fernandez Madeira F, Pinheiro Dutra-Rulli

- M, et al. Epidemiological and clinical-pathological aspects of helicobacter pylori infection in Brazilian children and adults. *Gastroenterology Research & Practice* 2018;2018:8454125.
5. Marcis L, Olga S, Jelizaveta P, Yaron N. Epidemiology of Helicobacter pylori infection. *Wiley Helicobacter* 2018;23:e12514.
 6. Geeraerts B, Vandenberghe J, Van Oudenhove L, et al. Influence of experimentally induced anxiety on gastric sensorimotor function in humans. *Gastroenterology* 2005;129:1437-44.
 7. Cavatorta O, Scida S, Miraglia C, et al. Epidemiology of gastric cancer and risk factors. *Acta Biomed* 2018;89:82-7.
 8. Laine L. Nonsteroidal anti-inflammatory drug gastropathy. *Gastrointestinal endoscopy clinics of North America* 1996;6:489-504.
 9. Farthing MJ, Fairclough PD, Hegarty JE, et al. Treatment of chronic erosive gastritis with prednisolone. *Gut* 1981;22:759-62.
 10. Chen G, Yu Z, Zhang Y, et al. Radiation-induced gastric injury during radiotherapy: molecular mechanisms and clinical treatment. *Journal of Radiation Research* 2023;64:870-9.
 11. Goel N, Levine MD, Chambers LM, Nagel CI. Gastritis as an immunotherapy-related toxicity in the treatment of endometrial cancer: A case report. *Gynecol Oncol Rep* 2023;47:101174.
 12. Chen J, Ruan X, Fu T, et al. Sedentary lifestyle, physical activity, and gastrointestinal diseases: evidence from mendelian randomization analysis. *EBioMedicine* 2024;103:105110.
 13. Zhang LY, Zhang J, Li D, et al. Bile reflux is an independent risk factor for precancerous gastric lesions and gastric cancer: an observational cross-sectional study. *J Dig Dis* 2021;22:282-90.
 14. Lee JY, Park HW, Choi JY, et al. Helicobacter pylori Infection with Atrophic Gastritis Is an Independent Risk Factor for Advanced Colonic Neoplasm. *Gut Liver* 2016;10:902-9.
 15. Kim MK, Ko BJ, Kim EY, et al. Fast eating speed increases the risk of endoscopic erosive gastritis in Korean adults. *Korean J Fam Med* 2015;36:300-4.
 16. Singh S, Chakole S, Agrawal S, et al. A comprehensive review of upper gastrointestinal symptom management in autoimmune gastritis: current insights and future directions. *Cureus* 2023;15:e43418.
 17. Misiewicz JJ. The Sydney System: a new classification of gastritis. Introduction. *J Gastroenterol Hepatol* 1991;6:207-8.
 18. Rugge M, Correa P, Di Mario F, et al. OLGA staging for gastritis: a tutorial. *Dig Liver Dis* 2008;40:650-8.
 19. Nikolova D, Trajkovska M, Trpevska EN, et al. Evaluation of the effects of gastro protect as an alternative medicine on gastritis and other gastrointestinal symptoms. *Pril (Makedon Akad Nauk Umet Odd Med Nauki)* 2024;45:51-60.
 20. Mogami S, Arita R, Nahata M, et al. Usefulness of a Kampo medicine on stress-induced delayed gastric emptying in mice. *Evid Based Complement Alternat Med* 2020;2020:3797219.
 21. Sun Y, Yin L, Nesheli DN, et al. Overall and cause-specific mortality among patients diagnosed with gastric precancerous lesions in Sweden between 1979 and 2014: an observational cohort study. *BMC Med* 2024;22:333.
 22. Park JB, Koo JS. Helicobacter pylori infection in gastric mucosa-associated lymphoid tissue lymphoma. *World J Gastroenterol* 2014;20:2751-9.
 23. Jencks DS, Adam JD, Borum ML, et al. Overview of current concepts in gastric intestinal metaplasia and gastric cancer. *Gastroenterol Hepatol (NY)* 2018;14:92-101.
 24. Chivu R, Evanghelides A, Georgescu DE, Pa Traşcu T. Navigating through surgical implications of Helicobacter pylori: an up-to-date comprehensive literature review. *Chirurgia (Bucur)* 2023;118:568-83.
 25. Emerenziani S, Guarino MPL, Trillo Asensio LM, et al. Role of overweight and obesity in gastrointestinal disease. *Nutrients* 2019;12:111.
 26. Turnip ED, Indriarini MY, Wijaya YM. Unhealthy lifestyle among sufferers of gastritis on young adult age. *Jurnal Berita Ilmu Keperawatan* 2023;16:232-9.

Correspondence: Carlotta Bertolina, Research Training Innovation Infrastructure, Research and Innovation Department (DAIRI), Azienda Ospedaliero-Universitaria SS. Antonio e Biagio e Cesare Arrigo, Alessandria, Italy.
E-mail: carlotta.bertolina@ospedale.al.it

Authors' contributions: BS, ER, AM, substantial contributions to the conception, design, acquisition of data, drafting the work and revising it critically for important intellectual content; CB, MR, substantial contribution to analysis and interpretation of data for the work, drafting the work and revising it critically for important intellectual content; AG, acquisition, analysis, and interpretation of data for the work, drafting the work and revising it critically for important intellectual content; RE, MB, critically revising the work for important intellectual content. All the authors have read and approved the final version of the manuscript, and agreed to be held accountable for all aspects of the work.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: none.

Ethics approval and consent to participate: not applicable.

Informed consent: the manuscript does not contain any individual person's data in any form.

Availability of data and materials: all data generated or analyzed during this study are included in this published article.

Received: 31 October 2024.

Accepted: 7 July 2025.

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Working Paper of Public Health 2025;13:10180

doi:10.4081/wpph.2025.10180

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