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REVIEW

Artificial intelligence in the early diagnosis of digestive cancer

Inteligencia artificial en el diagnóstico precoz de cáncer digestivo

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ABSTRACT

Digestive cancer is one of the leading causes of mortality worldwide, with an increasing incidence in several regions, including Latin America. Early detection of these pathologies is crucial to improve clinical outcomes and reduce the economic burden associated with the treatment of advanced stage cancers. This review is justified by the need to address the significant challenge of early detection of digestive cancer, especially in asymptomatic patients. The main objective of this study is to learn about the benefits of artificial intelligence (AI) in improving early diagnosis of digestive cancers, evaluating its effectiveness in identifying early lesions and its impact on diagnostic accuracy. Through a systematic review of the literature, and the application of the PRISMA model for its development, we examine various applications of AI as applied to medicine and specifically to the diagnosis of digestive cancers, including computer-aided detection (CADe), and discuss the benefits of its implementation in clinical practice. The findings suggest that AI has the potential to transform digestive cancer diagnosis, although further research is required to overcome current barriers and validate its use in clinical settings.

Keywords*:* Artificial Intelligence; Early Diagnosis; Digestive Cancer; Computer-Aided Detection (Cade); Colorectal Cancer.

RESUMEN

El cáncer digestivo es una de las principales causas de mortalidad a nivel mundial, con una incidencia creciente en diversas regiones, incluyendo Latinoamérica. La detección temprana de estas patologías es crucial para mejorar los resultados clínicos y reducir la carga económica asociada al tratamiento de cánceres en etapas avanzadas. Este trabajo de revisión se justifica en la necesidad de abordar el desafío significativo que representa la detección precoz de cáncer digestivo, especialmente en pacientes asintomáticos. El objetivo principal de este estudio es conocer los beneficios de la inteligencia artificial (IA) en la mejora del diagnóstico precoz de cánceres digestivos, evaluando su eficacia en la identificación de lesiones tempranas y su impacto en la precisión diagnóstica. A través de una revisión sistemática de la literatura, y de la aplicación del modelo PRISMA para su desarrollo, se examinan diversas aplicaciones de la IA, aplicada a la medicina y específicamente al diagnóstico de cánceres digestivos, incluyendo la detección asistida por ordenador (CADe), y se discuten los beneficios de su implementación en la práctica clínica. Los hallazgos sugieren que la IA tiene el potencial de transformar el diagnóstico del cáncer digestivo, aunque se requieren más investigaciones para superar las barreras actuales y validar su uso en entornos clínicos.

Palabras clave*:* Inteligencia Artificial; Diagnóstico Precoz; Cáncer Digestivo; Detección Asistida por Ordenador (Cade); Cáncer Colorrectal.

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INTRODUCTION

The digestive system consists of a set of organs that process food from the moment it is ingested until it is eliminated, allowing for the absorption of nutrients, their utilization for energy, and subsequent growth. It consists of the mouth, esophagus, stomach, small and large intestines, rectum, and anus, as well as related organs such as the liver, bile ducts, pancreas, and spleen.

Among the most common cancers of the digestive system worldwide is colorectal cancer, which is common in 16 countries, followed by liver cancer in 6 countries, and finally stomach cancer in 4 countries, with a predominance in all of them in North Asia and some European countries.(1)

According to data from the World Health Organization on its "Cancer Today" page, up to 2022, we can see the incidence of stomach cancer cases in Latin America and the Caribbean alone, with Brazil standing out with 31 % (approx. 23 000 cases), Mexico and Colombia with an approximate 12 % share, and Peru with a higher incidence than Argentina and Chile.(2)

Artificial intelligence is a tool used in various daily activities, enhancing their efficiency and effectiveness. In medicine, artificial intelligence is used to predict diseases, make more accurate diagnoses, suggest treatments, and provide additional data to deliver better care and, of course, reduce the error rate in diagnosis. Although it does not yet completely replace the work of doctors, it is a tool that helps us improve patient care. In terms of making more accurate diagnoses, and given the problem of rising rates of digestive cancers worldwide, artificial intelligence is being used for early detection of cancers using patterns and algorithms to interpret endoscopic processes, detect small lesions, anticipate the disease, and thus increase life expectancy and reduce future costs for individuals, families, and the state, among other benefits. According to The Lancet Oncology (2023), as cited in Vázquez, this tool increases breast cancer detection by 20 %, highlighting the importance of using it in the diagnosis of other types of cancer.(3)

Most artificial intelligence tools aim to detect minor abnormalities, as already mentioned, which is called computer-aided detection (CADe). It was first used for breast cancer through mammograms in 1998, and CADe is currently being developed for colorectal cancer screening with colonoscopy. The use of these devices has recently been approved in the US, Europe, and Japan for indicating possible polyps.(4)

In addition, Mori uses artificial intelligence to perform preventive screening, identifying adenomas that are removed during colonoscopy and could later develop into cancer. He shows some prevalence rates for colorectal cancer at approximately 5 %. However, the presence of adenomas is greater than 50 % and these may progress to cancer in the future.(4)

Deep learning systems have achieved sensitivity rates of 90 % or higher in identifying dysplasia and early-stage neoplasms across multiple pathologies, including esophageal, gastric, and colorectal cancer. This is the example of Chinese researchers through the company Huhan ENDOANGEL Medical Technology Co., Ltd, through which they develop artificial intelligence medical products, such as the ENDOANGEL Lower Gastrointestinal Endoscope, which is classified as "the third eye" for endoscopists, being used for computer-assisted polyp detection powered by artificial intelligence.(5,6)

According to Aguilera et al., artificial intelligence is essential in clinical, therapeutic, and surgical settings, as it reduces medical errors. One of the artificial intelligence systems mentioned is ENDO-AID CADe for endoscopies, which indicates the possible presence of lesions. During colonoscopic procedures, it is expected that the detection of adenomas will increase, thereby preventing colorectal cancer.(7)

Artificial intelligence also plays a crucial role in diagnosing Barrett's esophagus using ENDOANGEL-ELD, which offers improved efficiency and efficacy, with a sensitivity greater than 90 % and specificity greater than 80 % in the diagnosis of early esophageal adenoma.(7)

Firstly, according to the growing numbers of gastric cancers, mainly colorectal, liver, and gastric, which are among the leading causes of mortality worldwide, Peru ranks third in the incidence of gastric cancer, according to data from the World Health Organization on its "Cancer Today" page up to 2022. Despite medical advances, early detection remains a significant challenge, especially in asymptomatic patients. That is why artificial intelligence has emerged as a promising tool for improving early diagnosis through advanced analysis of images, clinical data, and molecular biomarkers.(1,2,3)

However, artificial intelligence in this area faces limitations, such as a lack of information and publicity about its benefits. Therefore, a comprehensive review of existing publications is crucial to understanding the benefits of developing artificial intelligence in the early diagnosis of digestive cancer. All of this will promote and publicize the use of artificial intelligence as a routine form of elective diagnosis, reducing errors and increasing efficiency and effectiveness. In addition, the collected information will be used to identify the barriers and limitations of artificial intelligence and to develop a more efficient and early method of diagnosing digestive cancer.

METHOD

For this work, a systematic review of the descriptive literature was carried out, following the guidelines established in the PRISMA statement, which has been designed for systematic reviews of studies to reduce bias during the review process and avoid redundant reviews, among other benefits of using this design, thus ensuring the necessary quality in the systematization of information.[8]

For this study, various research search engines were utilized, drawing on data sources from PubMed, ProQuest, and Scielo, as they are easily accessible and reliable. In addition, the following search terms were used: "digestive," "system," "diagnostic," "artificial," and "intelligence," which were combined using the Boolean term "AND" in the following formula: digestive AND system AND diagnostic AND artificial AND intelligence. Subsequently, the inclusion criteria were applied, which included a research period defined only for 2024, with document types limited to review articles, clinical trials, and meta-analyses. Additionally, only Spanish, English, and Portuguese were included, with free access and/or full-text availability.

On the other hand, articles that did not address the topic and did not meet the aforementioned inclusion criteria were excluded.

Figure 1 below outlines the search process, using the PRISMA statement, which initially excludes research outside the investigation period, then narrows the focus to the type of document, and subsequently to the language. Articles with restricted access were discarded, and those with free and/or open access were included. Additionally, we included studies that had only been conducted on humans and focused on material related to artificial intelligence, colorectal cancer, colorectal carcinoma, gastroenterology, polyps, and diagnosis. Furthermore, articles evaluated by experts and related to the topic in question were included. Finally, the bibliography was reviewed, analyzed, and selected in an organized and systematic manner, resulting in 21 studies. These were organized in a matrix for subsequent reading and analysis, systematically arguing and achieving this quality review, detailing the author, country, title, model, ID, and summary of eac

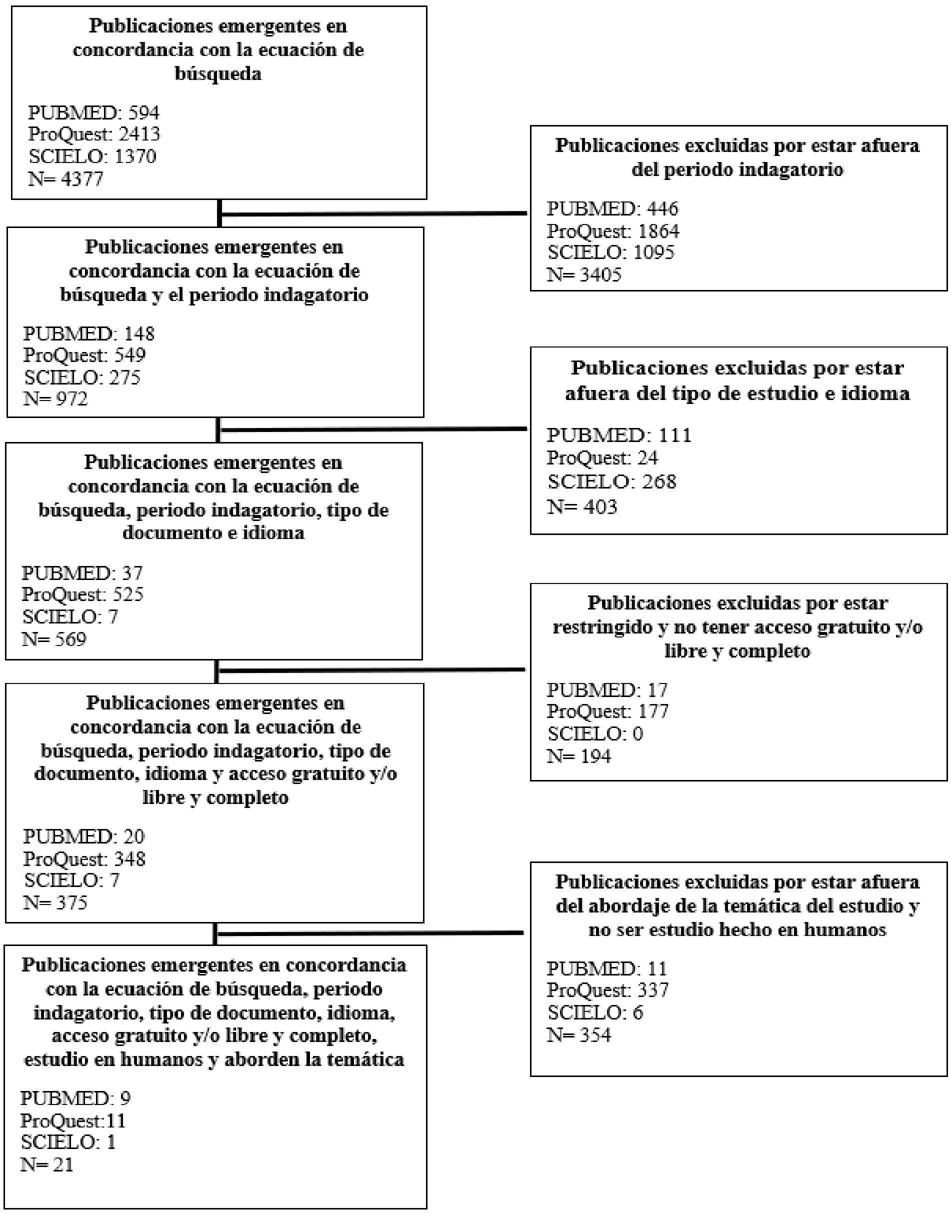

Figure 1. PRISMA flow chart of the systematization process

Table 1. Matrix

Author	Country	Title	Model	DOI	Abstract
Ioannis S Pateras; Ana Igea; Ilias P Nikas; Danai Leventakou; Nektarios I Koufopoulos; et al.	Greece, Spain, Cyprus, Sweden, Seoul.	Diagnostic Challenges during Inflammation and Cancer: Current Biomarkers and Future Perspectives in Navigating through the Minefield of Reactive versus Dysplastic and Cancerous Lesions in the Digestive System	Review	10.3390/ijms25021251	The incorporation of AI (artificial intelligence) in endoscopic images allowed the identification of polyps with AUC (area under the curve) values greater than 99 %, highlighting its discriminatory capacity. The integration of AI systems increased the ADR (adenoma detection rate) by more than 20 % compared to conventional methods, improving the ability to detect precancerous lesions early.[11]
Pei-Ying Zou; Jian-Ru Zhu; Zhe Zhao; Hao Mei; Jing-Tao Zhao; et al.	China	Development and application of an artificial intelligence-assisted endoscopy system for diagnosis of Helicobacter pylori infection: a multicenter randomized controlled study	Randomized controlled trial	10.1186/s12876-024-03389-3	The study developed a convolutional neural network model to diagnose H. pylori infection from endoscopic images. Compared to the group of endoscopists not assisted by AI (artificial intelligence), the AI-assisted group had better accuracy (92,8 % vs. 75,6 %), sensitivity (91,8 % vs. 78,6 %), and specificity (93,4 % vs. 74,5 %). All these differences were statistically significant (P < 0,05). 10
Ryosuke Kikuchi; Kazuaki Okamoto; Tsuyoshi Ozawa; Junichi Shibata; Soichiro Ishihara; et al.	-	Endoscopic Artificial Intelligence for Image Analysis in Gastrointestinal Neoplasms	Review	10.1159/000540251	For ESCC (esophageal squamous cell carcinoma) and EAC (esophageal adenocarcinoma) by CADe (computer-aided detection) systems: Approximate sensitivity of 91 % and 93 %, respectively, and approximate specificity of 79 % and 87 %, respectively. For GC (gastric cancer) by CADe systems: Sensitivity and specificity approximately 90 %.[9]
Hu Chen; Shi-Yu Liu; Si-Hui Huang; Min Liu; Guang-Xia Chen.	China	Applications of artificial intelligence in gastroscopy: a narrative review	Review	10.1177/03000605231223454	The article compiles the findings of different studies on the benefits of AI in the diagnosis of digestive cancer. AI in ESCCA (esophageal squamous cell carcinoma and adenocarcinoma): approximate sensitivity of 96,5 % and approximate specificity of 94,3 %. AI in GC (gastric cancer): approximate sensitivity of 94 % and approximate specificity of 91 %.[12]
Kareem Khalaf; Mary Raina Angeli Fujiyoshi; Marco Spadaccini; Tommy Rizkala; Daryl Ramai; et al.	Canada Japan, Italy, USA	From Staining Techniques to Artificial Intelligence: A Review of Colorectal Polyps Characterization	Review	10.3390/medicina60010089	CADx (computer-aided diagnosis) systems have demonstrated 94 % accuracy in polyp classification. The CNN (convolutional neural network) algorithm demonstrated 98 % accuracy in classifying colorectal lesions. An average AI (artificial intelligence)-assisted sensitivity of 92 %. Diagnosis of polyps using CADx with sensitivity and specificity exceeding 90 %.[13]
Katsuro Ichimasa; Shin-Ei Kudo; Masashi Misawa; Yuki Takashina; Khay Guan Yeoh; et al.	Japan, Singapore	Role of artificial intelligence in the management of T1 colorectal cancer	Review	10.1016/j.dld.2024.01.202	The sensitivity of CADx (computer-aided diagnosis) systems varies between 58,8 % and 96,7 %, and specificity ranges from 75,0 % to 94,4 %. The AUROC (area under the ROC curve) reached up to 0,97, showing a high discriminatory capacity for T1b lesions.[14]
Chunhua Yang; Kripa Sharma; Rabeya Jafrin Mow; Eunice Bolay; Anand Srinivasan; et al.	Georgia, Atlanta, Connecticut	Unleashing the Potential of Oral Deliverable Nanomedicine in the Treatment of Inflammatory Bowel Disease	Review	10.1016/j.jcmgh.2024.03.005	AI (artificial intelligence) models trained to identify colorectal and gastric cancer show high sensitivity (94 %-96 %) and specificity (91 %-94 %). In the detection of early gastric cancer, one model achieved an AUC (area under the curve) of 0,997. In AI-assisted colonoscopy studies, the adenoma detection rate increased by 21 % and the false negative rate was significantly reduced by the CaDE (computer-assisted endoscopy) system.[15]

Yuichi Mori; Eun Hyo Jin; Dongheon Lee.	Norway, Japan, South Korea	Improving collaboration between artificial intelligence and physicians for computer-assisted diagnosis in colonoscopy through better digital literacy	Review	10.1016/j.dld.2023.11.033.	The use of CADe (computer-aided detection) systems has shown a 44 % increase in ADR (adenoma detection rate) during colonoscopies. Sensitivity with CADx (computer-aided diagnosis) increased from 88,4 % to 90,4 % when used in conjunction with physicians.[31]
Nikhil R Thiruvengadam; Pejman Solaimani; Manish Shrestha; Seth Buller; Rachel Carson; et al.	California, New Jersey	The effectiveness of real-time computer-aided detection of colonic neoplasia in community practice: a pragmatic randomized controlled trial	Randomized controlled trial	10.1016/j.cgh.2024.02.021	The computer-assisted group showed a significantly higher ADR (adenoma detection rate) compared to traditional colonoscopy (42,5 % vs. 34,4 %, P = 0,005). The mean APC (adenomas per colonoscopy) was significantly higher in the EAC (esophageal adenocarcinoma) group (0,89 ± 1,46) compared to traditional colonoscopy (0,60 ± 1,12, P < 0,001).[30]
Jimbo González, Wendy Dayana	Ecuador	Early detection of gastric cancer using new endoscopic techniques. Systematic review	Review	https://dspace.ucacue.edu.ec/items/90dae8cd-5a0d-4527-b34f-8f2493d3db35	Using AI (artificial intelligence) with confocal endomicroscopy, sensitivity and specificity were 87,9 % and 96,5 %, respectively, with an accuracy of 94,7 % for detecting early gastrointestinal cancer. AI applied to histological images improved diagnostic accuracy from 82 % to 89 %.[17]
Auzine, Muhammad Muzzammil; Khan, Maleika Heenaye-Mamode; Baichoo, Sunilduth; Nuzhah Gooda Sahib; Bissoonauth-Daiboo, Preeti; et al.	San Francisco	Development of an ensemble CNN model with explainable AI for the classification of gastrointestinal cancer	Review	10.1371/journal.pone.0305628	A CNN (convolutional neural network) model showed a sensitivity of 91,18 %, specificity of 90,64 %, and accuracy of 90,91 % in distinguishing non-cancerous lesions and cases of EGC (early gastric cancer), with performance comparable to that of endoscopy specialists.[18]
Peng, Yifeng; Deng, Haijun.	London	Medical image fusion based on machine learning for health diagnosis and monitoring of colorectal cancer	Review	10.1186/s12880-024-01207-6	The diagnosis rate of colorectal cancer using artificial intelligence-based methods in medical images for patients in Phase 1 was 56 %, increasing to 68 % in Phase 2, 79 % in Phase 3, and reaching 91 % in Phase 4. These values are higher than those obtained using traditional methods.[19]
Peng, Cheng; Tian, Chong Xuan; Mu, Yijun; Ma, Mingjun; Zhang, Zhenlei ; et al.	United States, Bognor Regis	Hyperspectral imaging facilitating resect-and-discard strategy through artificial intelligence-assisted diagnosis of colorectal polyps: A pilot study	Review	https://doi.org/10.1002/cam4.70195	The sensitivity and specificity for detecting neoplastic lesions were 99,0 % and 96,0 %, respectively. And the AUC (area under the curve) was 0,97, demonstrating high predictive ability.[20]
Khalaf, Kareem; Mary Raina Angeli Fujiyoshi; Spadaccini, Marco; Rizkala, Tommy; Ramai, Daryl ; et al.	Switzerland, Basel	From Staining Techniques to Artificial Intelligence: A Review of Colorectal Polyps Characterization	Review	10.3390/medicina60010089	In 2019, a CNN-NBI (convolutional neural network system) achieved 94 % accuracy in distinguishing cancerous lesions (98 % sensitivity and 83 % specificity).[21]

Zhao, Luqing; Wang, Nan; Zhu, Xihan; Wu, Zhenyu; Shen, Aihua ; et al.	United States, London	Establishment and validation of an artificial intelligence-based model for real-time detection and classification of colorectal adenoma	Review	https://doi.org/10.1038/s41598-024-61342-6	The sensitivity of the ASODE model reached 87,96 % in the detection of polyps in images, surpassing other methods such as YOLOv3 (real-time AI-based object detection model) (79,49 %) and YOLOv4 (82,80 %). And the detection rate of adenomas with AI (artificial intelligence) was 92,70 %, highlighting its clinical applicability.(23)
Mota, Joana; Maria João Almeida; Martins, Miguel; Mendes, Francisco; Cardoso, Pedro ; et al.	Japan	Artificial Intelligence in Coloproctology: A Review of Emerging Technologies and Clinical Applications	Review	10.3390/jcm13195842	AI (artificial intelligence) models for predicting lymph node metastasis in colorectal cancer, based on CT/MRI (computed tomography and magnetic resonance imaging) images, show an average AUC (area under the curve) of 0,727 according to a meta-analytic review.(24)
Wan, Jing-Jing; Zhu, Peng-Cheng; Chen, Bo-Lun; Yu, Yong-Tao.	United States, London	A semantic feature enhanced YOLOv5-based network for polyp detection from colonoscopy images	Review	10.1038/s41598-024-66642-5	The improved AI (artificial intelligence) model of CFA (contrast-enhanced fluorescence angiography) demonstrated high accuracy in detecting polyps with low contrast against the background, achieving 93 % accuracy in images with weak contrasts.(25)
M. J. MD. Zubair Rahman; Mythili, R; Chokkanathan, K; Mahesh, T R; Vanitha, K ; et al.	United Kingdom, London	Enhancing image-based diagnosis of gastrointestinal tract diseases through deep learning with EfficientNet and advanced data augmentation techniques	Review	https://doi.org/10.1186/s12880-024-01479-y	The accuracy of recall (sensitivity) and F1-score (a metric that combines accuracy and recall into a single value) for the classification and therefore diagnosis of gastrointestinal cancerous lesions exceeded 98 %, highlighting its reliability and effectiveness in diagnosis.(26)
Sinonquel, Pieter; Eelbode, Tom; Pech, Oliver; De Wulf, Dominiek; Dewint, Pieter; et al.	Germany; Belgium	Clinical consequences of computer-aided colorectal polyp detection	Review	https://doi.org/10.1136/gutjnl-2024-331943	The CADe (computer-aided endoscopy) system showed a sensitivity of 94,6 %, comparable to that of endoscopists, 96,0 %. CADe detected 4,0 % (86/2141) of polyps that endoscopists did not identify. The PDR (polyps detection rate) increased from 46,9 % to 69,5 %. This system had an additional detection rate of 5,1 %, with 98,8 % of the polyps detected being tiny or small, of which 40,1 % were adenomas.(27)
Chen, Jian; Wang, Ganhong; Zhou, Jingjie; Zhang, Zihao; Ding, Yu; et al.	United Kingdom, London	AI support for colonoscopy quality control using CNN and transformer architectures	Review	10.1186/s12876-024-03354-0	An AUC (area under the curve) of 0,993 was obtained for the detection of cancerous lesions. EfficientNetB2 (neural network variant) for colonoscopy and detection of cancerous lesions such as polyps achieved an accuracy of 99,2 %, outperforming other models such as VGG19 (deep convolutional neural network variant with 19 layers) (84,8 %) and DenseNet121 (convolutional neural network variant) (80,8 %).(28)
Elshamy, Reham; Abu-Elnasr, Osama; Elhoseny, Mohamed; Elmougy, Samir.	United Kingdom, London	Enhancing colorectal cancer histology diagnosis using modified deep neural networks optimizer	Review	10.1038/s41598-024-69193-x	A CNN (convolutional neural network) model was developed using the improved SAdagrad optimizer (a variant of the Adagrad algorithm), which achieved 98 % accuracy, outperforming Adam (algorithm) (95 %) and Adagrad (learning algorithm) (92 %) in the classification of colorectal cancer histological images. The EfficientNetB2 model (neural network variant) showed exceptional discriminatory capabilities with an AUC (area under the curve) of 0,996, achieving high-precision classification of images of polyps, normal tissue, and other categories.(29)

DISCUSSION

This study aimed to determine the benefits of developing artificial intelligence for the early diagnosis of digestive cancer. The results obtained enable us to reflect on the benefits of AI (artificial intelligence) in addressing this problem, which is why it is essential to first understand the relevance of early diagnosis of digestive cancer, given its high incidence and prevalence rates, with colorectal cancer being the most common type. In light of this problem, it is essential that current tools, such as AI, are utilized to mitigate the high figures presented.

According to the studies cited, artificial intelligence models for detecting colorectal and gastric cancer exhibit a sensitivity ranging from 94 % to 96 % and a specificity ranging from 91 % to 94 %. This suggests that these tools are highly effective in accurately detecting positive cases while maintaining a low false-positive rate.

On the other hand, another study recorded in the document indicates that the sensitivity of assisted diagnostic systems ranges from 58,8 % to 96,7 %, showing variability in detection effectiveness between different models. The AUC of up to 0,997 in the detection of early gastric cancer indicates excellent discriminatory ability to detect lesions at this stage.

The results indicate that some AI models achieve sensitivity and specificity rates above 90 %, which is promising for their use in clinical practice. However, these results must be replicable in larger and more diverse studies.

According to other studies, this tool (AI) represents a revolutionary advance in the early diagnosis of digestive cancer, especially colorectal cancer, where it has shown an outstanding ability to improve both the detection and characterization of precancerous lesions. Several studies report that AI models have achieved sensitivity and specificity rates of over 90 %, even reaching 99 % in some instances, with tangible benefits such as a 44 % increase in ADR (adenoma detection rate) and a 50 % reduction in AMR (adenoma miss rate) compared to conventional methods 33 and 35.

In randomized controlled trials, the adenoma miss rate (AMR) was 50 % lower when using AI compared to standard colonoscopies (15,5 % vs. 32,4 %), highlighting the ability of AI to identify small and subtle lesions.

Additionally, these technologies optimize resources, reduce costs, and enhance efficiency in clinical procedures. Strategies such as "resect-and-discard," supported by AI, have eliminated unnecessary pathological analyses, saving up to $57 per patient and preventing thousands of cancer cases annually, according to estimates from systems in the United States.

This economic and clinical impact reinforces the need to promote public policies for their adoption, especially in countries with high colorectal cancer mortality rates. However, its integration faces challenges such as the need to train algorithms with massive databases and to overcome the initial resistance of some professionals. Nevertheless, convolutional neural networks (CNNs) have demonstrated excellent real-time performance, reducing dependence on medical expertise and standardizing diagnosis [36, 38]. This reinforces the need for public policies that promote equitable access to these technologies, especially in low- and middle-income countries, where CRC mortality remains high.

AI tools have evolved into CNN-based systems that not only detect lesions in real time but also classify polyps, contributing to more effective and standardized clinical management. Therefore, it is crucial to update and utilize algorithms and their variants to achieve the goal of further reducing the error rate. In addition, other studies have achieved sensitivities of 96 % and specificities of 78 %, achieving accuracy comparable to that of experienced pathologists for the histological diagnosis of polyps.

Despite these advances, larger prospective and multicenter studies are needed, as well as clear regulations and accessibility in the interpretation of AI-generated data, to consolidate its implementation in clinical practice and maximize its benefits in cancer prevention and treatment 36 and 37.

CONCLUSIONS

There are indeed benefits to the development of artificial intelligence in the early diagnosis of digestive cancer, demonstrating a significant increase in the detection rate of adenomas and polyps, with sensitivity reaching up to 99,7 % in systems such as GI-Genius, overcoming the limitations of conventional colonoscopy.

AI significantly reduces the rates of polyps and adenomas missed during traditional colonoscopies, addressing challenges such as the detection of small (<10 mm) or flat polyps, which are often overlooked. In addition, not only do they improve diagnostic accuracy, but they also reduce costs associated with colorectal cancer treatment, with studies suggesting savings of up to 8,2 % in medical expenses.

AI has been shown to reduce analysis time per frame in colonoscopy procedures (10 ms per frame versus 33-40 ms for endoscopists). AI-optimized strategies have demonstrated 93 % concordance with clinical guidelines, thereby reducing evaluation costs and improving patient outcomes.

REFERENCES

1. International Agency for Research on Cancer. Cancer Today. World Health Organization; 2022. https://

gco.iarc.fr/today/en/dataviz/maps-most-common-sites?mode=cancer&key=total

2. International Agency for Research on Cancer. Cancer Today. World Health Organization; 2022.

3. Vazquez N. Inteligencia artificial y detección precoz de cáncer: una nueva esperanza. New Medical. 2023. https://www.newmedicaleconomics.es/gestion/inteligencia-artificial-y-deteccion-precoz-del-cancer-una-nueva-esperanza/

4. Mori Y, Bretthauer M, Kalager M. Hopes and hypes for artificial intelligence in colorectal cancer screening. Gastroenterology. 2021;161(3):774–7.

5. Wuhan ENDOANGEL Medical Technology Co., Ltd. ENDOANGEL Endoscopio Gastrointestinal inferior, equipo de diagnóstico auxiliar de imagen. http://en.endoangel.cn/product/1.html

6. National Library of Medicine (NIH). ENDOANGEL mejora la detección de adenomas colorrectales no detectados en una segunda colonoscopia: un estudio retrospectivo. National Center for Biotechnology Information; 2024. https://pmc.ncbi.nlm.nih.gov/articles/PMC11245239/

7. Aguilera M, Sánchez S, Gonzalez B, et al. El papel emergente de la inteligencia artificial en la endoscopia gastrointestinal: una revisión de la literatura. Elsevier; 2021. https://www.elsevier.es/es-revista-gastroenterologia-hepatologia-14-pdf-S0210570521003095

8. Urrútia G, Bonfill X. Declaración Prisma: una propuesta para mejorar la publicación de revisiones sistemáticas y metanalisis. Elsevier; 2010.

9. Kikuchi R, Okamoto K, Ozawa T, Shibata J, Ishihara S, Tada T. Endoscopic Artificial Intelligence for Image Analysis in Gastrointestinal Neoplasms. Digestion. 2024;105(6):419–35.

10. Zou PY, Zhu JR, Zhao Z, Mei H, Zhao JT, Sun WJ, et al. Development and application of an artificial intelligence-assisted endoscopy system for diagnosis of Helicobacter pylori infection: a multicenter randomized controlled study. BMC Gastroenterol. 2024;24(1):335.

11. Pateras IS, Igea A, Nikas IP, Leventakou D, Koufopoulos NI, Ieronimaki AI, et al. Diagnostic Challenges during Inflammation and Cancer: Current Biomarkers and Future Perspectives in Navigating through the Minefield of Reactive versus Dysplastic and Cancerous Lesions in the Digestive System. Int J Mol Sci. 2024;25(2):1251.

12. Chen H, Liu SY, Huang SH, Liu M, Chen GX. Aplicaciones de la inteligencia artificial en gastroscopia: una revisión narrativa. J Int Med Res. 2024;52(1):3000605231223454.

13. Khalaf K, Fujiyoshi MRA, Spadaccini M, Rizkala T, Ramai D, Colombo M, et al. From Staining Techniques to Artificial Intelligence: A Review of Colorectal Polyps Characterization. Medicina (Kaunas). 2024;60(1):89.

14. Ichimasa K, Kudo SE, Misawa M, Takashina Y, Yeoh KG, Miyachi H. Role of the artificial intelligence in the management of T1 colorectal cancer. Dig Liver Dis. 2024;56(7):1144–7.

15. Yang C, Sharma K, Mow RJ, Bolay E, Srinivasan A, Merlin D. Unleashing the Potential of Oral Deliverable Nanomedicine in the Treatment of Inflammatory Bowel Disease. Cell Mol Gastroenterol Hepatol. 2024;18(2):101333.

16. Bektas M, Chia C, Burchell G, Daams F, Bonjer H, et al. Artificial intelligence-aided ultrasound imaging in hepatopancreatobiliary surgery: where are we now?. Surg Endosc. 2024;38:4869–79.

17. Gonzalez J, Dayana W. Detección temprana de cáncer gástrico utilizando nuevas técnicas endoscópicas. Revisión sistemática. Universidad Católica de Cuenca; 2024. https://dspace.ucacue.edu.ec/items/90dae8cd-5a0d-4527-b34f-8f2493d3db35

18. Auzine MM, Khan MH, Baichoo S, Nuzhah GS, Bissoonauth-Daiboo P, Gao X, et al. Development of an ensemble CNN model with explainable AI for the classification of gastrointestinal cancer. PLoS One. 2024;19(6):e0304642.

19. Peng Y, Deng H. Medical image fusion based on machine learning for health diagnosis and monitoring of colorectal cancer. BMC Med Imaging. 2024;24:154.

20. Khalaf K, Mary Raina AF, Spadaccini M, Rizkala T, Ramai D, Colombo M, et al. From Staining Techniques to Artificial Intelligence: A Review of Colorectal Polyps Characterization. Medicina. 2024;60(1):89.

21. Sreetama M, Sunita V, Pravin G. Navigating the Future: A Comprehensive Review of Artificial Intelligence Applications in Gastrointestinal Cancer. Cureus. 2024;16(2):e54725.

22. Zhao L, Wang N, Zhu X, Wu Z, Shen A, Zhang L, et al. Establishment and validation of an artificial intelligence-based model for real-time detection and classification of colorectal adenoma. Sci Rep. 2024;14(1):10750.

23. Mota J, Maria João Almeida, Martins M, Mendes F, Cardoso P, Afonso J, et al. Artificial Intelligence in Coloproctology: A Review of Emerging Technologies and Clinical Applications. J Clin Med. 2024;13(19):5842.

24. Wan J, Zhu P, Chen B, Yu Y. A semantic feature enhanced YOLOv5-based network for polyp detection from colonoscopy images. Sci Rep. 2024;14(1):15478.

25. Zubair Rahman AMJM, Mythili R, Chokkanathan K, Mahesh TR, Vanitha K, Yimer TE. Enhancing image-based diagnosis of gastrointestinal tract diseases through deep learning with EfficientNet and advanced data augmentation techniques. BMC Med Imaging. 2024;24:154.

26. Sinonquel P, Eelbode T, Pech O, De Wulf D, Dewint P, Neumann H, et al. Clinical consequences of computer-aided colorectal polyp detection. Gut. 2024;73(6):1002–10.

27. Chen J, Wang G, Zhou J, Zhang Z, Ding Y, Xia K, et al. AI support for colonoscopy quality control using CNN and transformer architectures. BMC Gastroenterol. 2024;24:223.

28. Elshamy R, Abu-Elnasr O, Elhoseny M, Elmougy S. Enhancing colorectal cancer histology diagnosis using modified deep neural networks optimizer. Sci Rep. 2024;14(1):19534.

29. Thiruvengadam N, Solaimani P, Shrestha M, Buller S, Carson R, et al. La eficacia de la detección asistida por computadora en tiempo real de la neoplasia de colon en la práctica comunitaria: un ensayo controlado aleatorio pragmático. Clin Gastroenterol Hepatol. 2024;22(11):2221-2230.e15.

30. Mori Y, Jin EH, Lee D. Mejora de la colaboración entre la inteligencia artificial y los médicos para el diagnóstico asistido por computadora en la colonoscopia a través de una mejor alfabetización digital. Dig Liver Dis. 2024;56(7):1140–3.

31. Wang KW, Dong M. Posibles aplicaciones de la inteligencia artificial en pólipos colorrectales y cáncer: avances y perspectivas recientes. World J Gastroenterol. 2020;26(34):5090–100.

32. Viscaino M, Torres Bustos J, Muñoz P, Auat Cheein C, Cheein FA. Inteligencia artificial para la detección precoz del cáncer colorrectal: una revisión exhaustiva de sus ventajas y conceptos erróneos. World J Gastroenterol. 2021;27(38):6399–414.

33. Mehta A, Kumar H, Yazji K, Wireko AA, Sivanandan Nagarajan J, Ghosh B, et al. Effectiveness of artificial intelligence-assisted colonoscopy in early diagnosis of colorectal cancer: a systematic review. Int J Surg. 2023;109(4):946–52.

34. Attardo S, Chandrasekar VT, Spadaccini M, Maselli R, Patel HK, Desai M, et al. Tecnologías de inteligencia artificial para la detección de lesiones colorrectales: el futuro es ahora. World J Gastroenterol. 2020;26(37):5606-16.

35. Kim KO, Kim EY. Aplicación de la Inteligencia Artificial en la detección y caracterización de neoplasias colorrectales. Gut Liver. 2021;15(3):346–53.

36. Bedrikovetski S, Dudi-Venkata NN, Kroon HM, Seow W, Vather R, Carneiro G, et al. Artificial intelligence for pre-operative lymph node staging in colorectal cancer: a systematic review and meta-analysis. BMC Cancer.

2021;21(1):1058.

37. Qiu H, Ding S, Liu J, Wang L, Wang X. Aplicaciones de la inteligencia artificial en la detección, el diagnóstico, el tratamiento y el pronóstico del cáncer colorrectal. Curr Oncol. 2022;29(3):1773-95.

38. Wallace MB, Sharma P, Bhandari P, East J, Antonelli G, Lorenzetti R, et al. Impact of Artificial Intelligence on Miss Rate of Colorectal Neoplasia. Gastroenterology. 2022;163(1):295-304.e5.

39. Mitsala A, Tsalikidis C, Pitiakoudis M, Simopoulos C, Tsaroucha AK. Inteligencia artificial en el cribado, diagnóstico y tratamiento del cáncer colorrectal. Una nueva era. Curr Oncol. 2021;28(3):1581-607.

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