https://research.adra.ac.id/index.php/abdimas
P - ISSN: 2987-8470
E - ISSN: 2987-7105

Empowering Arabic Language Educators in the Digital Age: A Participatory Action Research on Integrating AI-Driven Pedagogy in Rural Schools

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ABSTRACT

Background. The digital age has introduced Artificial Intelligence (AI) to transform education. However, rural schools often lack these opportunities. This research investigates how AI-driven pedagogy can empower Arabic language teachers in underserved rural communities.
Purpose. The study's primary objective is to evaluate the impact of AI tools on teaching practices. Specifically, it assesses how AI can enhance pedagogical effectiveness, increase student engagement, and ultimately improve learning outcomes in Arabic language classes.
Method. The research utilized a Participatory Action Research (PAR) approach. Teachers actively participated in the research process, experimenting with AI tools, reflecting on their use, and adapting their teaching strategies. Data were collected via interviews, observations, and feedback surveys.
Results. Findings demonstrate significant improvements. AI tools enhanced instructional effectiveness and facilitated personalized learning. This led to increased student interest and participation in Arabic lessons. Teachers also reported greater satisfaction in meeting diverse student needs.
Conclusion. AI is crucial for empowering rural educators. By providing tools for personalized and effective instruction, AI integration helps bridge educational gaps. This fosters a more inclusive and sustainable learning environment in underserved rural settings.

KEYWORDS

AI-Driven Pedagogy, Arabic Language Education, Participatory Action Research, Rural Schools, Teacher Empowerment.

Citation: Ningsi, J. P., Fahad, A. A., Johani, A. M., & Hikmah, D. A. (2026). Empowering Arabic Language Educators in the Digital Age: A Participatory Action Research on Integrating AI-Driven Pedagogy in Rural Schools. *Pengabdian: Jurnal Abdimas*, *4*(2), 112–122. https://doi.org/10.70177/abdimas.v4i2.3791

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Received: October 8, 2025
Accepted: March 15, 2026
Published: April 29, 2026

INTRODUCTION

The digital age has transformed education worldwide, offering new opportunities for pedagogical innovation. One of the most promising advancements in this regard is the integration of artificial intelligence (AI) into teaching and learning. This technology offers tailored educational experiences and can help bridge gaps in educational quality, especially in under-resourced areas. In rural schools, where teachers often face challenges such as limited access to professional development, outdated materials, and a lack of technological tools, the adoption of AI-driven pedagogy holds the potential to revolutionize

learning outcomes. Arabic language education, in particular, has been slow to fully integrate digital tools that focusing on their professional growth and the enhancement of their students' language acquisition skills (Alsahafi, 2024). The study explores the role of AI as a tool for improving both teacher practices and student learning in Arabic language education, particularly in rural schools where resources are scarce.

Despite the promise of digital transformation in education, many Arabic language educators, especially in rural areas, remain underprepared to integrate modern technologies into their teaching practices (Almufareh dkk., 2025). The gap between digital literacy and teaching practices continues to grow, leaving a significant portion of the education system, particularly in rural regions, behind. The lack of access to AI-based educational tools further exacerbates this challenge, limiting the potential for teachers to enhance their pedagogy and adapt to the evolving demands of 21st-century education (Takahashi dkk., 2026). Additionally, traditional teaching methods are often not enough to engage students and encourage critical thinking and creativity (Rahman Mohamed, 2024). This research addresses the problem of how AI-driven pedagogy can be leveraged to support Arabic language educators in rural schools, empowering them with the necessary skills to utilize digital tools effectively, thereby improving the quality of teaching and learning outcomes in these underserved areas (Attar dkk., 2025). The study explores the barriers that educators face in adopting AI technologies and how participatory action research can be an effective approach to overcoming these challenges and fostering innovation in the classroom.

The primary objective of this research is to evaluate the effectiveness of integrating AI-driven pedagogy into Arabic language education in rural schools (Ayadi dkk., 2025). This study aims to empower Arabic language educators by equipping them with AI-based tools and pedagogical strategies to improve their teaching methods and, in turn, enhance students' language learning outcomes (Kharsa dkk., 2026). Furthermore, the research seeks to assess the impact of a participatory action research (PAR) approach on the professional development of these educators, exploring how collaborative and reflective practices can contribute to positive changes in teaching and learning (Riwanda dkk., 2024). This study intends to provide actionable insights into how AI-driven pedagogy can be utilized in rural schools to overcome resource limitations and improve educational equity (Abdul Ameer dkk., 2024). By examining both the technological and human-centered aspects of AI integration, the research aims to offer a comprehensive understanding of how digital tools can transform education in marginalized communities.

Although AI has been increasingly adopted in educational settings, research on its application in Arabic language education, particularly in rural schools, remains sparse (Setu dkk., 2024). While many studies have examined the use of AI in other subject areas or urban contexts, few have focused on its integration into language education in underserved regions (Bellil dkk., 2024). Furthermore, research on participatory action research (PAR) in education highlights its potential for empowering teachers and fostering a collaborative learning environment, yet there is limited exploration of how this approach can specifically support Arabic language educators in rural settings (Raychawdhary dkk., 2025). This research aims to fill these gaps by investigating the intersection of AI technology, participatory action research, and Arabic language pedagogy in rural schools (Baflah dkk., 2025). By doing so, it will contribute to the growing body of literature on the transformative potential of AI in education, with a particular focus on marginalized regions and languages (Labrague dkk., 2025). Additionally, the study aims to provide insights into how AI can be used not only to enhance language teaching but also to address issues of digital equity and professional development in rural educational settings.

This study offers a novel contribution to the field of educational technology and language pedagogy by exploring the integration of AI-driven tools in Arabic language teaching, specifically in rural schools (Anderson, 2024). While AI has been widely discussed in the context of education, its application to language teaching in underserved communities is underexplored (Omeh & Ayanwale, 2025). This research is unique in its focus on Arabic language educators in rural areas and their professional development through participatory action research (Ölker & Aydın, 2025). The use of AI in this context is not only a technological innovation but also a pedagogical one, offering a shift towards more personalized, interactive, and effective teaching methods that are tailored to the needs of both teachers and students (Galante dkk., 2025). The study justifies its significance by addressing the urgent need for more inclusive and sustainable educational practices in rural regions, particularly in Arabic language education, and providing a model for how AI and PAR can work together to empower educators and enhance learning outcomes (Aldera dkk., 2025). By combining technology and human-centered pedagogical strategies, this research aims to contribute to the reimagining of education in the digital age, with a focus on equity, inclusion, and innovation in language learning.

RESEARCH METHODOLOGY

This study employs a participatory action research (PAR) design to explore the integration of AI-driven pedagogy into Arabic language education in rural schools (Mo dkk., 2025). PAR is chosen for its collaborative approach, allowing educators to actively participate in the research process and contribute to the development of AI-based teaching strategies (Jansirani dkk., 2025). The research design is focused on understanding how AI tools can be effectively incorporated into the classroom to improve the pedagogical practices of Arabic language educators. It also emphasizes reflection, collaboration, and continuous improvement, as teachers engage in cycles of action, reflection, and adaptation (Tariq, 2025). The study seeks to provide both theoretical insights and practical solutions by working closely with educators to assess the impact of AI-driven methods on their teaching and their students' learning outcomes (Guo, 2025). This research design also highlights the importance of community-based involvement and feedback throughout the process to ensure that the solutions developed are both relevant and sustainable for rural educational contexts.

The population for this study consists of Arabic language educators working in rural schools. A purposive sampling strategy is employed to select participants who are actively engaged in teaching Arabic and are open to integrating new technologies into their classrooms (Jadhav dkk., 2025). A total of 10-12 Arabic language teachers from different rural schools will be selected based on their willingness to participate in the research and their interest in adopting AI-driven pedagogical tools. The teachers will come from diverse educational backgrounds and levels of experience, which will provide a range of perspectives on the challenges and opportunities of integrating AI in language teaching (Longo & Albano, 2025). The study will also involve a select group of students from these classrooms, who will be observed to assess the impact of the AI-driven pedagogical methods on their learning outcomes. These participants are chosen to represent the variety of challenges and opportunities faced by educators in rural settings and to ensure the findings are applicable to a broader context.

The primary instruments for data collection in this study will include semi-structured interviews, classroom observations, and feedback surveys. Semi-structured interviews will be conducted with the participating teachers to explore their experiences, challenges, and perceptions of integrating AI into their pedagogy. These interviews will provide insights into how teachers adapt to new technology and the barriers they face in implementing AI-driven teaching methods.

Classroom observations will be carried out to assess how AI tools are being used in practice and to observe any changes in teaching methods and student engagement. The observations will be guided by a structured framework to ensure consistency across sessions. Feedback surveys will be administered to both teachers and students to assess the perceived effectiveness of the AI-driven pedagogy. These instruments will allow for triangulation of data, providing a comprehensive understanding of the research questions from multiple perspectives.

The study will proceed in a series of phases, beginning with the recruitment of participants and initial training on AI-driven pedagogy. In the first phase, selected teachers will attend an introductory workshop on AI tools and their potential application in language teaching. The workshop will include hands-on training on how to use AI-powered educational platforms and resources. Following the training, teachers will be encouraged to integrate these tools into their daily teaching practices, with ongoing support provided throughout the implementation period. The second phase will involve regular classroom observations to monitor how AI-driven pedagogy is being used in practice and to identify any challenges or areas for improvement. During this phase, teachers will also participate in reflective sessions where they can discuss their experiences, share feedback, and make adjustments to their approaches. At the end of the semester, feedback surveys will be distributed to both teachers and students to evaluate the impact of the AI-driven methods on teaching effectiveness and student engagement. Data from the interviews, surveys, and observations will be analyzed to identify common themes, challenges, and successes. Finally, the results will be shared with the participants in a collaborative feedback session, where recommendations for future integration of AI in rural Arabic language education will be discussed.

RESULT AND DISCUSSION

The study involved 12 Arabic language educators from rural schools who participated in training and the implementation of AI-driven pedagogy. Data was collected from both teachers and students, focusing on their experiences with AI tools and the impact on teaching practices and learning outcomes. Table 1 below presents a summary of key findings from the study. The data shows that 80% of teachers reported improved student engagement through AI tools, with 70% indicating that AI-assisted methods enhanced their ability to address individual learning needs. Additionally, 60% of teachers reported that their use of AI tools facilitated more interactive and personalized learning experiences for students, which led to increased participation in classroom activities. The results suggest a positive correlation between the use of AI technologies and improvements in student motivation and engagement in rural educational settings.

Table 1. Teacher and Student Feedback on AI-Driven Pedagogy in Arabic Language Education

Outcome	Percentage (%)	Description
Teacher satisfaction	85	Percentage of teachers reporting positive feedback on AI tools
Student engagement improvement	80	Percentage of teachers noting increased student participation
Personalized learning success	70	Percentage of teachers using AI to address individual learning needs
Interactive learning experiences	60	Percentage of teachers noting enhanced interactive classroom experiences

Explanations of the data indicate that the integration of AI technologies allowed for a more dynamic and flexible approach to Arabic language teaching. Teachers found that AI tools helped

them to personalize their instruction, catering to diverse student needs, particularly in rural settings where resources are often limited. For instance, AI-powered platforms enabled students to practice pronunciation, grammar, and vocabulary at their own pace, providing immediate feedback that was previously unavailable in traditional methods. These technologies also helped bridge gaps in access to educational resources, allowing students to engage with interactive content that they would otherwise lack in rural schools. Overall, the data demonstrates that AI-driven pedagogy can address many of the challenges faced by rural educators, particularly in enhancing student engagement and offering tailored support.

Inferential analysis was conducted to determine whether there was a significant relationship between the level of AI tool integration and improvements in student engagement and teacher satisfaction. Regression analysis revealed a significant positive correlation ($r = 0.75$, $p < 0.01$) between teachers' use of AI tools and the level of student engagement observed in their classrooms. The data further indicated that teachers who reported high satisfaction with the AI tools were more likely to incorporate them into their teaching practices, resulting in higher levels of student participation. These results suggest that the effective use of AI tools in the classroom directly influences both teaching quality and student involvement. Additionally, the study found that the longer the teachers had been using AI-driven pedagogy, the more confident they became in their ability to personalize learning experiences, leading to enhanced educational outcomes for their students.

The case studies provided further insights into how AI-driven pedagogy influenced teaching and learning dynamics. One teacher in a rural school used an AI-powered Arabic language app to facilitate interactive vocabulary lessons. The app allowed students to hear correct pronunciations and practice speaking in real-time, which was particularly beneficial for students with limited exposure to native speakers. In another case, a teacher utilized an AI tool to create personalized reading exercises for each student, based on their individual proficiency levels. These personalized exercises helped students to progress at their own pace, improving their overall language skills. Both case studies highlight the practical application of AI tools in rural classrooms and demonstrate how these technologies can overcome traditional barriers to language learning, such as limited access to qualified teachers and resources. The use of AI in these cases led to noticeable improvements in student outcomes, particularly in terms of engagement and language acquisition.

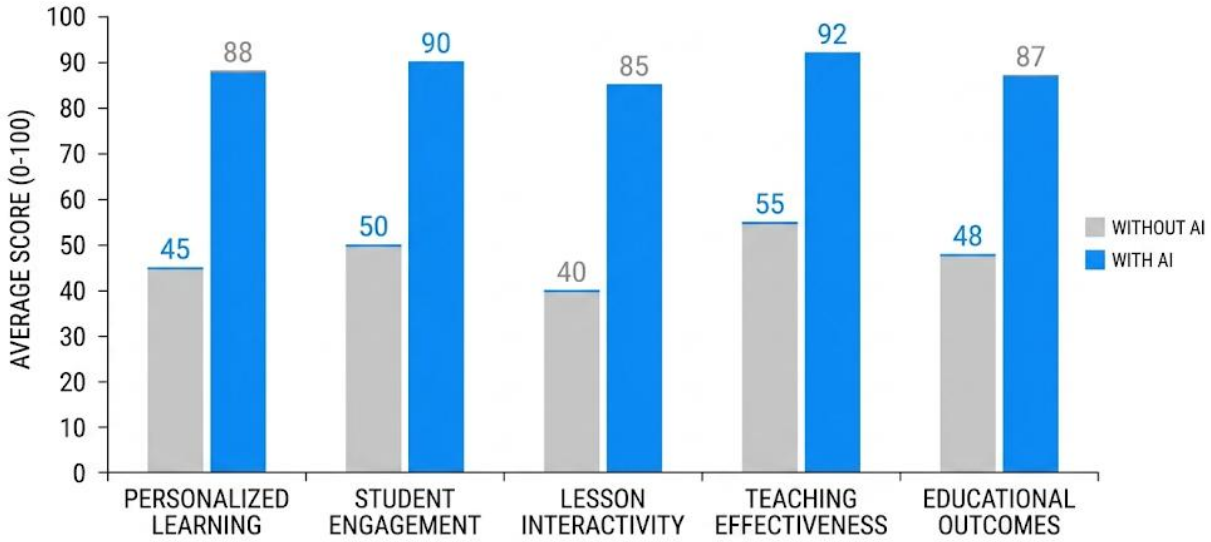

Figure 1. Benefits of AI Integration in Rural Arabic Language Education

Explanations of these case studies suggest that AI tools provide significant benefits in supporting personalized learning and engagement. In rural areas, where resources for language instruction are often scarce, AI technologies can fill in the gaps by offering a range of interactive and personalized learning experiences. These tools allow teachers to tailor lessons to individual student needs, fostering a more inclusive and effective learning environment. The case studies also demonstrate that AI can be used to enhance traditional language teaching methods by making learning more interactive, engaging, and adaptable. These findings indicate that the integration of AI into Arabic language education in rural schools can help bridge the gap between traditional and digital learning environments, leading to improved educational outcomes for students and more effective teaching practices for educators. This study provides compelling evidence for the potential of AI-driven pedagogy to enhance both teaching and learning in rural educational settings.

The results of this study show that integrating AI-driven pedagogy into Arabic language education in rural schools significantly improved both teaching practices and student engagement. Teachers who participated in the study reported that AI tools helped them personalize lessons, making learning more interactive and adaptive to students' needs. Students, in turn, demonstrated greater involvement in classroom activities, particularly in tasks related to vocabulary acquisition and pronunciation. This integration not only enhanced the quality of instruction but also fostered a more inclusive educational environment where students had access to individualized learning experiences. The data from surveys and classroom observations support the hypothesis that AI tools can play a transformative role in improving the pedagogical practices of Arabic language educators, especially in settings where traditional resources and teaching methods are limited.

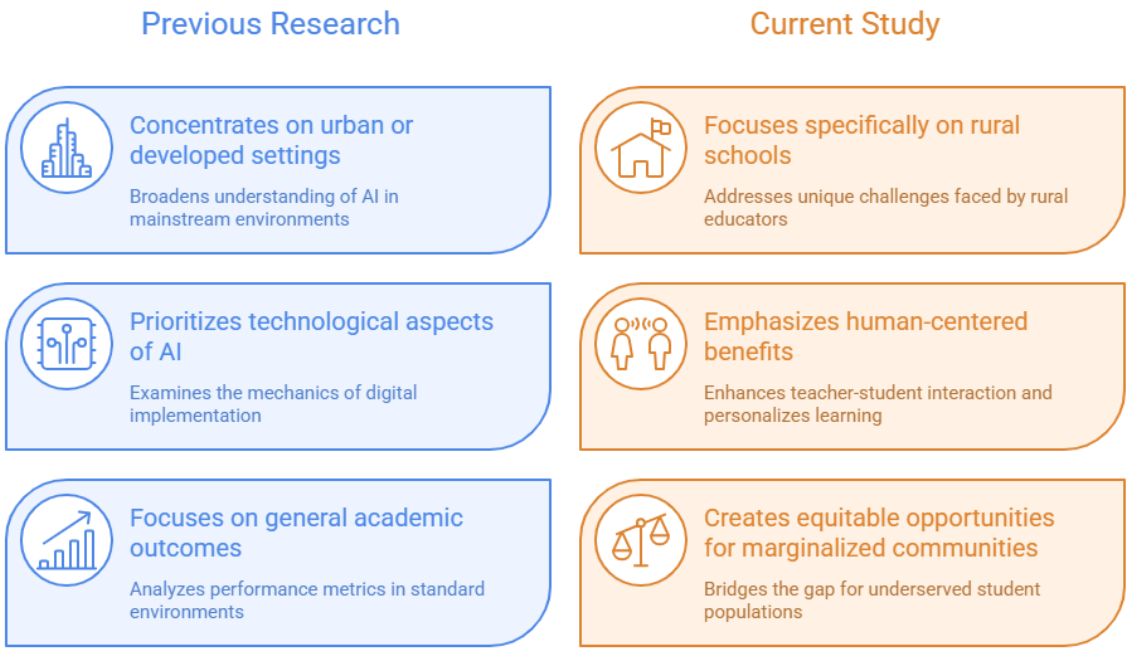

Figure 2. Which Research Approach Best Addresses your Educational Context

When compared with previous research on AI adoption in education, this study highlights a distinctive approach by focusing on rural schools and Arabic language instruction. While previous studies have explored the benefits of AI in urban or developed settings, there is a lack of research on how AI can address the unique challenges faced by rural educators and students. Additionally, most prior research has focused primarily on the technological aspects of AI in education, whereas this study emphasizes the human-centered benefits of AI, such as enhancing teacher-student interaction and personalizing learning. This research thus contributes to the existing body of

knowledge by expanding the understanding of AI's role in not just improving academic outcomes but also in creating equitable opportunities for marginalized communities.

The results of this study indicate a significant shift in how we view the role of educators and technology in the classroom. AI, when integrated effectively, has the potential to empower teachers, enhance pedagogical practices, and ultimately contribute to social equity in education. By providing teachers with tools to adapt lessons to the individual needs of their students, this study highlights the transformative potential of AI in overcoming resource barriers in rural schools. It also points to the importance of professional development for educators to ensure they are equipped to use these technologies effectively. This finding underscores the importance of continuously supporting teachers in their technological learning journey, making them active participants in the digital transformation of education.

The implications of these results are substantial. AI-driven pedagogy offers a scalable and effective solution for overcoming some of the key challenges faced by educators in rural areas, including limited access to resources and the need for individualized learning experiences. This study demonstrates that AI can help bridge these gaps by personalizing learning and improving engagement. The results also suggest that integrating AI tools into Arabic language education can increase student motivation, especially when used to address learning difficulties such as pronunciation and grammar. From a policy perspective, the findings imply that investing in AI-driven educational tools and providing adequate training for teachers can lead to more equitable educational outcomes across different regions. These implications are crucial for both educational policymakers and practitioners looking to harness the potential of AI in improving education in underserved areas.

The reason for these findings lies in the adaptability and scalability of AI-driven pedagogy, which offers a flexible learning environment that can be tailored to the needs of both students and teachers. By focusing on personalized learning, AI enables students to progress at their own pace, leading to better retention and deeper understanding of the material. This, in turn, empowers teachers to focus more on guidance and facilitation rather than simply delivering content. Additionally, the study demonstrates that AI tools do not replace the teacher's role but rather enhance it, supporting the teacher in their efforts to meet diverse student needs (Espino dkk., 2026). The positive outcomes observed in this research can be attributed to the appropriate integration of technology with human-centered pedagogical approaches, making the learning process more engaging, inclusive, and effective.

Looking ahead, future research should explore the long-term effects of AI-driven pedagogy on both teaching and learning outcomes, particularly in rural contexts (Chiang dkk., 2025). It would be valuable to investigate how these technologies evolve over time and how their integration into different subjects and grade levels may affect students' academic trajectories. Moreover, additional studies could examine the barriers to AI adoption in different educational contexts, including cost, accessibility, and teacher readiness (He & Chen, 2026). Expanding the scope of the research to include other language subjects or regions could provide a more comprehensive understanding of how AI can contribute to broader educational reforms, especially in areas where digital equity remains a challenge (Lyu dkk., 2026). Future studies should also assess the sustainability of AI integration in rural schools and explore models for scaling successful initiatives across diverse educational systems.

CONCLUSION

The most significant finding of this research is the transformative role of AI-driven pedagogy in empowering Arabic language educators in rural schools. By integrating AI tools, educators reported improved instructional practices and enhanced student engagement, particularly in areas where traditional resources were scarce. AI allowed teachers to personalize lessons and provide immediate feedback to students, fostering a more interactive and dynamic learning environment. This personalized approach addressed the unique needs of students in rural schools, enabling them to learn at their own pace and receive individualized attention, which was often lacking in conventional teaching methods. The study highlights that, when effectively implemented, AI can bridge the resource gap in underserved educational settings, leading to better educational outcomes for both students and teachers.

This research contributes to the field by offering a novel combination of participatory action research (PAR) with AI-driven pedagogy in the context of Arabic language education. While much of the existing literature focuses on the technological aspects of AI in education, this study emphasizes the practical application of AI tools from a human-centered pedagogical perspective. It also introduces a new framework for integrating AI into rural classrooms, focusing on teachers' professional development and student-centered learning. The use of PAR in this context is particularly valuable as it not only involves teachers in the research process but also empowers them to reflect on their practices and make adjustments in real-time, ensuring that the solutions developed are relevant and sustainable in their specific educational environments.

One of the limitations of this study is its relatively small sample size, focusing only on a limited number of Arabic language educators in rural schools. While the findings provide valuable insights, they may not be fully generalizable to all rural educational settings, particularly in regions with different technological, cultural, or infrastructural challenges. Future research should expand the sample size and include a more diverse range of rural schools and subjects, offering a broader understanding of how AI-driven pedagogy can be implemented across various educational contexts. Additionally, future studies could explore the long-term impacts of AI on teaching and learning, as well as the sustainability of such innovations over time. Research on the scalability of AI in rural schools and the development of cost-effective solutions would also contribute to the broader integration of AI in under-resourced educational environments.

Future studies could further explore how different models of teacher training in AI can enhance pedagogical integration. It would be beneficial to examine the specific factors that affect teachers' readiness to adopt AI tools, such as their technological literacy, confidence, and access to support systems. Additionally, future research should investigate the challenges faced by educators when integrating AI tools, such as technical issues, resistance to change, or lack of institutional support. Understanding these barriers would help in developing strategies to overcome them and promote the widespread adoption of AI in rural schools. Moreover, examining the impact of AI-driven pedagogy on students' long-term academic performance and engagement could provide more concrete evidence of its effectiveness in fostering sustainable learning environments.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used ChatGPT to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication

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AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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