

Addressing PCOS in Adolescents through Lifestyle Modification: A Preventive Approach

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Introduction

Polycystic Ovarian Syndrome (PCOS) is a multifactorial endocrine-metabolic disorder that affects approximately 6–10% of women of reproductive age globally. It is characterized by hyperandrogenism, chronic anovulation, and polycystic ovarian morphology (Azziz et al., 2016). Although commonly diagnosed in adulthood, research shows that PCOS symptoms first emerge during adolescence. (Franks, 2008).

During adolescence, physiological hormonal fluctuations are common, often complicating early diagnosis. Menstrual irregularities, acne, and hirsutism may be dismissed as typical features of puberty, leading to underdiagnosis or misdiagnosis of PCOS (Witchel et al., 2020). Delayed intervention contributes to long-term health issues, including infertility, type 2 diabetes, dyslipidemia, and cardiovascular disease (Sirmans and Pate, 2014).

The increasing prevalence of PCOS in adolescents is closely linked to modern lifestyle patterns such as sedentary behavior, high intake of refined carbohydrates and processed foods, stress, and disrupted sleep cycles (Teede et al., 2018). These lifestyle components exacerbate insulin resistance and hormonal imbalance, contributing significantly to the pathogenesis and progression of PCOS.

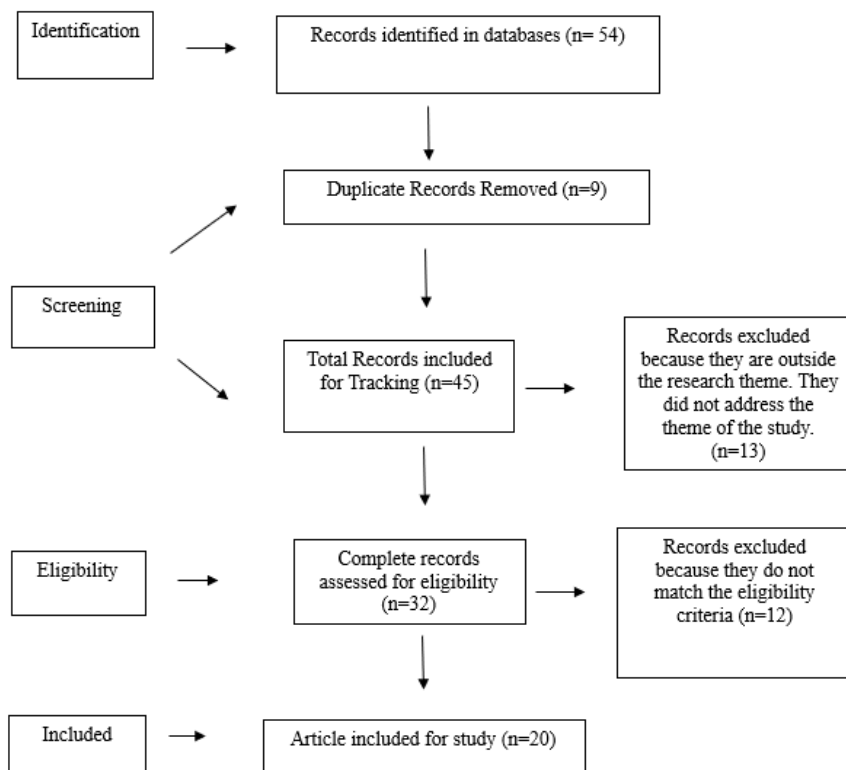
Given the modifiable nature of these risk factors, early lifestyle intervention in adolescents provides a valuable window for preventive care. Lifestyle modifications comprising of physical activity, dietary improvements, stress management, and sleep hygiene has shown efficacy in both the prevention and management of PCOS (Moran et al., 2011). Traditional systems of medicine like Unani offer additional holistic modalities that can be integrated into preventive strategies, particularly in South Asian contexts (Firdose K F and Shameem I.2016).

Methods and Methodology

This paper adopts a narrative review methodology supported by clinical observation. Scientific databases including PubMed, Scopus, Google Scholar, and the WHO Global Health Library were used to source peer-reviewed articles, guidelines,

and clinical reviews from 2013 to 2024. Keywords used for the search included “PCOS in adolescents,” “lifestyle modification,” “insulin resistance in youth,” “exercise and PCOS,” “nutrition and polycystic ovaries,” and “Unani management of PCOS.”

Inclusion criteria focused on studies involving adolescents (ages 10–19), emphasizing early intervention and lifestyle-based strategies. In parallel, adolescent PCOS case profiles from the Unani Clinical Unit, Faculty of Indigenous Medicine, University of Colombo, were examined for clinical correlation. These cases were managed using a combination of Ilaj bil Tadbeer (regimental therapy), Ghiza-e-Mufida (diet therapy), and herbal interventions (Ilaj bil Dawa).



Research Findings and Discussion

Adolescent PCOS Diagnosis

Diagnosis of PCOS in adolescents is complicated by similarities between PCOS symptoms and normal pubertal changes. Persistent oligo/anovulation beyond two years post-menarche, in conjunction with clinical or biochemical

hyperandrogenism, is necessary for diagnosis (Witchel et al., 2020). However, due to limited awareness and lack of standard adolescent-specific guidelines, diagnosis is often delayed (Legro et al., 2013).

Insulin resistance and central obesity are highly prevalent among adolescents with PCOS. Over 50% of overweight adolescent girls with PCOS have insulin resistance, which exacerbates androgen excess and ovulatory dysfunction (Banaszewska et al., 2006). This reinforces the need for interventions targeting metabolic health in early adolescence.

Influence of Lifestyle Factors

Numerous studies support the significant influence of lifestyle on the pathogenesis of PCOS. Key modifiable contributors include the following.

Physical Inactivity: Sedentary adolescents show greater metabolic and hormonal dysregulation. Regular physical activity (≥ 150 minutes/week) improves insulin sensitivity, decreases testosterone levels, and normalizes menstrual cycles (Moran et al., 2011).

Unhealthy Diets: High glycemic load diets and frequent fast-food consumption worsen hyperinsulinemia and androgen excess. Conversely, diets rich in fiber, lean protein, and healthy fats promote hormonal balance (Teede et al., 2018).

Stress and Sleep Disorders: Chronic stress and sleep deprivation are increasingly prevalent among adolescents and are associated with HPO axis dysregulation. Stress also exacerbates eating disorders and body image issues (Chandrasekaran and Sagili, 2018).

Obesity and Self-esteem: Adolescent girls with PCOS often experience low self-esteem, depression, and anxiety due to visible symptoms like hirsutism and acne. This psychosocial distress can lead to poor lifestyle choices and further exacerbate symptoms (Sirmans and Pate, 2014).

Effectiveness of Early Lifestyle Modification

Early intervention with lifestyle changes has proven effective. A randomized controlled trial in 2020 demonstrated that a 12-week structured program involving exercise, dietary regulation, and stress management led to significant improvements in BMI, testosterone levels, and menstrual frequency compared to pharmacologic treatment alone (Teede et al., 2018).

In Unani clinical practice, adolescent patients with PCOS have shown improvement through holistic approaches that combine *Riyazat* (physical activity), *Taleem wa Tadeeb* (lifestyle counseling), and *Ghiza-e-Mufida* (customized diet). Herbal formulations such as *Aslussoos* (*Glycyrrhiza glabra*), *Zanjabeel* (*Zingiber officinale*), and *Shuniz* (*Nigella sativa*) are used adjunctively to reduce inflammation, enhance digestion, and regulate hormones (Rasool and Sabina, 2010; Rasool, 2020).

A review by Firdose K F and Shameem I. (2016) also validates the efficacy of Unani treatments in improving menstrual regularity, managing weight, and reducing androgenic symptoms. This demonstrates potential for integrative approaches in culturally relevant settings like Sri Lanka.

Barriers to Implementation

Despite its efficacy, the implementation of lifestyle modification strategies faces several barriers in adolescents such as poor awareness about PCOS and its complications, taboos surrounding menstruation and reproductive health discussions, peer pressure and body image issues that discourage health-seeking behavior, and lack of school-based screening or lifestyle education programs.

Addressing these barriers requires a community-wide effort to build adolescent-friendly and culturally sensitive health services.

Awareness among adolescents

Schools are an ideal setting for introducing preventive health programs. Comprehensive school health education can normalize discussions around menstruation, reproductive health, and body image. Programs including nutritional awareness, menstrual tracking, and peer-led support can create a positive impact.

Families, particularly mothers, play an influential role in shaping adolescent behavior. Engaging families in lifestyle intervention enhances sustainability and compliance. Traditional systems like Unani offer preventive frameworks that emphasize balance in temperament, diet, environment, and physical activity, which are in line with local cultural values (Farooki, 2011).

In this context, Unani principles such as *Hifz-e-Sehat* (preservation of health) align well with preventive care. Promoting Unani-based lifestyle recommendations, such as temperate foods, mild detoxification (*Tahleel*), and sleep hygiene (*Tanweem al-naum*), offers adolescents a personalized and non-pharmacologic path to wellness.

Conclusion

Polycystic Ovarian Syndrome is increasingly recognized as a condition that originates in adolescence, yet current health systems are not adequately equipped to respond to it at this early stage. Lifestyle modification through physical activity, dietary balance, sleep regulation, and stress management is the most effective and least invasive strategy for prevention.

This review highlights that lifestyle modification not only improves clinical outcomes but also aligns with the principles of holistic traditional medicine like Unani. Incorporating adolescent-centered, culturally appropriate health promotion

strategies, especially within school and community settings, can help reduce the growing burden of PCOS.

Future research should focus on the long-term impact of adolescent lifestyle intervention programs, the integration of traditional medicine systems into mainstream care, and policy development for school-based reproductive health education. Addressing PCOS through early, sustainable, and integrative strategies will significantly enhance the reproductive and metabolic health of future generations.

Keywords: *Polycystic ovary syndrome, adolescence, insulin resistance, lifestyle modifications*

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Ethical Use of AI Tools in Academic Research: Issues, Challenges and Remedies

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Abstract

The use and misuse of AI tools in academic research have raised broader concerns in academia, policy, and ethics. While AI tools offer various benefits, including saving time, improving accuracy, and facilitating data analysis, they also raise serious research concerns in legitimate research ethics. This paper examines key issues, including a lack of awareness among researchers, data privacy risks, problems with authorship and plagiarism, bias inherent in AI tools, and the absence of clear guidelines from educational institutions. Some researchers often use AI tools without understanding ethical implications or potential consequences and repercussions. As a result, they tend to inadvertently misuse AI tools, share sensitive data without consent, or fail to give proper credit. Bias in AI tools can also lead to unfair or misleading research results. Without appropriate guidance, researchers may struggle to make the right ethical choices. This study recommends practical steps to promote the responsible use of AI tools. These include creating clear policies, providing training for researchers, and nurturing open discussions on the use of AI tools. Institutions may play an active role in setting standards and guiding researchers in their adherence to these standards. Researchers should also take responsibility by learning about ethical AI tools practices and using AI tools wisely. By doing so, the academic community can enjoy the benefits of AI tools while protecting research integrity. The paper emphasises the need for a balanced and informed approach to the use of AI tools in academic settings. Strong ethical practices are essential to ensure quality and fairness in research.

Keywords: *Academic, Artificial intelligence, Ethical, knowledge, Research*

Introduction

The integration of Artificial Intelligence (AI) tools into academic research transforms the way scholars review literature, analyse data, and disseminate knowledge. Researchers now rely on AI tools to accelerate complex tasks, improve precision, and enhance productivity. However, this growing dependence raises significant ethical concerns. Scholars must address issues such as algorithmic bias, data privacy, intellectual integrity, and transparency. When researchers allow AI tools to generate or interpret academic content without critical oversight, they risk

undermining academic rigour and ethical standards. Institutions and researchers must develop clear ethical guidelines and adopt responsible AI tools practices to protect the credibility of scholarly work. Ignoring these concerns may lead to unintentional plagiarism, misrepresentation of data, and erosion of trust in academic outputs. This paper examines the pressing ethical issues surrounding AI tools in scholarly research, analyses the underlying causes of these concerns, and proposes practical solutions to ensure that AI tools serve as a responsible and trustworthy partner in the pursuit of knowledge.

Review of Literature

The increasing use of Artificial Intelligence (AI) tools in academic research and writing has sparked critical ethical discussions across disciplines. Scholars have recognized the transformative potential of AI and the urgent need for ethical oversight in its integration. AI tools like ChatGPT can streamline academic processes, but they also introduce ethical risks, such as plagiarism, misinformation, and authorship ambiguity (Guleria, Krishan, Sharma, & Kanchan, 2023). Researchers must consider how reliance on AI can compromise originality and academic accountability.

The foundational principles of academic integrity and AI challenges are transparency and responsibility, and the accurate representation of ideas is contested (Ghotbi, 2023). He argues that educational institutions must create ethical awareness among students and faculty while integrating AI into research and learning environments. Academic institutions must redefine their codes of conduct to accommodate emerging AI-related concerns, particularly those related to originality and the unchecked automation of intellectual work (Khatri & Karki, 2023).

A web content analysis reveals widespread misuse of AI tools in manuscript preparation (Aslam & Nisar, 2024). They observe that some researchers allow AI systems to generate entire research drafts without adequate verification or acknowledgement. Such practices erode trust in scholarly publishing and distort the peer-review process. The evolving ethical landscape of AI in academic writing is a challenge (Ateriya, Sonwani, Thakur, & Kumar, 2025). They argue that researchers must establish clear boundaries between human and machine contributions to maintain credibility and authorship integrity.

The psychological dimensions of AI use in academia, noting that ethical awareness, perceived ethical risks, and "AI ethical anxiety" significantly influence students' willingness to engage with generative AI tools (Zhu, Huang, Zhou, Li, & Shi, 2025). They urge universities to embed ethical training into curricula to mitigate misuse and promote responsible engagement. In the context of developing nations, it is observed that in emerging economies, the rapid adoption of tools like ChatGPT occurs without a corresponding ethical infrastructure (Zhu, Huang, Zhou, Li, & Shi,

2025). This imbalance intensifies the risk of academic misconduct and the marginalisation of local research ethics frameworks.

The broader institutional implications, noting that the integration of AI must align with academic values such as inclusivity, critical thinking, and scholarly rigour, must be considered (Molligan & Pérez-López, 2024). They warn that uncritical adoption may lead to dependence on algorithms, thereby weakening human judgment and reflective inquiry. Meanwhile, AI can also serve as an ally in ethical enforcement (Sridharan & Sivaramakrishnan, 2025). Their case study in medical research illustrates how AI systems can detect ethical violations and ensure compliance with research standards.

A taxonomy of generative AI applications in education, emphasising the importance of establishing institutional policies that define appropriate AI usage, must be established (Samala, Rawas, Wang, Reed, & Ertz, 2025). They argue that future research must not only evaluate the functionality of AI but also investigate its ethical implications in diverse academic settings. When researchers and institutions fail to engage critically with these dimensions, they risk normalizing practices that compromise academic integrity.

Together, these studies suggest that while AI offers efficiency and innovation, ethical vigilance must guide its adoption. Researchers and institutions must remain proactive in creating frameworks that preserve integrity, accountability, and scholarly excellence.

Materials and Methods

This qualitative study investigated the ethical application of artificial intelligence (AI) tools in academic research among undergraduate students in Sri Lanka. The research aimed to explore students' awareness, attitudes, and practices concerning the responsible use of AI-based applications in academic settings.

The study population comprised forty-four undergraduates from a private Sri Lankan university. From this group, ten participants aged between 23 and 25 years were randomly selected to ensure representation across gender, discipline, and ethnicity, including Sinhala, Tamil, and Muslim backgrounds. This diversity enabled a better understanding of the cultural and educational influences on ethical perspectives related to the use of AI tools.

Data collection employed two instruments: semi-structured interviews and a questionnaire. The semi-structured interviews provided qualitative insights into participants' experiences with tools such as ChatGPT, Grammarly, and citation generators. Each interview lasted approximately 30–40 minutes and was conducted in English, the medium of instruction at the institution. All interviews were recorded with consent and subsequently analysed. The questionnaire gathered supplementary data on students' familiarity with AI tools, frequency of use, and understanding of

institutional ethical guidelines. This mixed-method approach enhanced triangulation and strengthened the validity of findings.

Both instruments were pre-tested with two undergraduates from the same institution to refine question clarity and ensure contextual relevance. Necessary adjustments were made before the main data collection. Participants received detailed information about the study’s purpose, its voluntary nature, and the confidentiality measures in place. Pseudonyms were used to ensure anonymity of the participants.

Interview data were analysed using thematic analysis following Braun and Clarke’s (2006) six-step framework. This process involved coding, identifying themes, and interpreting recurring patterns relating to ethical challenges, responsible use, and institutional accountability in AI-assisted research. Descriptive analysis of questionnaire responses provided complementary evidence of students’ usage patterns and ethical concerns, thereby reinforcing the qualitative insights.

Results and Discussion

The study revealed varied levels of awareness, usage, and ethical concern regarding AI tools in academic research among the 10 participants. All students had prior experience using AI-powered tools, such as ChatGPT, Grammarly, or citation generators like IEEE, Harvard, and APA, during their undergraduate coursework. However, their understanding of the ethical implications differed significantly.

Seven out of ten participants admitted to using AI tools regularly for generating ideas or drafting sections of assignments. Among them, four students acknowledged relying heavily on AI-generated content without verifying accuracy or originality. These students did not express deep concern about authorship attribution, suggesting a lack of exposure to academic integrity guidelines related to the use of AI tools.

Three students demonstrated a strong ethical awareness. They reported using AI tools only for idea generation or proofreading, and ensured that they properly cited

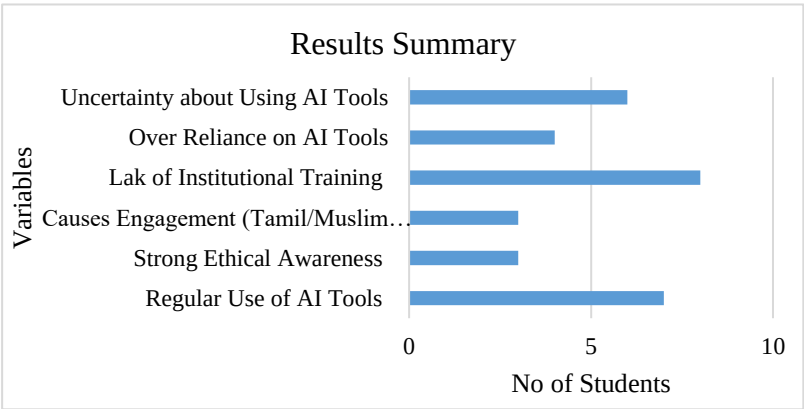


Figure 1

sources and critically reviewed content before submission. These participants emphasised the importance of maintaining academic honesty and expressed concern that AI tools could undermine critical thinking skills if they are overused.

The two Tamil students and the Muslim student in the sample exhibited more cautious engagement with AI, frequently cross-checking AI-generated outputs against external sources. One Tamil student reported that faculty guidance had helped them understand ethical boundaries, while another noted uncertainty about institutional policies regarding the use of AI.

Among Sinhala students, responses varied. Five students openly discussed using AI tools for literature review and assignment writing, but only two expressed concerns about potential ethical violations. The remaining three viewed AI tools as neutral tools and had not considered the implications of data bias, plagiarism, or misrepresentation of authorship.

When asked about institutional support, eight participants reported that they had not received any formal training or clear guidelines from the university regarding the ethics of AI. One student suggested that lecturers themselves appeared uncertain about how to respond to AI-generated content. Only two students reported attending workshops or lectures where ethical concerns related to AI tools were discussed.

The thematic analysis identified three major themes: (1) Uncertainty about ethical boundaries, (2) Over-reliance on AI tools for academic tasks, and (3) Lack of institutional guidance. These themes cut across all ethnic and demographic groups in the sample.

Overall, the results highlighted a gap between the use of AI tools and an understanding of ethics. While students valued the efficiency of AI tools in academic work, many lacked awareness of the ethical standards necessary to guide their responsible use of these tools. The findings suggested an urgent need for targeted ethical education and clear institutional policies regarding the integration of AI tools in higher education.

Findings

The ethical use of AI tools in academic research raises many important issues. *First*, many researchers do not fully comprehend the ethical issues that can arise from the use of AI. This lack of awareness often leads to mistakes or the wrong use of AI tools. *Second*, AI tools usually work with personal or sensitive data. This raises serious concerns about privacy, consent, and the security of information. *Third*, when people use AI tools to help write or produce work, it becomes difficult to determine who the actual author is. This can lead to issues with plagiarism and a loss of trust. *Fourth*, AI tools can exhibit built-in bias due to the data used to train them. This bias can impact the fairness and accuracy of the research. *Ultimately, many universities and research institutions lack clear guidelines on how to use AI tools*

effectively. This leaves researchers unsure about what is right or wrong. Clear policies and training can help solve these problems.

Conclusion

The ethical use of AI tools in academic research demands constant vigilance, clear guidelines, and a strong commitment to integrity. Researchers must prioritise transparency, accountability, and fairness when integrating AI tools into their work processes. Institutions should provide training, establish clear ethical frameworks, and promote the responsible use of AI tools. Failing to fulfil these responsibilities risks compromising academic standards and eroding trust. As AI tools continue to evolve, researchers must engage in critical reflection and make informed, ethical decisions. By addressing current concerns and implementing effective remedies, the academic community can harness the potential of AI tools without sacrificing its core values. Ethical practice must guide every step of integrating AI tools into research.

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Mapping the Literature on Artificial Intelligence (AI) in Higher Education: A Bibliometric Approach

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Introduction

Artificial Intelligence (AI) has become extensive technology in the lives of twenty-first century citizens and is being signify as a tool that can be used to enhance and advance all sectors of our lives (Górriz et al., 2020). According to the Britannica. It is explained that artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. With the rapid development of new AI tools, the use of AI in Higher Education (HE) has increased dramatically over the past five years (Chu et al., 2022). AI tools, which provide a variety of opportunities and functionalities from automated support to personalized learning, are being incorporated into the higher education sector continuously. These tools can assist for students for their higher education with academic writing & research assistance, accessing e-resources, student support services, language learning & accessibility, adaptive learning platforms, and content creation, while also providing educators with resources for lesson planning, feedback, and student engagement. Currently, the growth of AI technology and its applications in education have been increasing, with considerable potential (Zhang and Aslan, 2021). As a widely growing field, conducting a bibliometric analysis on this is essential to understand the scope, growth, and direction of scholarly research in this field. Thus, this paper employs bibliometric analysis to perform a comprehensive mapping of the growing field of AI and higher education as well as to identify current emerging trends and valuable publications and scholars for the field in the different sectors. By identifying the above-mentioned advantages, it helps to map the intellectual structure and highlight research gaps. This is particularly valuable for educators, researchers, and policymakers who seek to make informed decisions about integrating AI into higher education systems.

Keywords: *Artificial Intelligence (AI), Higher education, Bibliometric, OpenAlex, Biblioshiny*

Objectives of the Study

- i). To analyze the publication output and growth of research in AI and higher education sector from 2020-2024.
- ii) To test the fitness of Bradfords's law in this bibliometric study.

- iii) To study the correlation between the h-index of authors and journals.
- iv) To identify the most influential authors, journals, countries, and keywords contributing to AI in higher education.
- v) To provide recommendations for future research related to AI applications in higher education.

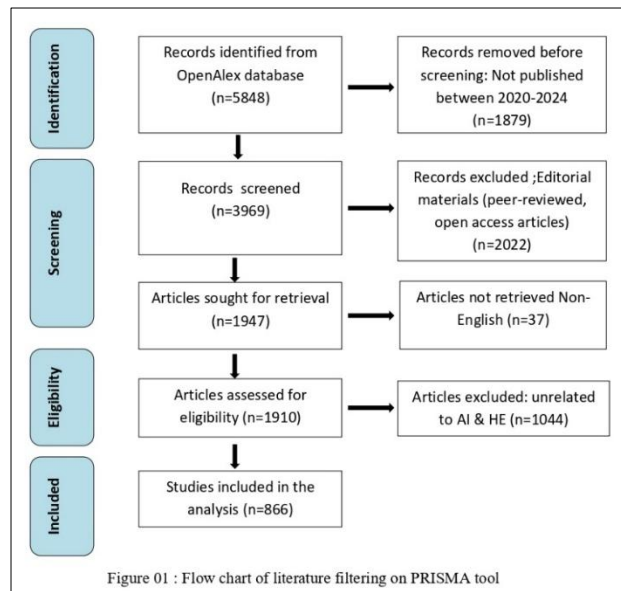


Figure 01: Flow chart of literature filtering on PRISMA tool

The results were filtered to include articles published from 2020 to 2024, leaving 3,969 articles. Then refined the articles by type to include peer-reviewed articles with work in open access. This led to the exclusion of 2,022 articles, leaving 1,947 articles. Articles not written in English were excluded, and this left 1,910 articles. The remaining 1,910 articles were exported to MS Excel for analysis. Publications not related to AI and HE were removed, leaving 866 articles that were analyzed. The 866 articles were downloaded from the OpenAlex database in CSV Excel format. The key bibliographic information was exported to Biblioshiny, a free bibliometric tool that provides automatic interpretations, critical insights, and narrative summaries of bibliometric results within the platform. Quantitative methods were applied to analyze the data and interpret the findings.

Methodology

The primary data for this bibliometric analysis was obtained from the OpenAlex database. OpenAlex database were used to retrieve peer-reviewed articles

on Artificial Intelligence (AI) in Higher Education, published in year 2020–2024. In the context of this paper, OpenAlex was employed in the research and the initial search string involved selecting articles focused on AI and HE. Then restricted to search in titles and abstracts containing ‘Artificial Intelligence OR AI’ AND “Higher education” and found 5,848 articles. To ensure the relevance of the dataset, the following inclusion and exclusion criteria were applied through PRISMA diagram.

Results and Discussion

Annual Scientific Production

Table 01 reveals a clear upward trend in the number of scientific articles published from 2020 to 2024. In 2020, the number of articles was relatively low, with only 32 publications. This figure gradually increased to 46 in 2021 and 67 in 2022, reflecting a steady growth in research activities in AI in higher education during the early years. However, a significant improvement can be observed in 2023, with the number of articles rising up to 265 articles. The upward progress continues in 2024, reaching a peak of 457 articles, which marks a 72.5% increase from 2023. Therefore, the evaluation of publications concerning AI and higher education for the period of

Year	Articles	MeanTCperArt		MeanTCperYear
2020	31	37.6		6.18
2021	46	45.0		9.0
2022	67	43.73		10.93
2023	265	48.70		16.23
2024	457	9.89		4.94

Table 01: Annual Scientific Production

2020-2024 confirms the rising tendency.

The data also show that from 2020 to 2023, both the Mean Total Citations per Article (MeanTCperArt) and the Mean Total Citations per Year (MeanTCperYear) steadily increased, reaching their highest values in 2023 with 48.7 citations and 16.23 citations per year, respectively. However, in 2024, the MeanTCperArt dropped to 9.89 and the MeanTCperYear to 4.94, due to the shorter citation period available for articles published that year.

Most Relevant Sources

According to the figure 02, it illustrates the top 10 academic journals based on the number of documents published in AI in higher education. It reveals that AI in higher education sector is based on education, technology and sustainability, with focusing on AI, psychology, and information sciences. The top source is Sustainability and it leads with 20 articles. Other high-relevance journals are

Computers and education artificial intelligence, Education sciences, Frontiers in Education and these journals indicate a strong focus on educational technology, AI in learning and broader education research.

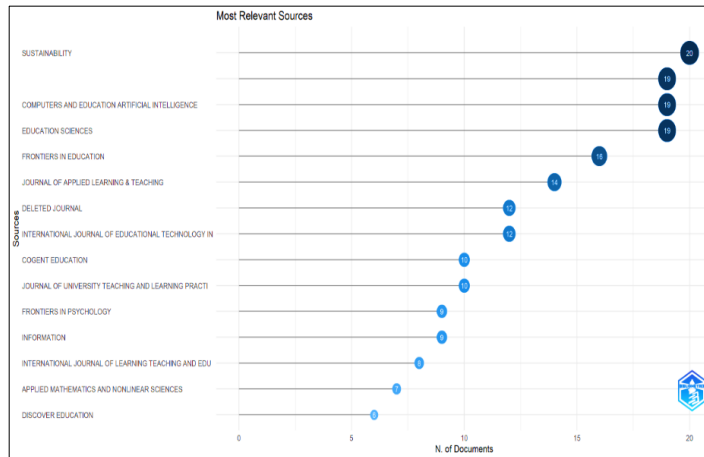


Figure 02 : Most relevant sources

Appropriateness of Bradford's law

Bradford's Law states that journals on a subject can be divided into a core and successive zones of equal article output, following the ratio $1 : n : n^2 \dots$ (Bradford, 1934; Garfield, 1980). Figure 03 illustrates the application of Bradford's Law to AI in higher education, highlighting the distribution of articles across various academic sources. According to Bradford's distribution, the 866 papers on AI in HE should be divided into zones with about 288 papers each. However, the articles are not uniformly distributed across the zones. Instead, each successive zone contains approximately 3.7 times more journals than the previous one to produce a similar number of papers.

Source Impact Analysis

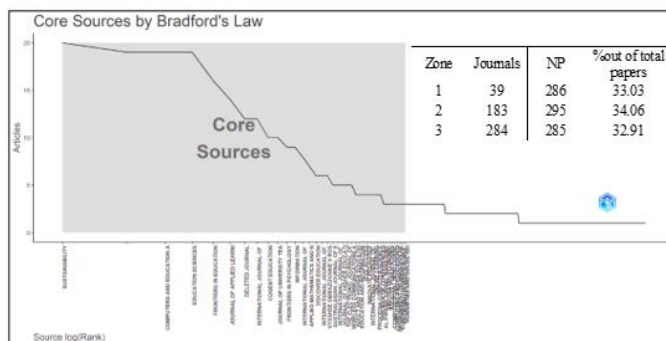


Figure 03: Distribution of research articles and Core sources on the basis of Bradford's law

The source impact analysis identifies journals and publications, which can be stated as the most suitable to the field of AI in higher education by using the measures as h-index, g-index, m-index, total citations (TC), number of published articles (NP) and the year the source started publishing (PY_start) on this topic. Table 02 highlights that among the top 10 journals, Computers and Education, Artificial Intelligence, and Sustainability stand out with notable proportions of citations and achieve the highest h-index of 15.

Source	h_index	g_index	m_index	TC	NP	PY_start
Computers and Education Artificial Intelligence	15	19	3	1555	19	2021
Sustainability	15	20	2.5	1090	20	2020
International Journal of Educational Technology in Higher Education	11	12	1.833	1901	12	2020
Education Sciences	10	19	2	1068	19	2021
Frontiers in Education	9	16	3	439	16	2023
Frontiers in Psychology	8	9	1.6	376	9	2021

Table 02: Source impact analysis

Author Impact Analysis

The author's impact analysis provides insight into the most influential researchers in the field of AI in higher education. Table 03 listed the top 10 prolific authors based on the number of publications engage in AI in higher education field from variety of institutions. Joseph Crawford has published highly cited research articles with h-index 5. Also, most authors began publishing in 2023, showing AI in higher education is in a new and fast-growing field.

Author	h_index	g_index	m_index	TC	NP	PY_start
Joseph Crawford	5	5	1.667	478	5	2023
Jürgen Rudolph	4	5	1.333	1289	5	2023
Michael Cowling	4	5	1.333	467	5	2023
Milena Ilić	4	4	0.8	476	4	2021
Shannon Tan	4	4	1.333	1289	4	2023
Zouhaier Slimi	4	5	1	163	5	2022

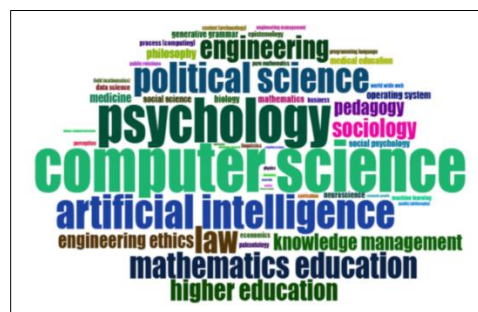
Table 03: Author impact analysis

Country impact analysis, presented in Table 04, shows the top 10 countries with the highest citations.

Country	TC	Average Article Citations
United Kingdom	2725	109.00
United States	1198	42.80
Hong Kong	754	83.80
China	732	13.30
Australia	629	37.00

The United Kingdom, USA, Hong Kong, China, Australia, and Germany rank as the most cited, each with over 500 citations. The most influential country is the United Kingdom, leading with the highest total citations (2725) and the highest average citations per article (109). The United States also ranks high in total citations (1198), but its average citations per article (42.80) are lower than those of the UK and Hong Kong. China ranks fourth in total citations (732), but its average citations per article (13.30) remain comparatively low.

A word cloud was used to display high-frequency terms in text data visually. A total of 866 articles was analyzed based on term frequencies, with results presented through word clouds and tables. Figure 04 shows the word cloud of high-frequency terms, where larger font sizes represent more frequent terms. The most common terms include “computer science,” “artificial intelligence,” “psychology,” “engineering,” “knowledge management,” and “mathematics education.”



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Conclusion

The present study aimed to provide a bibliometric analysis of research trends on the application of AI in higher education using the OpenAlex database. It offers an overview of AI research in higher education, examining the status, trends, and leading contributors, including top countries in this field. A total of 866 articles were initially selected based on defined search criteria, with non-English publications and studies unrelated to AI in higher education excluded. The analysis was conducted using the Biblioshiny tool, covering annual scientific production, sources, authors, countries, and keyword trends from 2020–2024. The results reveal a dramatic increase in publications, underscoring the growing importance of AI in higher education. Developed countries dominate research contributions, while output from developing countries remains limited. Understanding the current status and trends of AI research in higher education is crucial for academics, practitioners, and policymakers. By identifying key contributors and collaboration patterns, this analysis supports the development of policies that foster meaningful engagement with AI in higher education. Overall, the study highlights how AI is reshaping the foundations of higher education and provides insights into its thematic progression within the academic landscape.

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AI Tools in Thesis Writing: Experiences of Master in TESL Students in Sri Lanka

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Abstract

Thesis writing and literature reviews are now supported by a wide range of AI-powered tools which are widely adopted by university students, researchers, and academic professionals to enhance productivity in writing theses. This study explored how Master in TESL students experience using AI tools for their thesis, focusing on its impact on their motivation, the challenges they face, and how it helps them solve problems. This study used a qualitative approach, including 30 graduate students (master level) from a local university who had already completed their Masters thesis. The purposive sampling method was used and the data collection involved in-depth, semi-structured interviews and data was analyzed using thematic analysis. The results conveyed that AI had proven to be beneficial for graduates in the thesis writing process, and it motivated them to complete their academic assignments with practical solutions to many longstanding research challenges. It can be recommended that the future of academic research would relate to AI and institutions need to develop robust frameworks to guide students.

Keywords: *Academic Research, AI, Graduate Students, Literature Review, Thesis Writing*

Introduction

As Artificial Intelligence (AI) continues to transform academic research into this era, one area where it has made significant improvements is in thesis writing and literature review. Thesis writing and literature reviews are now supported by a wide range of AI-powered tools that assist researchers search, summarize, and organize information quickly and accurately which were once a labor-intensive and time-consuming task (Candilas et al., 2024). These tools are widely adopted by university students, researchers, and academic professionals looking to enhance productivity and recreate insights into the scholarly landscape.

AI tools have become a powerful instrument in research and writing, specifically for undergraduate and graduate academic requirements. Among the top tools utilized are grammar checks and plagiarism, among others, in improving academic work standards and quality. In the study of Jordan and Mitchell (2019), it was stated that AI tools revolutionized education by improving and enhancing the efficiency, accuracy, and overall quality of scholarly work done by the students.

Lin & Morrison (2021) emphasized that writing a thesis is difficult because graduate/undergraduate students are required to think critically and have high-quality writing skills in which they need to use analytical skills to prove information they want to present. Prior research which was conducted by Lestari (2020) examined how challenging writing a thesis was seen by students at Muhammadiyah University of Bengkulu, showing that the most challenging aspects of writing were the ability to paraphrase sentences, determining topics, difficulties in determining research methodology, and experiencing thought barriers (Dorado, 2024).

Objective: To explore how Master in TESL students experience using AI tools for their thesis, focusing on its impact on their motivation, the challenges they face, and how it helps them solve problems.

Research Question:

How do Master in TESL students get the influence of AI tools on their motivation, to overcome thesis writing challenges, and their decision-making processes in problem-solving throughout AI-supported thesis writing?

Methodology

This research used a qualitative approach, specifically a qualitative transcendental phenomenological research design because participants shared their experiences using AI in their thesis writing. The participants were 30 graduate students (master level) from a local university specialized in MA in TESL (Teaching English as a Second Language) who have already completed their Masters thesis and had experience in using AI tools. The purposive sampling method was used to select the participants for the study and the data collection involved in-depth, semi-structured interviews. Data was analyzed using thematic analysis after transcribing the audio recorded interviews (30-45 minutes per participant) which were completed with the participants' consent and the audio-recorded interviews were transcribed verbatim. Under the thematic analysis, a systematic process of inductive coding was used to generate initial codes, where themes emerged directly from the data. Data saturation was reached when no novel themes/ insights emerged. The trustworthiness and rigor of the study emerged when the coding process was documented, providing a clear audit trail of how themes were developed from the raw data.

Results and Discussion

After analyzing the data that has been collected, the results were grouped into three themes as follows:

- 1) Improve students' motivation in writing a thesis
- 2) Challenges in AI tools

3) The decision-making to solve problems

Theme 1: AI improved students' motivation in writing a thesis

With the involvement of AI in the thesis writing process, most of the MA in TESL students felt more encouraged to understand their research topics in depth. This increased their sense of accomplishment and encouraged them to continue improving. Some of them reported that through the sense of accomplishment and support provided by AI tools they became motivated:

“I also feel that the use of AI can increase my experience in writing a literature review chapter and the entire thesis and I feel more motivated ...” (Participant 1)

“As my first experience writing a thesis, ... I started involving AI to create background drafts and look for references, I felt more motivated because I saw AI's ability to overcome difficulties that arise while writing a thesis” (Participant 4).

With the emergence of this motivation, students felt the benefits of AI in their abilities as literature review writing. The positive feedback from participants highlighted a key psychological mechanism of *The Reinforcement loop*. This phenomenon, where a positive result (seeing progress) encouraged by further action (continuing to write), was a well-established concept in educational psychology (Fahad Mon et al., 2023). The use of AI effectively created a more frequent and immediate feedback loop, which is the traditional, slower process of academic supervision. Further, students could improve their abilities to think critically, creatively, and analytically. This ability was critical to their progress as thesis writers. Based on these findings, the integration of AI in thesis writing had a positive impact on students' motivation and assisted them to show more interest (Khasawneh et al., 2023) and helped them develop personal abilities as a thesis writer.

Theme 2: Challenges in AI literature tools

Several AI literature tools rely on open-access databases that include preprints and non-peer-reviewed content, and platforms like arXiv and bioRxiv are valuable for accessing the latest research (Yousaf, 2025). As a result, AI tools that pull heavily from these sources could flood literature reviews and thesis with unverified or speculative findings which were also supported with prior research in the international context (Bista & Bista, 2025).

According to the participant data, despite the efficiency of automated summarization, these tools often missed critical nuances, particularly in theoretical, philosophical, or interdisciplinary studies. A summary generated by AI might capture the surface-level findings of a study but fail to represent its methodological limitations, theoretical contributions, or contextual relevance (Candilas et al., 2024). This lack of depth could lead to misinterpretations and oversights in the literature review process based on some experience (Dorado, 2024).

"You get these AI summaries that look great on the surface, but then you dig into the actual paper and realize the AI completely missed a crucial nuance or limitation." (Participant 7)

A large portion of global academic knowledge is published in languages other than English, but these works were often excluded or poorly indexed by English-centric AI tools. This language barrier has limited access to important regional studies and diverse perspectives. and it is not a technical problem but a matter of epistemological bias and knowledge exclusion.

Theme 3: AI assists decision-making to solve problems

It was found that Master in TESL students had problems with grammar and the issues were identified as problematic who participated in this study. On many occasions these students found that they seem confused about the correct use of grammar in their theses:

"I'm not very confident about my grammar skills not because I don't really understand it, but because sometimes I find it difficult to get the idea of using that part of grammar." (Participant 1)

On the other hand, there were students in research who expressed confusion in determining their thesis topics, and as well as have confused plans or ideas on completing them with insufficient and not related information. This confusion arose partly because they felt that every thesis topic they wanted to research had already been researched before and they had hardly any topics to be researched on (Puspita, C., 2021).

Apart from determining the topic, participants also had trouble in paraphrasing sentences or quotations. This was one of the difficulties experienced by students paraphrasing the sentences in theory (Rizwan et al., 2022), so they had to copy-paste the theory without providing a sentence, which could be argued as not an effective result. As a result of that, there were many graduate theses that sometimes were said to be plagiarized (Lestari, 2020), and according to the participant data sets, students tended to plagiarize when they had no information to be found on their own. Students unknowingly use AI-generated text that is not sufficiently transformed from its source material, or they rely on AI to generate ideas without proper attribution. The ethical risks and potential for over-reliance on AI for foundational tasks like paraphrasing must be given sufficient weight.

Conclusion

In conclusion it can be mentioned that AI had proven to be beneficial for graduate Master in TESL graduates in the thesis writing process, as students were significantly more motivated to complete their academic assignments when their thesis was written with AI. Fast and relevant AI feedback not only made students feel

better about their achievements but also encouraged them to continue improving and discovering more about what they were learning. By combining AI with academic rigor, researchers would have the potential to generate theses that are efficient and intellectually robust. The future of academic research lies in a deliberate and ethically grounded partnership between human intellect and AI. Further, institutions can develop robust frameworks that guide students with integrity and intellectual responsibility related to AI usage in scholarships.

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