Interdisciplinary Journal of Virtual Learning in Medical Sciences

Review Article

Breaking Down Walls: A Literature Review on the Power of Artificial Intelligence in Enhancing Universal Language Connection

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ABSTRACT

Background: Effective communication across linguistic and cultural boundaries is essential for global collaboration, yet language barriers continue to impede interactions. Artificial intelligence (AI), particularly through advancements in Natural Language Processing (NLP) and machine translation, offers transformative potential to bridge these gaps and foster universal language connections. This literature review examines the transformative role of AI in enhancing universal language connections through advanced machine translation and natural language processing, fostering inclusive global communication.

Methods: A literature review was conducted using databases such as PubMed, Google Scholar, Scopus, and Web of Science. The search focused on peer-reviewed articles published in English from January 2020 to June 2024, using keywords like 'artificial intelligence,' 'communication,' 'natural language processing,' and 'machine translation.' Studies were selected based on methodological rigor, with data extracted independently by two reviewers and synthesized narratively to identify key themes.

Results: AI-driven technologies, including machine translation and NLP tools, significantly enhance multilingual communication across sectors such as business, healthcare, and education. Applications like multilingual chat platforms demonstrate high translation accuracy and user satisfaction, facilitating cross-cultural interactions. AI also improves professional communication efficiency and supports personalized language learning, promoting intercultural competence. However, challenges such as translation inaccuracies, algorithmic biases, and ethical concerns necessitate continuous improvement and human oversight.

Conclusion: AI is revolutionizing global communication by overcoming linguistic barriers and fostering inclusive interactions. Addressing challenges like accuracy and bias is critical to maximizing its potential. This review highlights AI's transformative impact and provides a foundation for future research and responsible implementation.

Keywords: Artificial Intelligence, Natural Language Processing, Culture, Language, Machine Translation, Communication, Social Networking

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Please cite this paper as:
Jamalnia Sh, Karimian Z. Breaking Down Walls: A Literature Review on the Power of Artificial Intelligence in Enhancing Universal Language Connection. Interdiscip J Virtual Learn Med Sci. 2025;16(2):2-14. doi: 10.30476/ijvlms.2025.107475.1343.

Received: 09-06-2025
Revised: 22-06-2025
Accepted: 23-06-2025

Introduction

In an increasingly interconnected world, the capacity to communicate effectively across linguistic and cultural boundaries has become a cornerstone of global cooperation (1). As societies become more multicultural and international collaboration becomes a norm in academia, business, and governance, the ability to transcend language differences is no longer a luxury but a necessity (2). Effective cross-cultural communication enhances diplomacy, fosters mutual understanding, and enables communities to work together towards shared goals (2, 3). Without such communication, the best-intentioned global efforts may be misread or misconstrued, which can diminish their potential impact (4).

Despite the growing importance of global interconnectedness, language remains a persistent barrier that impedes meaningful interaction across borders (5). Miscommunication due to language differences can hinder social cohesion, obstruct economic transactions, and compromise the effectiveness of global partnerships (5, 6). As globalization continues to accelerate, the convergence of diverse communities and the proliferation of transnational networks underline the urgent need for innovative solutions that address linguistic fragmentation (7). In this landscape, emerging technologies—particularly in the domain of Artificial Intelligence (AI)—are increasingly being looked upon as tools capable of bridging these gaps and facilitating more inclusive global communication (8, 9).

Artificial intelligence, especially through advancements in Natural Language Processing (NLP), has emerged as a powerful force with the potential to transform communication practices across multiple domains (10, 11). In recent years, AI-driven innovations have significantly improved machines' ability to comprehend, translate, and generate human language, enabling more fluid and accurate communication between speakers of different languages (12, 13). From speech recognition to automated subtitling and real-time voice translation, these technologies are reshaping the way individuals interact in multilingual environments and are rapidly becoming integral tools in international business, diplomacy, and media (13, 14).

The impact of NLP extends beyond mere translation; it includes sentiment analysis, emotion detection, text summarization, and even dialogue generation, making AI a versatile instrument for linguistic interaction (13, 15). These tools not only support routine communication but also enable strategic initiatives—such as multicultural marketing, global customer service, and multilingual governance—that rely heavily on clear and adaptive language use (16, 17). By embedding language understanding into digital systems, AI empowers institutions to engage with diverse audiences more effectively, fostering inclusivity and reducing linguistic isolation (18, 19). As these technologies continue to evolve, their capacity to handle increasingly complex and context-sensitive language tasks will be central to their broader societal integration (20, 21).

The application of AI to language technologies spans a wide array of sectors, each benefiting from its unique capabilities (22). In the field of education, AI-driven platforms are revolutionizing language learning by offering personalized and adaptive content tailored to each learner's pace, proficiency level, and preferred learning style (23, 24). These systems leverage data analytics to provide targeted feedback, track progress, and dynamically adjust learning materials, thereby increasing engagement and improving learning outcomes (25). Such platforms have the potential to democratize access to language education, especially in underserved regions where qualified language instructors may be scarce.

In the business domain, AI-powered translation services are streamlining internal and external communications in multinational organizations (26, 27). These systems facilitate real-time, accurate translation of documents, emails, and meetings, reducing delays and misunderstandings in international operations (26, 28). Moreover, they enable businesses to offer localized content and customer support,

enhancing the user experience and increasing brand loyalty across diverse markets (29, 30). In humanitarian and crisis response contexts, AI-based communication tools play a critical role in interpreting and disseminating vital information across language barriers, ensuring that aid reaches multilingual populations swiftly and effectively (31, 32). The breadth of applications highlights AI's versatility in addressing the multifaceted nature of linguistic diversity (18).

Despite the promise of AI in enhancing language connectivity, its implementation is fraught with challenges that must be critically assessed. One of the most pressing concerns is the issue of accuracy; while AI systems have made significant progress, they are not infallible (33). Misinterpretations or contextually incorrect translations can lead to miscommunication, particularly in high-stakes fields such as healthcare, law, or international diplomacy (34, 35). These errors can have serious consequences, underlining the need for rigorous testing, continuous model improvement, and human oversight in sensitive applications (35).

Equally important are the ethical issues related to algorithmic bias and representational fairness (35). AI systems are only as unbiased as the data they are trained on, and linguistic corpora often reflect historical and societal inequalities. As a result, marginalized languages, dialects, and cultural expressions may be underrepresented or misrepresented, perpetuating stereotypes and limiting the inclusivity of AI-driven communication tools (36). Addressing these concerns requires the development of transparent and accountable AI frameworks that prioritize ethical considerations, linguistic diversity, and user equity, ensuring that technological advancement does not come at the cost of fairness and inclusivity (37, 38).

As the influence of AI on global communication continues to expand, it is imperative to examine both the transformative opportunities and the potential risks associated with its integration into language systems (18, 39). This study aims to explore how artificial intelligence—particularly through advancements in natural language processing and machine translation—can enhance universal language connections and foster inclusive global communication, as well as to identify the associated challenges and ethical implications.

Methods

Study Design

To provide a thorough examination of the role of AI in communication, a literature review was conducted utilizing a range of reputable databases. The study focused on identifying and analyzing research that examined the implementation and impact of AI technologies in communication, particularly recent advancements in AI-driven communication tools such as natural language processing and machine translation, which have evolved rapidly during the specified period.

Search Strategy

The literature search employed keywords such as 'artificial intelligence,' 'communication,' 'natural language processing,' 'machine learning,' 'human-computer interaction,' 'chatbots,' and 'AI-driven communication.' Searches were performed across multiple reputable databases including PubMed, Google Scholar, Scopus, and Web of Science to capture a comprehensive set of relevant studies.

Selection Criteria

Inclusion criteria focused on peer-reviewed articles published between January 2020 and June 2024, specifically targeting studies that examined the implementation and impact of AI technologies in communication. Only research published in English was considered, including research articles, review papers, and case studies that provided empirical data or substantial methodological detail. Exclusion criteria eliminated non-peer-reviewed articles such as opinion pieces and editorials, as well as studies lacking sufficient methodological rigor or empirical data, to maintain a high standard of quality in the selected literature.

Data Extraction

Two reviewers separately extracted the data using a standardized form. Key findings, participant characteristics, intervention details (if applicable), study characteristics (e.g., author(s), publication year, and study design), and outcomes measured were among the extracted data. To guarantee accuracy and consistency, any disagreements between reviewers were settled by conversation or by consulting a third reviewer.

Quality Assessment

To uphold the rigor and validity of the review, non-peer-reviewed articles such as opinion pieces, editorials, and commentaries were excluded. Additionally, studies that lacked sufficient methodological rigor or did not provide empirical data were omitted to maintain a high standard of quality in the selected literature. Furthermore, to enhance the methodological quality and transparency of the review process, the SANRA (Scale for the Assessment of Narrative Review Articles) checklist was utilized. This checklist guided the critical appraisal of narrative reviews included in the study, ensuring systematic evaluation of their scientific quality, clarity, and relevance. The use of SANRA contributed to a more rigorous and reliable synthesis of the literature on AI-driven communication. The selection and evaluation of articles were independently conducted by two specialists in the field of e-learning, ensuring expert judgment and minimizing bias in the inclusion process.

Data Synthesis and Analysis

For data synthesis we summarized and integrated findings from the included studies. Key themes and patterns across these studies were identified, and the findings were synthesized to provide a comprehensive assessment of artificial intelligence as the new language of connection. The selection process is illustrated in Figure 1.

Results

The following results synthesize findings from recent studies exploring the role of AI in transforming communication across

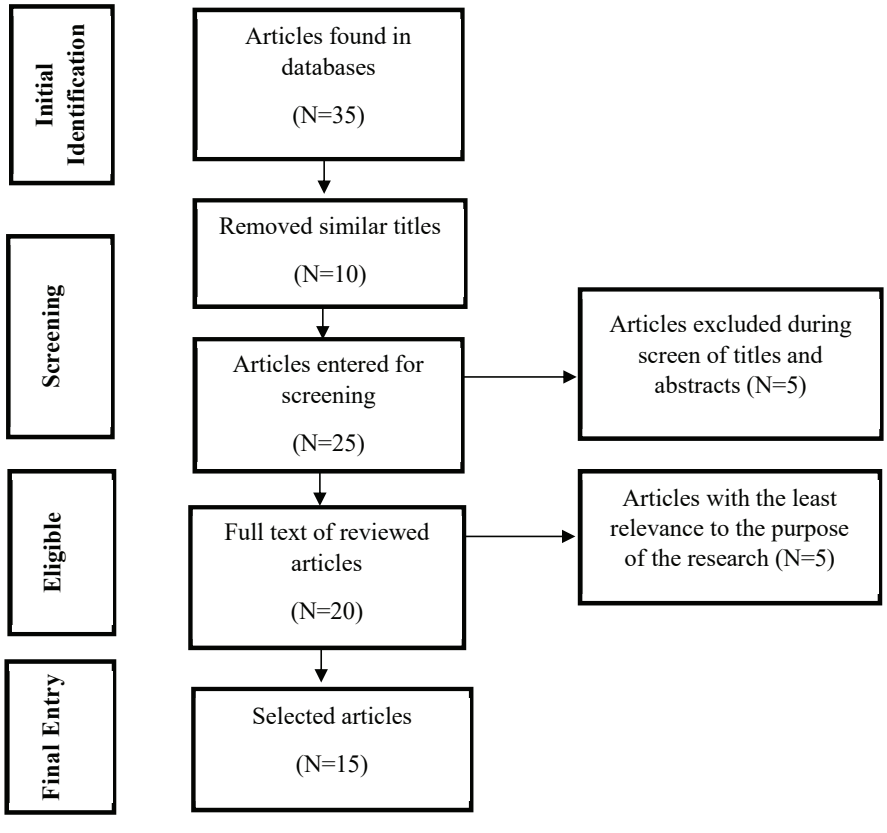

Figure 1: The process of screening articles and reviewing texts

Table 1: Summary of Study Results

Title	Author(s)	Journal	Year	Key Findings
Towards Development of a Multilingual Mobile Chat Application for Enhanced Global Communication	Akputu and colleagues (40)	Teknika	2024	This paper introduces Kobapp, a multilingual chat application designed to enhance communication across languages using technologies like React-Native and Deep Learning Application Programming Interface (DeepL API). A user study showed a strong correlation between user satisfaction and translation accuracy, highlighting the app's commitment to quality and future exploration in multilingual communication.
The Use of Machine Translation for Outreach and Health Communication in Epidemiology and Public Health: Scoping Review	Herrera-Espejel and Rach (41)	JMIR public health	2023	Machine translation plays a pivotal role in overcoming language barriers, fostering effective global communication. The paper highlights its evolution, current capabilities, and potential to enhance diverse communities' interactions.
Revolutionizing communication: overcoming language barriers with ai and NLP	Siddiqua (42)	Journal of Nonlinear Analysis and Optimization	2023	This paper explores how AI and NLP can overcome language barriers in global communication, addressing challenges in sectors like business, diplomacy, and healthcare. It highlights AI-driven tools such as translation, speech recognition, and sentiment analysis to enhance cross-cultural interaction.
Artificial intelligence technologies in college English translation teaching	Wang (43)	Journal of psycholinguistic research	2023	The paper explores the integration of artificial intelligence technologies into professional English-speaking translator education, proposing a pedagogical concept for an online course to develop key competencies in a digital environment.
A Situation Awareness Perspective on Human-AI Interaction: Tensions and Opportunities	Jiang and colleagues (44)	International Journal of Human–Computer Interaction	2023	Human-Centered Artificial Intelligence (HCAI) emphasizes the central role of humans in AI systems, focusing on both the potential of AI to enhance human performance and the design of AI to optimize user experience, mitigating tensions through improved usability and fostering collaboration between humans and intelligent agents within a structured framework like Situation Awareness.
Artificial intelligence in communication impacts language and social relationships	Hohenstei and colleagues (45)	Scientific Reports	2023	The use of AI-powered smart replies in global communication increases the speed of conversations and fosters more positive language and cooperation among people worldwide. However, when users are openly perceived to rely on these algorithmic responses, they face negative judgments that can undermine the potential social benefits of AI in global interactions.

Title	Author(s)	Journal	Year	Key Findings
Breaking down barriers with artificial intelligence (AI): cross-cultural communication in foreign language education	Karakas (46)	In Transforming the Language Teaching Experience in the Age of AI	2023	This article discusses the importance of cross-cultural communication in a globalized world and how AI facilitates language exchanges, offering benefits like personalized feedback and native speaker interaction. It also addresses challenges such as cultural biases and presents case studies of effective AI-facilitated language exchange platforms.
What if artificial intelligence become completely ambient in our daily lives? Exploring future human-AI interaction through high fidelity illustrations	Lee and colleagues (47)	International Journal of Human–Computer Interaction	2023	Based on the insights derived from the online exhibition, the authors explored user-centered considerations for implementing AI in users' daily lives.
Investigating the Impact of Artificial Intelligence AI and Technology in English Language Learning	Kumar (48)	Advances in Social Behavior Research	2023	This article explores how technology has reshaped communication, introducing new norms like abbreviations and emoticons. It discusses globalization's influence on hybrid languages and the role of AI in minimizing language barriers while highlighting challenges in empathy and interpersonal skills posed by social media.
Rethinking communication in the era of artificial intelligence	Sundar and Lee (49)	Human Communication Research	2022	AI's integration into communication creates a fundamental tension between human and machine agency, acting as both communicator and mediator across mass and interpersonal contexts. Understanding and categorizing AI's diverse roles is crucial for advancing research on its complex effects—both positive and negative—on human communication.
Will artificial intelligence replace human customer service? The impact of communication quality and privacy risks on adoption intention	Song and colleagues (50)	Journal of Retailing and Consumer Services	2022	Different types of service agents, including chatbots, significantly influence consumers' intention to adopt them, with perceived communication quality and privacy risks mediating this effect. Additionally, consumers' need for human interaction moderates how they perceive accuracy, communication competence, and privacy risks, highlighting the importance of tailoring human-computer interaction in e-commerce based on user preferences.

Title	Author(s)	Journal	Year	Key Findings
Artificial intelligence-assisted tools for redefining the communication landscape of the scholarly world	Razack and colleagues (51)	science editing	2021	This article discusses the growing impact of AI in scholarly publishing, highlighting its ability to enhance content quality, identify errors, and improve efficiency. It emphasizes the need for writers and publishers to leverage AI tools for effective dissemination of scientific information.
AI-mediated communication: Definition, research agenda, and ethical considerations	Hancock and colleagues (52)	Journal of Computer-Mediated Communication	2020	AI-Mediated Communication is evolving quickly and has the potential to significantly impact various aspects of human interaction, including personal relationships and political decision-making.
Artificial intelligence and communication: A Human–Machine Communication research agenda	Guzman, and colleagues (53)	New media & society	2020	Communicative AI differs from human communication, requiring a new human–machine communication framework.
Artificial intelligence in communication management: a cross-national study on adoption and knowledge, impact, challenges and risks	Zerfass and colleagues (54)	Journal of Communication Management	2020	Communication professionals generally have a limited understanding of AI and anticipate its impact more on the profession overall than on their own roles or organizations. Major challenges include individual skill gaps and organizations facing uneven competency levels and unclear responsibilities in implementing AI.

various domains. By analyzing key themes, the studies have been grouped into four topics that capture AI's impact on multilingual interactions, human-AI collaboration, professional communication, and social and commercial contexts (Table 1).

AI-Driven Multilingual Communication

Findings from related studies indicate that AI significantly enhances global communication by reducing language barriers through advanced machine translation and multilingual platforms. These technologies enable real-time, accurate translation, fostering seamless interactions across diverse linguistic contexts such as business, diplomacy, and healthcare. Studies also reveal a strong link between high translation accuracy and user satisfaction, with these platforms playing a key role in supporting cross-cultural communication. However, the effectiveness of these tools depends on continuous improvements to handle complex linguistic nuances and cultural subtleties, ensuring inclusive and precise communication.

Human-AI Collaboration Dynamics

Studies reveal that AI-mediated communication reshapes user experiences by balancing human and machine roles, though it introduces tensions in agency and social perceptions. Frameworks prioritizing human-centered design improve collaboration and usability, particularly in tasks requiring situational awareness. AI tools, such as smart replies, accelerate communication and promote positive language, but over-reliance can lead to negative social judgments, impacting trust. The rapid evolution of these systems influences personal relationships and decision-making, underscoring the need for new frameworks to address the unique nature of human-machine interactions and ensure effective integration into communication processes.

AI in Professional Communication

Findings demonstrate that AI enhances efficiency and quality in professional communication, particularly in scholarly publishing and communication management. AI tools streamline content creation, error detection, and dissemination, improving the accessibility and rigor of academic and professional outputs. However, adoption faces barriers, including limited understanding among professionals and organizational challenges like unclear responsibilities. These gaps highlight the need for upskilling and strategic frameworks to fully harness AI's potential in optimizing professional communication workflows.

AI's Social and Commercial Influence

Research findings indicate that AI reshapes social and commercial interactions by influencing communication norms and consumer behaviors. In commercial settings, AI-driven service agents improve interaction efficiency, but their adoption hinges on communication quality and privacy considerations, with user preferences for human interaction playing a moderating role. Socially, AI introduces new linguistic norms, such as abbreviations and emoticons, reflecting globalized communication patterns, yet it may diminish empathy in digital exchanges. User-centered design is critical for integrating AI into daily social contexts, ensuring alignment with human needs while addressing privacy and emotional connectivity challenges.

Discussion

The findings from the reviewed studies highlight the transformative role of AI in reshaping communication across diverse domains, particularly in addressing linguistic and cultural barriers. The studies collectively highlight AI's potential to foster seamless global interactions, enhance cross-cultural understanding, and streamline professional communication, while also raising critical considerations regarding ethical challenges and implementation barriers. The evolution of research in this field, from foundational frameworks to practical applications, reflects a maturing understanding of AI's capabilities and limitations in communication.

A prominent theme across the studies is AI's ability to enhance multilingual communication through advanced machine translation and NLP technologies. For instance, Akputu and colleagues (2024) demonstrate the practical application of these technologies through Kobapp, a multilingual chat application that leverages tools like React-Native and Deep Learning Application Programming Interface (DeepL API) to deliver real-time translations with high user satisfaction (40). Similarly, Herrera-Espejel and colleagues (2023) emphasize the pivotal role of machine translation in overcoming language barriers, enabling effective global communication in sectors such as healthcare (41). These findings align with Siddiqua's study (2023), which highlights the versatility of AI-driven tools—including translation, speech recognition, and sentiment analysis—in facilitating cross-cultural interactions (42). The convergence of these studies suggests that AI is not only bridging linguistic divides but also enabling more inclusive communication by accommodating complex linguistic nuances and cultural subtleties. However, as noted in the results, the effectiveness of these tools hinges on continuous improvements to ensure accuracy and cultural sensitivity, particularly in high-stakes contexts where miscommunication could have significant consequences.

The integration of AI into professional communication, as explored by Razack and colleagues (2021), reveals its potential to enhance efficiency and quality in scholarly publishing and communication management (51). AI tools streamline processes such as content creation, error detection, and dissemination, making academic and professional outputs more accessible and rigorous. However, Zerfass and colleagues (2020) points out significant barriers to adoption, including limited understanding among professionals and organizational challenges such as unclear

responsibilities (54). These findings indicate a need for targeted upskilling and strategic frameworks to maximize AI's benefits in professional settings. The contrast between the transformative potential of AI and the practical challenges of its implementation underscores the importance of aligning technological advancements with workforce readiness and organizational structures.

Ethical considerations and human-AI collaboration dynamics emerge as critical areas of focus in the reviewed studies. Jiang and colleagues (2023) advocate for human-centered AI design to enhance usability and collaboration, addressing tensions in agency and social perceptions (44). Similarly, Hohenstein and colleagues (2023) note that while AI-powered tools like smart replies accelerate communication and promote positive language, over-reliance can lead to negative social judgments, impacting trust and interpersonal relationships (45). These findings highlight the delicate balance between leveraging AI's efficiency and preserving human agency in communication. Furthermore, ethical challenges such as algorithmic bias and representational fairness, as discussed in the introduction, remain significant concerns. The reliance of AI systems on training data that may reflect historical inequalities underscores the need for transparent and accountable frameworks to ensure inclusivity and equity in AI-driven communication tools.

The social and commercial implications of AI in communication further illustrate its transformative impact. Song and colleagues (2022) demonstrate that AI-driven service agents enhance interaction efficiency in commercial settings, but their adoption depends on communication quality and privacy considerations (50). User preferences for human interaction also play a moderating role, suggesting that AI systems must be designed with user needs at the forefront. Additionally, Kumar (2023) notes that AI introduces new linguistic norms, such as abbreviations and emoticons, reflecting globalized communication patterns (48). However, this shift may diminish empathy in digital exchanges, highlighting the need for user-centered design to maintain emotional connectivity.

Limitations and Suggestions

This review has several limitations. First, the search was restricted to peer-reviewed articles published in English between January 2020 and June 2024, potentially excluding earlier foundational works and non-English studies that may provide valuable insights into AI-driven communication. Additionally, given the rapid pace of developments in AI, new tools and research are continually emerging beyond the review's timeframe, potentially impacting the relevance and thoroughness of this synthesis. Future research should adopt a broader temporal and linguistic scope to capture the long-term evolution of AI in communication. Furthermore, interdisciplinary approaches that integrate technological, ethical, and socio-cultural perspectives will be critical to ensuring that AI-driven communication tools are not only efficient but also socially responsible and responsive to diverse global contexts.

Conclusion

This literature review highlights AI's transformative role in overcoming linguistic and cultural barriers through natural language processing and machine translation, enabling seamless global communication in sectors like business, healthcare, and education. AI-driven tools, such as multilingual platforms and personalized language learning systems, enhance efficiency, inclusivity, and intercultural competence, yet challenges like translation inaccuracies, algorithmic biases, and adoption barriers persist. Future efforts must focus on refining AI to handle linguistic nuances, developing ethical frameworks to address bias, and upskilling professionals to ensure equitable and effective integration, positioning AI as a catalyst for a more connected and inclusive global communication landscape.

Abbreviations

AI: Artificial Intelligence
DeepL API: Deep Learning Application Programming Interface
HCAI: Human-Centered Artificial Intelligence
NLP: Natural Language Processing

Acknowledgements

Not applicable.

Author's contribution

Sh.J led the writing of the main manuscript, carried out the literature review, and contributed to the evaluation section of the article. Z.K helped with writing and editing the manuscript, as well as assessing the articles. All authors reviewed and approved the final version of the manuscript.

Conflict of Interest

The authors declare that they have no competing interests. Zahra Karimian, as a member of the Editorial Board, was not involved at any stage in managing this manuscript. The Editorial Board has brought together independent experts to assess this paper without her awareness.

Ethical Considerations

This research was carried out following the guidelines set forth by the Vice-Chancellor for Research at Shiraz University of Medical Sciences. The search for critical reviews of previous studies was conducted with impartiality and without bias. Additionally, the intellectual property rights of individuals were duly respected.

Funding/Support

This research received no specific grant from any funding agency or university.

Availability of data and materials

All the data are openly available in public domains.

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