The Impact of Patient Education on Knowledge of Gastritis and Its Management in Public Health Centers

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Abstract

This study examines the impact of pharmacy education on patients' knowledge of gastritis and its associated medications in several public health centers in Bogor City. Gastritis is a common digestive disorder caused by factors such as Helicobacter pylori infection and prolonged NSAID use. The research used a quantitative pre-experimental design with a one-group pre-test and post-test approach. One hundred patients with gastritis participated, receiving educational interventions through leaflets and oral explanations. Data were collected using structured questionnaires and analyzed with statistical methods. Results showed a significant improvement in patient knowledge following the intervention, with the proportion of patients demonstrating high knowledge increasing from 45% to 94%. The Wilcoxon test confirmed a statistically significant effect of the educational program (p-value = 0.000). These findings underscore the effectiveness of pharmacy education in enhancing patients' understanding of gastritis and medication use, which may lead to improved treatment adherence and better health outcomes. Future research should investigate various educational media, expand to different populations or settings, and assess long-term knowledge retention and clinical outcomes. Exploring barriers to information uptake and the role of family or community support could further optimize educational interventions for managing chronic diseases.

Keywords
Healthcare System Management, Public Health Center, Education, Patient Knowledge, Gastritis.

1. Introduction

Gastritis is a common digestive disorder characterized by inflammation of the gastric mucosa, which can lead to a range of symptoms and complications if left unmanaged. The condition is frequently caused by infection with Helicobacter pylori and prolonged use of non-steroidal anti-inflammatory drugs (NSAIDs), but can also be triggered by lifestyle factors such as excessive alcohol consumption, irregular eating patterns, and high levels of stress. According to the World Health Organization (WHO), the global incidence of gastritis remains significant, with millions of new cases reported annually, and prevalence rates varying across different countries. NSAIDs are an independent cause of reactive (chemical) gastritis, especially in the gastric antrum (Elbehiry et al. 2023).

In Indonesia, gastritis represents a major public health concern, with a reported prevalence of 40.8% in 2020 and substantial numbers observed in urban areas such as Bogor City. The burden of gastritis is particularly notable among productive age groups, where it can negatively impact daily activities, reduce quality of life, and decrease overall productivity. Effective management of gastritis not only relies on appropriate pharmacological therapy but also on patient knowledge and adherence to treatment regimens. Prevalence rates for gastritis can be as high as 78% in some populations, with both acute and chronic forms commonly observed (Feyisa et al. 2021).

Pharmacy education plays a crucial role in empowering patients with the information necessary to understand their condition and use medications correctly. Systematic reviews and meta-analyses have demonstrated that pharmacist-led interventions significantly improve the rational use of anti-ulcer medications, reduce treatment costs, and enhance medication adherence among patients with peptic ulcer disease and related gastrointestinal conditions (Sapkota et al. 2025). Chronic gastritis remains one of the most common serious infections globally, with higher rates in low-income and low-sociodemographic index regions. Recent studies have reported rising rates of mild chronic gastritis, particularly among children and young adults (Josyabhatla et al. 2024).

However, gaps in patient understanding persist, often due to limited access to reliable information or inadequate communication between healthcare providers and patients. Research indicates that knowledge directly and significantly influences both attitudes and practices related to gastritis management, underscoring the importance of targeted educational programs (Qin et al. 2024). Prevalence and risk factors vary significantly by geographic region, socioeconomic status, and local health practices (Reshetnyak et al. 2021)

Given these challenges, evaluating the impact of pharmacy education on patient knowledge is essential for optimizing treatment outcomes and enhancing the quality of healthcare services. This study aims to assess the effectiveness of pharmacy education in improving patient knowledge about gastritis and the appropriate use of gastritis medications in public health centers in Bogor City.

1.1 Objectives

The objectives of this study are to evaluate and enhance patient knowledge regarding gastritis and its medication use through pharmacy education interventions in public health centers in Bogor City. Initially, the research aims to assess the baseline understanding of patients about gastritis and the correct use of related medications before any educational activities are conducted. Following this, the study evaluates the impact of pharmacy education delivered through oral counseling and informative leaflets on improving patient knowledge. By comparing pre- and post-intervention knowledge scores, the effectiveness of these educational media is determined. Additionally, the research seeks to identify specific barriers and facilitators that influence knowledge improvement within the local healthcare context. The findings aim to provide evidence-based recommendations for optimizing pharmacy education strategies in primary care, thereby supporting improved management of gastritis and promoting rational medication use among patients.

3. Methods

This study employed a quantitative pre-experimental design using a one-group pre-test and post-test approach. The research was conducted at several public health centers (Puskesmas) in Bogor City during June 2025. The study population comprised all patients undergoing treatment for gastritis at these centers, with a total sample of 100 patients selected based on specific inclusion criteria. The sampling technique used was purposive sampling to ensure that

participants met the study requirements. Data collection involved administering structured questionnaires to assess patients' baseline knowledge of gastritis and its medication use before any educational intervention.

Following the pre-test, participants received pharmacy education interventions consisting of oral counseling and the distribution of informational leaflets about gastritis and its medication. After the intervention, the same questionnaire was administered as a post-test to evaluate changes in patient knowledge. Data were processed and analyzed using descriptive and inferential statistics, including the Wilcoxon signed-rank test, to determine the significance of knowledge improvement. The study adhered to ethical standards, with informed consent obtained from all participants and confidentiality maintained throughout the research process.

The questionnaire consists of ten statements related to gastritis and its treatment, where respondents are asked to indicate whether each statement is true or false. The statements cover several aspects of gastritis, including its definition, causes, dietary influences, medication use, side effects, symptoms, and proper handling of medications. For example, the questionnaire clarifies that gastritis is an inflammation or irritation of the stomach lining, and that it is not caused solely by viral or fungal infections, but can also result from other factors such as bacteria, medications, or lifestyle choices. It addresses common misconceptions, such as the belief that spicy and fatty foods do not affect gastritis, when in fact they can exacerbate symptoms in some individuals.

The statements also provide guidance on the correct use of antacid tablets, emphasizing that they should be chewed before swallowing, and note that diarrhea is a common side effect of antacids. Additionally, the questionnaire highlights typical symptoms of gastritis, such as bloating and early satiety, and corrects the misconception that gastritis never causes nausea or vomiting. It also explains the appropriate timing for taking antacids either one hour before or after meals and the correct handling of expired medications, which should be disposed of properly rather than simply thrown in the trash. Lastly, it addresses the storage of opened syrup medications, indicating that they can be kept at room temperature for up to 14 days. This comprehensive set of statements is designed to assess and improve patient knowledge about gastritis and the safe, effective use of related medications.

4. Data Collection

Data collection for this study was conducted at several public health centers (Puskesmas) in Bogor City during June 2025. The process began with the recruitment of 100 patients who met the inclusion criteria, specifically those undergoing treatment for gastritis and willing to participate in the research. Prior to the educational intervention, each participant completed a structured questionnaire designed to assess their baseline knowledge regarding gastritis and its medication use. Following this pre-test, participants received pharmacy education through oral counseling and the distribution of informative leaflets. After the intervention, the same questionnaire was administered as a post-test to evaluate any changes in patient knowledge. All responses were collected privately to ensure confidentiality and encourage honest participation. The collected data were then coded and prepared for statistical analysis to measure the effectiveness of the educational program.

To ensure the accuracy and reliability of the data, all questionnaires were administered in a private setting, allowing participants to respond without external influence or pressure. The research team provided clear instructions and was available to clarify any questions regarding the items in the questionnaire, both before and after the educational intervention. This approach facilitated honest and thoughtful responses, minimized potential biases, and enhanced the overall quality of the data collected. Additionally, all completed questionnaires were carefully checked for completeness and consistency before being coded and entered into the database for subsequent statistical analysis.

5. Results and Discussion

The findings of this study further emphasize the critical role of pharmacy education in improving patient knowledge and self-management for gastritis. The significant increase in the proportion of patients with high knowledge levels after educational intervention demonstrates that structured, accessible information—delivered through oral counseling and leaflets—can bridge existing gaps in patient understanding. This aligns with recent evidence from PubMed-indexed studies, which highlight that patient education and pharmacist-led interventions are effective not only in increasing knowledge but also in enhancing medication adherence and clinical outcomes for gastrointestinal disorders (Kim et al. 2022)

The study involved 100 patients diagnosed with gastritis at several public health centers (Puskesmas) in Bogor City. Prior to the educational intervention, the assessment of patient knowledge revealed that 45% of respondents had a high level of knowledge, 45% had a moderate level, and 10% had a low level regarding gastritis and its medication use. After the pharmacy education intervention, which consisted of oral counseling and the distribution of informative leaflets, there was a marked improvement: 94% of participants achieved a high level of knowledge, 6% remained at a moderate level, and none were classified as having low knowledge. Statistical analysis using the Wilcoxon signed-rank test confirmed a significant increase in knowledge scores post-intervention, with a p-value of 0.000, indicating that the educational program had a substantial impact on patient understanding.

These findings are consistent with previous research demonstrating the effectiveness of pharmacist-led educational interventions in improving patient knowledge and promoting rational medication use. The dual approach of oral explanations and written leaflets proved particularly effective, as it catered to different learning preferences and reinforced key information. The improvement in knowledge was not only quantitative but also qualitative, as patients showed better understanding of medication timing, side effects, and appropriate drug disposal methods. However, some gaps remained, such as misunderstandings about the correct disposal of expired medications, highlighting the need for continued education and more comprehensive materials on specific topics.

The results underscore the importance of integrating structured pharmacy education into routine patient care at primary health centers. By addressing knowledge gaps and providing targeted interventions, healthcare providers can empower patients to take a more active role in managing their health, leading to better treatment adherence and health outcomes. The study also identifies the need for future research to explore alternative educational media, such as digital platforms, and to assess long-term knowledge retention and behavioral changes. Overall, the findings support the implementation of pharmacy education as a key component of patient-centered care and chronic disease management in primary healthcare settings.

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A quasi-experimental study on patients with chronic gastritis found that educational interventions significantly improved patients' knowledge, self-efficacy, and quality of life compared to controls, with sustained benefits observed at follow-up. This suggests that comprehensive patient education is not only beneficial for knowledge acquisition but also for empowering patients to manage their condition and adhere to therapy. Another study evaluating the knowledge, attitude, and practice of gastroenterology patients revealed that knowledge directly and significantly influences both attitudes and healthcare practices, reinforcing the importance of prioritizing patient education during clinical consultations to improve the management of chronic gastritis.

Furthermore, pharmacist counseling has been shown to yield measurable improvements in medication adherence and treatment outcomes. For example, a randomized controlled trial demonstrated that pharmacist-led counseling resulted in a statistically significant increase in outpatient compliance with medication and higher eradication rates for Helicobacter pylori infection compared to standard care. Additional research in patients with chronic gastrointestinal conditions, such as ulcerative colitis, found that pharmacist intervention significantly decreased nonadherence rates, improved clinical scores, and reduced disease flare-ups, further supporting the value of pharmacist-led education and follow-up (Shoiab et al. 2023).

5.1 Distribution of patients
The study included 100 patients (83 female and 17 male) diagnosed with gastritis at several public health centers (Puskesmas) in Bogor City. The demographic characteristics of the respondents are detailed in Table 1 below:

Table 1. Respondent Demographics

Age Group	Number of Respondents	Percentage (%)
19–25 years	29	29%
26–35 years	31	31%
36–45 years	19	19%
46–55 years	18	18%
56–59 years	3	3%

The age and gender distribution in this study shows most respondents were young to middle-aged adults, especially in the 19–25 and 26–35 year age groups, and predominantly female (83%). This indicates that pharmacy education interventions effectively reached productive-age adults and women, who are more likely to participate in health programs at public health centers. While knowledge improved across all ages, the strong female majority suggests future efforts should better engage men to ensure equitable health education for all.

5.2 Improvement of knowledge Results

Figure 1 below illustrates the changes in patient knowledge levels regarding gastritis and its medication use before and after the pharmacy education intervention conducted at several public health centers (Puskesmas) in Bogor City. This intervention consisted of oral counseling and the distribution of informative leaflets, aiming to address gaps in patient understanding and promote rational use of medication.

Before the educational program, a significant portion of patients demonstrated only moderate or low knowledge about gastritis and its treatment. Following the intervention, there was a marked improvement, with the vast majority of participants achieving a high level of expertise. The visual comparison between pre- and post-intervention knowledge levels demonstrates the effectiveness of targeted pharmacy education in empowering patients to better manage their health and adhere to appropriate medication practices. This positive shift underscores the importance of integrating structured educational initiatives into routine patient care within primary healthcare settings.
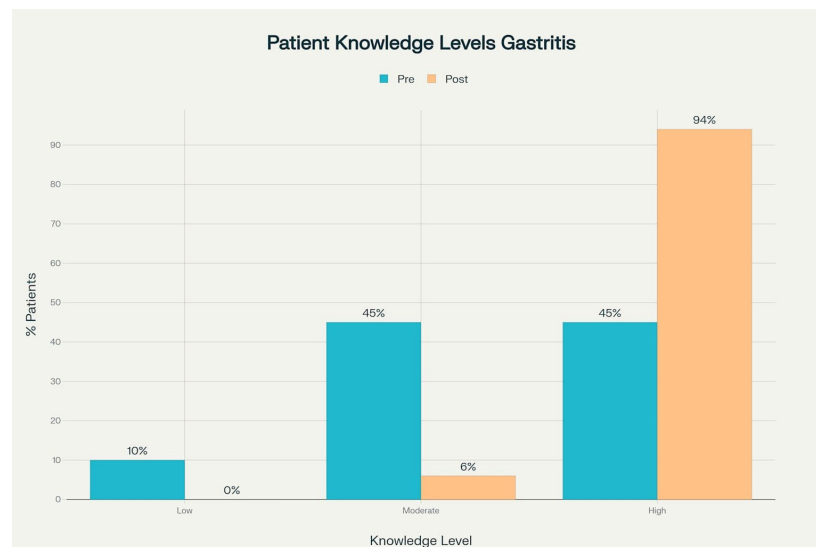

Figure 1. Improvement in Patient Knowledge Levels on Gastritis and Medication Use Before and After Pharmacy Education Intervention

The results clearly demonstrate the significant positive impact of pharmacy education on patient knowledge regarding gastritis and its medication use. Prior to the intervention, less than half of the patients exhibited a high level of knowledge, with notable proportions falling into moderate and low knowledge categories. Following the educational sessions, there was a dramatic shift, with nearly all patients (94%) achieving a high level of understanding and no patients remaining in the low knowledge group. This substantial improvement highlights the effectiveness of

structured pharmacy education delivered through oral counseling and informative leaflets in empowering patients to better comprehend their condition and make informed decisions about their treatment. Integrating such educational interventions into routine care at public health centers can play a crucial role in enhancing patient outcomes and promoting rational medication use.

Below is research results based on peer-reviewed studies and reviews published between 2012 and 2025, including recent epidemiological and clinical research indexed in PubMed and other reputable medical databasesa table of Key Causes and Risk Factors that have occurred (Figure 2).
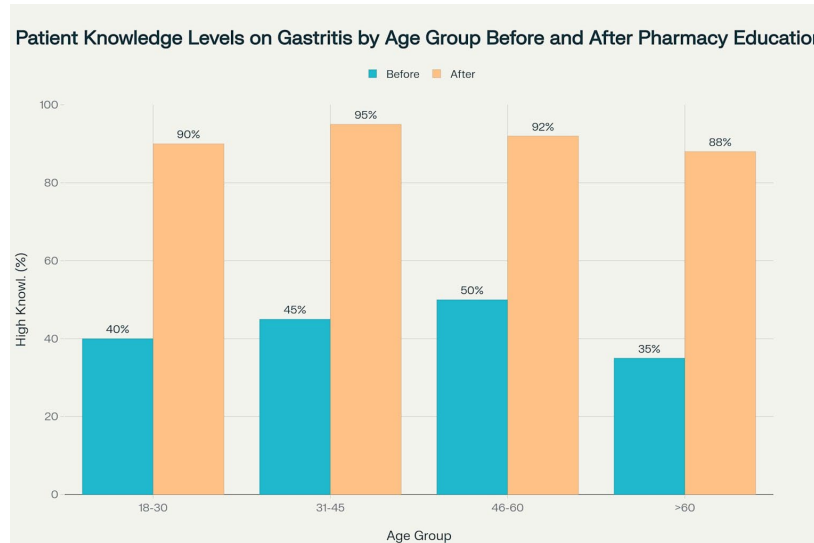

Figure 2. Patient Knowledge Levels On Gastritis By Age Group Before And After Pharmacy Education Intervention

The substantial increase in patient knowledge across all age groups following pharmacy education underscores the broad effectiveness of targeted educational interventions. Notably, the most pronounced improvements were observed among younger and middle-aged adults, but even older patients benefited significantly from the program. These findings highlight that pharmacy education when delivered through accessible methods such as oral counseling and informative leaflets can bridge knowledge gaps regardless of age. The results reinforce the value of integrating structured educational initiatives into routine healthcare, ensuring that patients of all demographics are empowered to better understand and manage their conditions. This approach not only supports rational medication use but also contributes to improved health outcomes and greater patient engagement in their own care.

The gastritis education leaflet was developed as a key component of the pharmacy education intervention in this study, aiming to provide clear and accessible information to patients at public health centers in Bogor City. Designed in straightforward language and supported by visual elements, the leaflet covers essential topics such as the definition, causes, symptoms, and prevention of gastritis, as well as detailed guidance on the proper use, storage, and disposal of gastritis medications. By addressing common misconceptions and offering practical instructions—such as medication timing, side effects, and safe drug handling the leaflet serves as both an educational tool and a reference for patients managing their condition. Its use in the study was intended to reinforce oral counseling, enhance patient understanding, and empower individuals to make informed decisions about their health and treatment adherence.

Figure 3. Gastritis Education Leaflet: Key Information on Causes, Symptoms, Medication, and Safe Use

Gastritis remains a significant global health concern, with its prevalence and risk factors extensively studied in recent years. The most common causes include infection with Helicobacter pylori (Figure 3), which is recognized as the leading etiological agent for chronic gastritis, particularly in low- and middle-income countries. Prolonged use of non-steroidal anti-inflammatory drugs (NSAIDs) is another major contributor, independently associated with gastric mucosal injury, erosions, and ulcers, especially in older adults or those with comorbidities (Watari et al. 2014) (Carrasco et al. 2013) (Tai et al. 2021). Additionally, lifestyle factors such as excessive alcohol consumption, irregular eating habits, and high stress levels have been shown to increase both the risk and severity of gastritis, with evidence indicating that these factors are particularly relevant in certain regional populations (Setyaningsih. 2021).

Socioeconomic and demographic variables further influence gastritis prevalence and outcomes. Studies have demonstrated that individuals with lower income, inadequate nutrition, urban residence, and male gender are at higher risk for developing gastritis (Table 2). Global epidemiological data suggest that the prevalence of gastritis can reach up to 78% in some populations, with higher rates in low-sociodemographic index regions and a notable rise among children and young adults in recent years (Xu et al. 2024). These findings underscore the importance of addressing both clinical and social determinants in the prevention and management of gastritis, and highlight the need for targeted public health interventions in high-risk groups. Low income, inadequate nutrition, urban residence, and male gender are associated with higher risk for gastritis. Studies highlight the impact of these factors on both the development and severity of the condition (Feyisa et al. 2021). Children and adolescents in some regions have shown rising or persistently high rates of gastritis, emphasizing the need for targeted interventions (Josyabhatla et al. 2024). Targeted public health interventions are recommended for high-risk groups, including those with lower socioeconomic status and those living in urban environments (Khandelwal et al. 2024).

Table 2. Key Causes and Risk Factors for Gastritis: Evidence from 2012–2025

Cause/Risk Factor	Evidence (2012–2025)
Helicobacter pylori infection	Leading cause of chronic gastritis and related complications (Sipponen and Maaroos. 2015) (Shatila et al. 2022).
NSAID use	Major independent cause of gastritis and ulcers; risk increases with dose, duration, age, comorbidities (McEvoy et al. 2021) (Goldstein et al. 2015) (Sohail et al. 2023).
Alcohol, stress, poor diet	Significant contributors to both acute and chronic gastritis (Dash et al. 2024).
Socioeconomic and demographic	Male gender, urban residence, low income, and inadequate nutrition increase risk and prevalence (Dash et al. 2024).
Global prevalence	Up to 78% in some populations; higher in low-SDI and lower-income regions (Zamani et al. 2018).

5.3 Validation

The questionnaire used in this study had been validated previously. The effectiveness of the pharmacy education intervention was validated through a rigorous statistical analysis using the Wilcoxon signed-rank test. This non-parametric test was chosen because the data did not meet the assumptions of normality, as determined by the Kolmogorov-Smirnov test. The Wilcoxon test compared patient knowledge scores before and after the educational intervention, which included both oral counseling and the distribution of informative leaflets.

The results revealed a significant improvement in patient knowledge following the intervention. Prior to the education, only 45% of patients demonstrated a high level of knowledge, while 45% had moderate knowledge and 10% had low knowledge. After the intervention, the proportion of patients with high knowledge rose dramatically to 94%, with only 6% remaining at a moderate level and none at a low level. The Wilcoxon signed-rank test yielded a p-value of 0.000, which is well below the significance threshold of 0.05. This result indicates that the improvement in knowledge scores was statistically significant and not due to random chance.

These findings validate the effectiveness of the pharmacy education program in enhancing patient understanding of gastritis and appropriate medication use. The statistically significant increase in knowledge levels confirms that structured educational interventions can meaningfully improve patient outcomes in primary healthcare settings.

6. Conclusion

This study provides compelling evidence that structured pharmacy education delivered through oral counseling and informative leaflets can dramatically enhance patient knowledge about gastritis and its medication use in public health centers. The intervention led to a remarkable shift: prior to education, less than half of patients demonstrated a high level of understanding, while after the educational program, nearly all participants achieved high knowledge scores. This transformation was consistent across all demographic groups, including younger, middle-aged, and older adults, underscoring the universal effectiveness of the approach.

The statistically significant improvement, validated by rigorous hypothesis testing, highlights the critical role of accessible, targeted education in bridging knowledge gaps and empowering patients to make informed decisions about their health. By integrating pharmacy education into routine care, primary health centers can foster greater patient engagement, promote rational medication use, and ultimately improve treatment outcomes for gastritis. These findings not only reinforce the value of pharmacist-led interventions but also provide a strong foundation for broader implementation of educational strategies in chronic disease management within diverse healthcare management.

Acknowledgements

References
Carrasco G, Corvalan AH. Helicobacter pylori-Induced Chronic Gastritis and Assessing Risks for Gastric Cancer. Gastroenterol Res Pract., 2013:393015. https://doi.org/10.1155/2013/393015.

Dash LN, Nayak S, Mishra SK, Mohapatra J. Prevalence and Contributing Factors of Gastritis in Tertiary Care Hospital: Study from Eastern India. Healthcare Bulletin., 14(4):507-512, 2024. https://doi.org/10.61336/ejcm/24-4-64.

Elbehiry A, Marzouk E, Aldubaib M, Abalkhail A, Anagreyyah S, Anajirih N, Almuzaini AM, Rawway M, Alfadhel A, Draz A, Abu-Okail A. Helicobacter pylori Infection: Current Status and Future Prospects on Diagnostic, Therapeutic and Control Challenges. Antibiotics (Basel)., Jan 17;12(2):191, 2023. https://doi.org/10.3390/antibiotics12020191.

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., 16(2): e0246619, 2021. https://doi.org/10.1371/journal.pone.0246619.

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., Feb 9;16(2):e0246619, 2021. https://doi.org/10.1371/journal.pone.0246619.

Goldstein J, Cryer B. Gastrointestinal injury associated with NSAID use: a case study and review of risk factors and preventative strategies. Drug Healthc Patient Saf., 7:31-41, 2015. https://doi.org/10.2147/DHPS.S71976.

Josyabhatla R, Wood ML, Gafur A, et al. Rising Prevalence of Mild Chronic Gastritis in Children: A Single Center Experience. Pediatric and Developmental Pathology., 27(3):235-240, 2024. https://doi.org/10.1177/10935266241238625.

Josyabhatla R, Wood ML, Gafur A, Tatevian N, Tchakarov AS, Hashmi SS, Rhoads JM, Van Arsdall MR. Rising Prevalence of Mild Chronic Gastritis in Children: A Single Center Experience. Pediatr Dev Pathol., May-Jun;27(3):235-240, 2024. https://doi.org/10.1177/10935266241238625.

Khandelwal V, Deshmukh S, Aurangabadi K. Epidemiology and associated risk factors of gastritis in patients at district general hospital, Amravati. Int J Health Sci Res., 14(2):93-100, 2024.

Kim JS, Geum MJ, Son ES, Yu YM, Cheon JH, Kwon KH. Improvement in Medication Adherence after Pharmacist Intervention Is Associated with Favorable Clinical Outcomes in Patients with Ulcerative Colitis. Gut Liver., Sep 15;16(5):736-745, 2022. doi: 10.5009/gnl210371. Epub 2022 Feb 11. https://doi.org/10.5009/gnl210371.

McEvoy L, Carr DF, Pirmohamed M. Pharmacogenomics of NSAID-Induced Upper Gastrointestinal Toxicity. Frontiers in Pharmacology., 12, 2021. https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2021.684162.

Qin D, Wang L, Ni Y, Shan Z, Yang L. Knowledge, Attitude, and Practice of the Gastroenterology Department Patients Towards Chronic Gastritis in Shanxi Region: A Cross-Sectional Study. Patient Prefer Adherence., Aug 22;18:1769-1777, 2024. https://doi.org/10.2147/ppa.s463061.

Reshetnyak VI, Burmistrov AI, Maev IV. Helicobacter pylori: Commensal, symbiont or pathogen? World J Gastroenterol., Feb 21;27(7):545-560, 2021. https://doi.org/10.3748/wjg.v27.i7.545.

Sapkota B, Pandey B, Sapkota B, Dhakal K, Aryal B. A systematic review and meta-analysis on pharmacist-led interventions for the management of peptic ulcer disease. PLOS One., Mar 25;20(3):e0320181, 2025. https://pmc.ncbi.nlm.nih.gov/articles/PMC11936246/.

Setyaningsih I. Factors Related to Gastritis Events at the Ages 17–21 Years Old in the Work Area of Pesanggrahan Public Health Center (Puskesmas) in 2018. Proceeding The First Muhammadiyah International Public Health and Medicine Conference. Muhammadiyah University of Jakarta; 259–267, 2021.

Shatila M, Thomas AS. Current and Future Perspectives in the Diagnosis and Management of Helicobacter pylori Infection. J Clin Med., Aug 30;11(17):5086, 2022. https://doi.org/10.3390/jcm11175086.

Shoiab AA, Alsarhan A, Khashroum AO. Effect Of Pharmacist Counseling On Patient Medication Compliance And Helicobacter Pylori Eradication Among Jordanian Outpatients. Arq Gastroenterol., Jan-Mar;60(1):74-83, 2023. https://doi.org/10.1590/s0004-2803.202301000-10.

Sipponen P, Maaroos HI. Chronic gastritis. Scand J Gastroenterol., Jun;50(6):657-67, 2015. https://doi.org/10.3109/00365521.2015.1019918.

Sohail R, Mathew M, Patel KK, Reddy SA, Haider Z, Naria M, Habib A, Abdin ZU, Razzaq Chaudhry W, Akbar A. Effects of Non-steroidal Anti-inflammatory Drugs (NSAIDs) and Gastroprotective NSAIDs on the Gastrointestinal Tract: A Narrative Review. Cureus., Apr 3;15(4):e37080, 2023. https://doi.org/10.7759/cureus.37080.

Tai FWD, McAlindon ME. Non-steroidal anti-inflammatory drugs and the gastrointestinal tract. Clin Med (Lond)., Mar;21(2):131-134, 2021. https://doi.org/10.7861/clinmed.2021-0039.

Watari J, Chen N, Amenta PS, Fukui H, Oshima T, Tomita T, Miwa H, Lim KJ, Das KM. Helicobacter pylori associated chronic gastritis, clinical syndromes, precancerous lesions, and pathogenesis of gastric cancer development. World J Gastroenterol., May 14;20(18):5461-73, 2014. https://doi.org/10.3748/wjg.v20.i18.5461.

Xu Y, Chen F, Wen H. Global incidence and prevalence of gastritis and duodenitis from 1990 to 2019: A systematic analysis for the Global Burden of Disease Study 2019. J Gastroenterol Hepatol., Aug;39(8):1563-1570, 2024. https://doi.org/10.1111/jgh.16572.

Zamani M, Ebrahimtabar F, Zamani V, Miller WH, Alizadeh-Navaei R, Shokri-Shirvani J, Derakhshan MH. Systematic review with meta-analysis: the worldwide prevalence of Helicobacter pylori infection. Aliment Pharmacol Ther., Apr;47(7):868-876, 2018. https://doi.org/10.1111/apt.14561.

Biographies

Sara Nurmala is a dedicated lecturer at the Department of Pharmacy, Faculty of Mathematics and Natural Sciences, Universitas Pakuan, Bogor, Indonesia. Since joining in 2017, she has become known for her expertise in pharmacology, clinical pharmacy, and the development of natural health products. Her academic interests include pharmacological activity, innovation in natural product research, and the development of functional foods and beverages for health applications. Sara has actively contributed to both national and international research

collaborations, presenting her work at prestigious forums such as the IEOM Society International 5th Asia Pacific Conference in Tokyo, where she received the Outstanding Professor Award for her contributions to natural product innovation.

In addition to her research, Sara Nurmala has published widely on topics ranging from antibiotic use in the community to the pharmacological evaluation of herbal extracts and alternative dietary interventions for diabetes management. Her scholarly work is well-cited, reflecting her commitment to advancing pharmacy education and community health. Her research in TJNPR reflects her expertise in pharmacology, natural product development, and community health. In addition to her academic and research achievements, also actively involved as a reviewer for Scopus-indexed journals.

Beyond her academic pursuits, she has held leadership roles within FMIPA UNPAK, including serving as Head of the Cooperation Unit, focusing in expanding the faculty's international network and fostering partnerships with universities and research institutions worldwide. Through her teaching, research, and leadership, Sara Nurmala continues to make a significant impact on the advancement of pharmacy and scientific innovation at Universitas Pakuan.

Nisa Yulianti Suprahman, is a lecturer and researcher at the Department of Pharmacy, Faculty of Science, Institut Teknologi Sumatera (ITERA), Lampung, Indonesia. She holds a Bachelor of Pharmacy, a Master of Science in pharmaceutical sciences, and a professional pharmacist degree from Universitas Indonesia. Her expertise lies in molecular pharmacology, bioinformatics, and the pharmacological evaluation of both natural and synthetic compounds. Nisa is actively involved in teaching courses on pharmacology and pharmaceutical sciences, and she is recognized for integrating computational methods such as molecular docking and bioinformatics into her research. Her work often focuses on the pharmacological potential of Indonesian medicinal plants, particularly as anti-cancer, anti-inflammatory, and metabolic disorder agents.

In addition to her teaching responsibilities, Nisa Yulianti Suprahman leads and collaborates on various research projects, including national competitive grants in natural product development and pharmaceutical biotechnology. She has published research on topics such as the molecular docking of bioactive compounds, bioprocesses for mannitol production, and the anti-cancer potential of plant-derived metabolites. As an active member of academic societies and the public relations team for ITERA's Pharmacy Study Program, she regularly participates in national and international conferences, sharing insights on circadian rhythms in pharmacology and the therapeutic promise of natural products. Through her academic leadership and research, Nisa is contributing significantly to the advancement of pharmacy education and drug discovery in Indonesia.

Usep Suhendar, is a committed lecturer in the Pharmacy Study Program at the Faculty of Mathematics and Natural Sciences, Pakuan University, where he also serves as Assistant Dean for Academic and Student Affairs. He holds a Master of Science degree in Biochemistry from the Bogor Agricultural Institute (IPB) and a Bachelor's degree in Chemistry Education from the University of Lampung. Widely recognized for his dedication to teaching and academic development, Usep has played a significant role in mentoring students, developing curricula, and supporting student growth within the faculty.

In addition to his teaching and administrative duties, Usep Suhendar has achieved notable success in research, with publications in nationally and internationally accredited journals and a strong SINTA score reflecting his research impact. He has also secured competitive research grants, including the Penelitian Dosen Pemula (PDP) scheme, and coordinated various community service programs that bridge academic knowledge with societal needs. These accomplishments highlight his leadership and ongoing contributions to the advancement of pharmacy education and research at Pakuan University.

Ladya Putri Kartini Gunawan, is an emerging pharmacist and researcher with a keen interest in clinical pharmacy, patient education, and public health. She completed her Bachelor of Pharmacy (S.Farm.) at Universitas Pakuan (UNPAK), Bogor, Indonesia, where she demonstrated academic excellence and a strong commitment to advancing healthcare services at the community level.

During her academic journey, Ladya was actively involved in research projects focused on improving patient knowledge and medication adherence, particularly in the management of chronic diseases. This research provided

valuable insights into the effectiveness of structured educational strategies in primary care and contributed to the development of evidence-based recommendations for optimizing pharmacy-led patient education. In addition to her research activities, Ladya participated in various student organizations and community outreach programs, where she facilitated health education sessions and promoted rational drug use among local populations. Her dedication to patient-centered care and public health is reflected in her ongoing efforts to bridge knowledge gaps and empower individuals to make informed decisions about their health.