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Artificial intelligence, bioethics, and gender in medical training: a critical review of the current landscape in latin America

Abstract

This work analyzes the bioethical and gender-related aspects of artificial intelligence (AI) use in university-level medical education in Latin America. The study recognizes that the increasing incorporation of intelligent technologies in educational settings may introduce new ethical tensions, particularly concerning algorithmic design and its implementation in learning environments that must ensure fairness, transparency, and justice. A systematic literature review was conducted using Google Scholar, PubMed, and SciELO, covering the period from 2020 to 2025. The search focused on titles containing the keywords: bioethics, gender, artificial intelligence, students, and medicine. The Google Scholar search yielded 1,350 results, from which eight scientific articles were selected for analysis based on inclusion criteria. Thesis, essays, interviews, and studies focused on practicing medical professionals were excluded. No relevant studies were identified in PubMed or SciELO during the specified period. The selected literature shows limited explicit discussion on the intersections between ethics, gender, and AI use in medical education. Most of the discourse is framed in technical or operational terms. Significant gaps are evident in institutional policies guiding ethical AI use in education, and there is a lack of frameworks to address gender considerations.

Keywords: artificial intelligence, bioethics, gender, medical training, higher education

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Introduction

The rapid advancement of artificial intelligence (AI) has transformed many areas of human endeavor,

including, significantly, the educational processes in higher education. Particularly in health-related fields such as medicine, the use of intelligent systems has begun to permeate teaching and learning through clinical simulators. Particularly in health-related fields such as medicine, the use of intelligent systems has begun to permeate teaching and learning through clinical simulators, intelligent tutors, conversational assistants, automated diagnostic systems, and pedagogical personalization platforms.[1] This transformation, however, is not without profound ethical implications, especially when automation and algorithmic analysis are integrated into pedagogical practices that have historically been guided by a humanistic, empathetic, and ethical relationship between medical knowledge, the educator, and the future professional. In this context, legitimate concerns arise regarding the extent to which intelligent technologies can replicate, exacerbate, or even render invisible existing structural biases in educational environments, including gender dimensions and fundamental bioethical principles.[2]

Bioethics, as a discipline focused on analyzing the moral conditions that regulate intervention in human life, has begun to open up new lines of reflection on the application of AI technologies in healthcare. However, its incorporation as a critical tool in evaluating the use of AI in training processes is still in its infancy, especially when considering the perspective of medical students. The principles of autonomy, distributive justice, non-maleficence, and beneficence, classic pillars of bioethics, face unprecedented challenges in the face of the development and use of opaque, non-auditable algorithmic systems designed without institutional ethical oversight. Likewise, the gender approach, understood as the analysis of power relations and representation between sex-gender identities in educational systems, has been scarcely articulated in discourses on artificial intelligence applied to medical teaching. This is despite the fact that multiple studies have shown that AI systems can reproduce androcentric biases if they are trained with unbalanced data or if explicit equity criteria are not incorporated during their design and validation.[3]

Over the last two decades, international literature has documented a growing interest in incorporating intelligent technologies into medical training, highlighting benefits such as improved diagnostic accuracy, personalized feedback, reduced human error, and curricular efficiency. However, most studies focus on the operational and technical advantages of AI, neglecting the ethical, social, and pedagogical impacts on the subjects participating in the training process. In particular, the literature from Latin American contexts is scarce and fragmented, making it difficult to gain a comprehensive understanding of how medical education institutions in the region are addressing the bioethical and gender dimensions of AI use.[4]

There are significant gaps that become evident when reviewing the current state of knowledge. First, the available scientific output on the explicit approach to ethics and gender in the context of artificial intelligence for medical teaching in Latin America has not been systematized. Second, there is a scarcity of institutional models that regulate the ethical use of these technologies in the classroom, both from a regulatory and educational perspective. Third, existing works tend to adopt technocentric approaches that do not problematize the implications of the automation of pedagogical and clinical judgment, nor its differential effects on students according to their gender identity, ethnic status, or socioeconomic level. Consequently, there is an urgent need to develop a critical and systematic approach that highlights these gaps and guides the construction of regulatory and curricular frameworks that are sensitive to these challenges.[5]

The overall objective of this study is to conduct a systematic review of scientific literature produced between 2020 and 2025 on the treatment of bioethical and gender issues in the incorporation of artificial intelligence in medical education at Latin American universities. Using a systematic review methodology, it explores the degree of articulation between the application of AI in medical education contexts and existing ethical regulatory frameworks, as well as the explicit consideration of gender variables in its implementation. This research seeks to provide empirical and conceptual evidence that contributes to strengthening the academic and professional debate on the need for ethical, fair, and contextualized educational AI that is adapted to the sociocultural realities of Latin America.

Material and methods

A systematic review of scientific literature was conducted to identify and analyze publications addressing bioethical and gender issues in the use of artificial intelligence applied to teaching in university medical programs in Latin America. The search was conducted the 16 June 2025 in three databases: Google Scholar, PubMed, and SciELO. The bibliographic collection period ranged from January 2020 to June 2025, considering an exploratory approach that would allow capturing the recent development of these topics in the region.

In Google Scholar, a search strategy was implemented using the following terms combined within the title: "bioethics," "gender," "artificial intelligence," "students," and "medicine." The full-text search option was selected without language or publication type restrictions, with the aim of covering as much indexed literature as possible. This search yielded a total of 1,350 initial results. Subsequently, inclusion and exclusion criteria were applied, selecting only peer-reviewed articles published in academic journals that explicitly presented an analysis of at least one of the defined thematic components: ethics, gender, or AI in medical education. Thesis, essays, interviews, non-peer-reviewed technical documents, and studies focused on practicing medical professionals were excluded, as the focus was restricted to university educational settings.

In the case of PubMed, an advanced search was performed using the same key terms in English, combined using Boolean operators: "bioethics AND gender AND artificial intelligence AND students AND medicine." The search option was selected without restrictions on document type or language, covering the same time interval. This search did not yield any relevant results that met the established criteria.

A similar search was performed in the SciELO database, limiting the period to 2020-2022 due to system restrictions on including later years. The same combined terms were used in the title and abstract of the articles. This search also did not generate results that met the defined criteria.

After the filtering process, the final sample consisted of eight scientific articles that met all the inclusion criteria. For each of these documents, a qualitative content analysis was applied to identify thematic categories associated with bioethical principles (autonomy, justice, beneficence, non-maleficence), the presence of gender approaches, and how AI is conceptualized and applied in medical education settings. This analysis was performed manually, using ad hoc coding matrices, which allowed the findings to be structured by categories, subcategories, and frequency of occurrence of each thematic component.

In order to ensure the reliability of the analysis, cross-validation was performed through independent review by two researchers with specific training in bioethics applied to medical education, who verified the consistency of the categorization process and the relevance of the interpretations made. Discrepancies were resolved by consensus. Finally, the results were structured considering the presence or absence of the target themes in each article, the degree of conceptual development of the ethical and gender approaches, and the explicit or implicit incorporation of policies or normative principles aimed at regulating the use of AI in the context analyzed.

Results

The bibliographic search conducted in Google Scholar, using the terms "bioethics," "gender," "artificial intelligence," "students," and "medicine" restricted to the title of the document, yielded a total of 1,350 results for the period between 2020 and 2025 (Table 1). From the total number of initial results, inclusion criteria were applied that allowed only eight paper-type articles to be identified that met the requirements established for the analysis. The selected papers were published in indexed scientific journals and were peer-reviewed. The articles included explicit references to the integration of artificial intelligence systems into medical training processes, as well as approaches that related these developments to bioethical principles and/or gender analysis (Table 1).

Table 1 Classification and frequency of documents retrieved and selected in the systematic review, with n=13 articles that passed the first selection.

Type of document	Absolute number	Percentage (%) of n=13
Scientific articles included	8	61,55
Excluded theses	2	15,38
Essays excluded	1	7,69
Excluded interviews	1	7,69
Excluded articles focusing on practicing physicians	1	7,69
Articles in other disciplines excluded	1337	-
Total documents recovered	1350	-

Source: Prepared by the author based on a bibliographic search in Google Scholar (2020–2025).

During the screening process, two texts identified as theses, one essay, one interview, and one article that dealt exclusively with licensed physicians in clinical practice, without reference to undergraduate training contexts, were excluded. Likewise, texts that, although they included relevant thematic elements, focused on other professions or disciplines outside the medical field were also discarded.

A review of the selected articles revealed that most of them focused on specific institutional experiences or conceptual reviews of the use of artificial intelligence in the medical classroom. Five of the eight papers addressed the topic from a predominantly ethical perspective, describing possible risks associated with student autonomy, the delegation of clinical judgments to algorithmic systems, and the need to incorporate bioethical frameworks into professional training. Three articles explicitly incorporated analyses of gender bias in the design or implementation of artificial intelligence-based technologies, highlighting concerns about the reproduction of androcentric patterns in learning platforms and clinical simulators.

Regarding geographic coverage, the selected articles came from experiences and analyses conducted at higher education institutions located in Argentina, Mexico, Colombia, Chile, and Spain. No studies developed at universities in Central America or the Caribbean were identified that met all the established criteria. Four articles were

written in Spanish, three in English, and one in Portuguese, reflecting a certain linguistic diversity in the scientific production on the topic in the region.

With respect to the PubMed database, the search performed using the same combined terms did not yield relevant results for the period 2020–2025. In the SciELO database, with a time range limited by the system to between 2020 and 2022, no publications were identified that met the selection criteria.

The thematic coding of the selected articles revealed that, although initial approaches to the issue exist, no formalized pedagogical or institutional models were identified that systematically integrate bioethical principles or a gender perspective into the use of artificial intelligence in medical education. Furthermore, no internal policies or regulatory guidelines for the ethical evaluation of intelligent educational technologies were found within the programs analyzed.

Discussion

The results obtained in this systematic review reveal a significant scarcity of studies that address, in an integrated manner, the bioethical and gender aspects of the application of artificial intelligence in university medical education in Latin America. This lack of specialized literature represents a novel finding in the field of medical education, considering the sustained increase in the incorporation of intelligent technologies in learning environments. While AI has been extensively studied from the perspective of its technical and pedagogical impact, the specific literature that articulates ethics, gender, and artificial intelligence in medical educational contexts remains marginal in the region. This gap is particularly relevant, given that algorithmic systems can reproduce biases and generate unforeseen consequences if they are not evaluated from robust normative frameworks that are sensitive to diversity.[6]

The presence of only eight scientific articles that meet the defined inclusion criteria, within an initial pool of 1350 results, confirms the thematic dispersion and the lack of academic systematization on this issue. Several authors have warned about the incipient nature of this type of reflection, pointing out the urgent need to integrate bioethics education into health training programs in light of the advance of AI in clinical and educational contexts. Iglesias et al. argue that the use of intelligent technologies in medicine must be accompanied by critical training in bioethical anthropology, which allows students to analyze the moral implications of these tools within the educational process.[7]

Furthermore, the review reveals that only three of the selected studies explicitly address the gender dimension. This omission is consistent with the observations of Morales Ramírez, who warns that AI algorithms, when trained with historically biased data, can reproduce and amplify forms of structural discrimination, especially against women and gender and sexual minorities.[8] The lack of institutional mechanisms to detect, mitigate, or correct these biases in educational settings represents a significant ethical risk, particularly in highly regulated professional fields such as medicine.

Another relevant finding is the limited formalization of policies or regulatory frameworks within higher education institutions that govern the ethical use of AI in educational settings. Fernández et al. note that, while international frameworks such as the UNESCO ethical principles and the European Union's AI regulation exist, these have not yet been translated into concrete operational guidelines within Latin American universities.[9] This lack of regulatory adequacy limits the capacity of institutions to supervise the pedagogical uses of AI from a perspective of rights, equity and epistemic justice.[10]

Furthermore, the analyzed literature shows a widespread emphasis on the technical potential of artificial intelligence, to the detriment of a critical perspective on its integration into teaching practices. Gómez argues that AI is frequently presented as a promise of educational modernization without a comprehensive evaluation of its effects on the pedagogical relationship, the teacher's role, and student agency.[11] This technocratic reductionism has also been problematized by Aguirre Flórez et al., who propose distinguishing between the instrumental use and the pedagogically grounded use of these technologies in the medical classroom.[12]

Regarding the epistemological dimension, the absence of references to cultural pluralism and the diversity of bioethical approaches in the reviewed articles is concerning. Most of the analyzed works adopt principle-based or techno-legal ethical frameworks, without considering contextualized Latin American bioethical approaches or intersectional perspectives. This has been pointed out by Rego and Gorini, who warn that big data approaches applied to health need to be rethought from inclusive and non-Eurocentric perspectives.[13] Along these lines, the analysis suggests the need to promote an ethics of AI that integrates deliberative principles, social justice, and gender equity as basic criteria in the design of institutional policies.

From a methodological standpoint, one of the limitations of this study lies in access to databases. Despite efforts to broaden coverage through Google Scholar, PubMed, and SciELO, it was not possible to identify relevant works in the latter two databases during the search period. This could reflect not only a real gap in scientific production but also a limitation in the visibility or indexing of Latin American studies on the topic. Additionally, the analysis focused exclusively on peer-reviewed academic literature, excluding institutional reports, technical documents, and other gray-source research that could contain relevant contributions. This methodological decision, while justified by scientific quality standards, may have narrowed the range of cases considered.

Another limitation is the thematic focus on the university level, which excludes potential developments in technical or continuing health education settings. Furthermore, the design of the qualitative coding matrix, although peer-validated, did not incorporate indicators of institutional impact or direct student perception, aspects that could be addressed in future studies to complement the literature review.

Taken together, the results confirm a disconnect between technological advancements in artificial intelligence applied to medical education and the capacity of Latin American institutions to integrate these advancements in a critical, ethical, and inclusive manner. As argued by Díez and Pereira, the coexistence of technology and medical humanism requires the development of new forms of ethical rationality that recognize the limitations of algorithmic judgment in the face of the complexities of the educational and clinical act.[14]

Conclusion

This systematic review demonstrates a profound lack of Latin American scientific literature that addresses, in an integrated and explicit manner, the bioethical and gender aspects of the use of artificial intelligence in university medical education.

This finding is especially relevant in a context where intelligent technologies are being increasingly incorporated into medical training processes, without a corresponding normative, institutional, or pedagogical framework to guarantee their ethical and equitable use. The lack of robust conceptual frameworks and educational policies aimed at mitigating algorithmic risks and gender biases

reveals a critical disconnect between technological advancement and the educational responsibility of higher education institutions. The ethical dimension and the gender perspective continue to be treated as peripheral elements, when in reality they should occupy a structural position in the design, implementation, and evaluation of artificial intelligence tools in sensitive academic environments such as medicine.

Based on this evidence, it is essential to promote the development of institutional curricular policies that explicitly integrate bioethics training and a gender perspective as cross-cutting themes in the incorporation of artificial intelligence in the medical classroom. Latin American universities must assume an active role in generating regulations that ensure the responsible, fair, and ethically informed use of these technologies. This implies not only updating content but also transforming teaching methodologies, evaluation criteria, and institutional mechanisms for technology oversight. Furthermore, it is necessary to strengthen interdisciplinary research capacities that allow for the production of contextualized local evidence on the ethical and social implications of AI use in medical education.

Looking ahead, it is proposed to move toward the design of ethical governance models for educational artificial intelligence that include the active participation of students, faculty, bioethics specialists, and gender experts. It is also suggested that algorithmic auditing mechanisms and differentiated impact analyses based on sociocultural variables be included. Finally, the need is raised to strengthen regional systems for indexing and making visible critical scientific literature, in order to improve the circulation of knowledge produced in Latin America and to promote its integration into international debates on AI, education and social justice.

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Ethical aspects

The study followed international regulations in accordance with the Declaration of Helsinki. Did not require approval from a scientific ethics committee due to the type of study.

Conflicts of interest

The authors have no conflicts of interest for the development of this article.

Authors contribution

All authors contributed to the development of the article.

References

1. As'ad M. Intelligent tutoring systems, generative artificial intelligence (AI), and healthcare agents: a proof of concept and dual-layer approach. *Cureus*. 2024;16(9):e69710.
2. Busch F, Adams LC, Bressem KK. Biomedical ethical aspects towards the implementation of artificial intelligence in medical education. *Med Sci Educ*. 2023;33(4):1007–1012.
3. Berger-Estilita J, Gisselbaek M, Devos A, et al. AI and inclusion in simulation education and leadership: a global cross-sectional evaluation of diversity. *Adv Simul (Lond)*. 2025;10(1):26.
4. Zhang W, Cai M, Lee HJ, et al. AI in medical education: global situation, effects and challenges. *Educ Inf Technol*. 2024;29(4):4611–4633.
5. Khakpaki A. Advancements in artificial intelligence transforming medical education: a comprehensive overview. *Med Educ Online*. 2025;30(1):2542807.
6. Saroha S. Artificial intelligence in medical education: promise, pitfalls, and practical pathways. *Adv Med Educ Pract*. 2025;16:1039–1046.
7. Iglesias MN, Rabino MC, Zocchi M. Use of artificial intelligence in medicine: importance of bioethical anthropological education for medical students. *InIt.*2022;12(1):38–46.
8. Morales Ramírez G. Anthropological problems behind discrimination generated by artificial intelligence algorithms. *Med Ética*. 2023;34(2):429–480.
9. Biscaia Fernández JM, González-Soltero M del R, Biscaia Fernández CJ, et al. Use of ChatGPT in biomedical education: risk analysis from the ethical principles of UNESCO and the European Union Regulation on artificial intelligence. *Rev Iberoam Bioét*. 2024;(25):1–15.
10. Rodriguez D, Strickler Prouvay A, Arellano Pajaro R, et al. Perception of bioethical competence and joint ethical-clinical deliberation between medicine and nursing in basic pediatric hospitalization. *ARS Med.* 2024;49(2):7–14.
11. Aparicio Gómez WO. Artificial intelligence and its impact on education: transforming learning for the 21st century. *Rev Int Pedagog Innov Educ.* 2023;3(2):217–230.
12. Aguirre Flórez M, Gómez González JF, Jiménez Osorio LA, et al. Use of artificial intelligence in medical education: tool or threat? Scope review. Investig Educ Méd. 2025;14(53):90–106.
13. Rego S, Gorini C. Ethical aspects of the use of big data. *EIDON.* 2023;(60):42–58.
14. Baños Díez JE, Guardiola Pereira E. The coexistence of technology and medical humanism. *Med Clin Pract*. 2024;7(3):100437.