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ICT ADOPTIVE BEHAVIOUR AMONG SECONDARY LEVEL STUDENTS AND ITS IMPACT ON THEIR ACADEMIC PERFORMANCE

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Abstract

This study examined ICT adoption behaviour among secondary-level students and its impact on their academic performance. In the present study, the investigator used the ex post facto research method, whereas the stratified random sampling method was used to select 600 secondary-level students of secondary level from Kanpur city, 300 of whom were male and 300 of whom were female. A five-point rating scale consisting of 25 items was constructed to obtain the ICT adoption behaviour of senior secondary level students. In the present study, percentage, mean, standard deviation, quartile deviation, ANOVA and post hoc test (post t-test) were employed for analysis of data. The findings indicated that a significant percentage of the sampled students (both male and female) exhibited an average level of ICT adoptive behaviour, and no significant difference was observed between male and female students in relation to their ICT adoptive behaviour. Further, it is also found that those students have high level of ICT adoptive behaviour possessed higher grades as compared to the grades of those students having a low level of ICT adoptive behaviour. Thus, it is concluded that the students of secondary level exhibited a moderate level of ICT adoptive behaviour, and the impact of ICT adoptive behaviour of the students was found to be significant on their academic performance. It is recommended that teachers and parents should provide the opportunities to the students for adopting the ICT in daily life.

Key words: ICT adoptive behaviour, academic performance and secondary level students

Introduction

Education is seen as the main, fundamental basis for all human endeavours in this era of globalisation and technological growth. The curriculum has been developed to expand students' horizons and make sure they are aware of their career opportunities, guided by the National Policy on ICT for school education (MHRD, 2012). Human society has transitioned from the information

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technology age to the knowledge era due to the rapid and widespread development of information and communication technologies (Kozma, 2003).

According to Venezky and Davis (2002), ICT includes all tools, equipment, material, assets, services, and forums that may be converted to digital formats and used to accomplish educational goals, increase resource accessibility, foster skill development, and efficiently manage the educational system. In addition to computer hardware and software, this will also include interactive digital content, television and radio programming, online material archives, collaborative discussion platforms, systems for managing learning, and information management systems. ICTs are commonly acknowledged as modern resources that enable teachers to modify their methods in order to improve student involvement (Mumtaz, 2000). Human society depends on communication and information, and the 21st century has made the incorporation of ICT into daily life inevitable (Hargreaves, 2003).

The development and expansion of ICTs have revolutionised teaching and learning methodologies. Recognising its importance, the MHRD (Ministry of Human Resource Development) considers ICT a key tool for the future of school and higher education in India (MHRD, 2012). Globally, ICT has become a major catalyst for innovation, enhancing efficiency and progress across various industries (Kozma, 2003). Within the education sector, ICT plays a crucial role in enriching learning experiences both inside and outside the classroom. Teachers can leverage ICT to modify pedagogical approaches, ultimately improving academic performance (Mumtaz, 2000; Higgins, 2003). Research indicates that secondary students who adopt adaptive ICT behaviours, such as self-regulated learning through digital platforms, tend to perform better on standardised assessments (Voogt & Pelgrum, 2005; Law, Pelgrum, & Plomp, 2008).

Literature Review

Kumar, Ashok (2021) examined the influence of ICT on students' academic performance at the secondary school level. A group of thirty secondary-level students took part in the study. The research discovered a notable impact of ICT on students' academic performance. Ultimately, the research indicates that appropriate actions must be implemented by policymakers, administrators, and educators at various educational institutions to encourage the use of ICT for academic objectives.

Debarun Chakraborty et al. (2018) examined the "Applicability of ICT in uplifting the Higher education system in India" and determined that ICT has a substantial impact on higher education in the country. India is currently making efforts to strengthen ICT integration within its higher education framework. The study examined the effective implementation of ICT by evaluating factors such as accessibility, usage, understanding, and cost.

Wael Sh. Basri et al. (2018) explored how the adoption of ICT influenced students' academic performance. Their research highlighted that integrating information technology into education significantly enhances students' learning outcomes. The findings suggest that even in a more

traditional or conservative academic environment, the use of ICT positively impacts students' academic success by improving access to resources, engagement, and overall learning experiences. Nzwili. K. Mwendwa (2009) investigated on the availability of resources and ICT Integration in schools and concluded that despite the potential for technology to enhance education, inadequate infrastructure and resource constraints hindered its implementation in primary schools.

Mohd.T. Al-Hariri and Abdulghani (2017) researched the effect of students' technology usage on their academic accomplishments. The results indicated that a blend of smart devices, such as laptops and mobiles, with instant access to the University's e-facility is essential for classroom learning.

Objectives of the Study

1. To study the ICT adoption behaviour of male and female secondary level students.
2. To study the impact of ICT adoption behaviour of secondary level students on their academic performance.

Hypotheses of the Study

1. There is no significant difference between the ICT adoption behaviour of male and female secondary level students.
2. There is no significant impact of ICT adoption behaviour of secondary level students on their academic performance.

Research Method

In alignment with the study's aim and objectives, the researcher adopted a descriptive research method, specifically the ex-post facto method. This design was deemed appropriate as the study sought to examine the existing levels of ICT adoption behaviour among secondary level students and to assess its impact on their academic performance without any direct manipulation of the independent variable. The ex-post facto approach allowed the investigator to retrospectively analyse the naturally occurring variations in ICT adoptive behaviour and their consequent effects on academic outcomes, thereby establishing a logical association between the variables under investigation (Kozma, 2003; Law, Pelgrum, & Plomp, 2008).

Sample Design

A total of 600 senior secondary school students, comprising 300 males and 300 females, were selected from various schools in Kanpur city using the stratified random sampling method. This sampling technique was employed to ensure adequate representation of both genders and to minimise selection bias, thereby enhancing the generalisability of the findings. The stratification was based on gender, which is a critical demographic variable in ICT adoption research, as prior studies have indicated potential gender differences in technology usage and attitudes (Imhof, Vollmeyer, & Beierlein, 2007; van Braak, 2001). The sample size of 600 was considered sufficient to achieve statistical power for the employed analytical techniques, including ANOVA and post hoc comparisons.

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Tools of the Study

To evaluate the ICT adoption behaviour of senior secondary students, a five-point rating scale comprising 25 items was developed by the researcher. The scale was designed to capture the multidimensional nature of ICT adoption, including aspects such as access, usage, motivation, and competency, in alignment with established theoretical frameworks (Davis, 1989; Venkatesh & Davis, 2000). Content validity was established through expert review, ensuring that the items effectively assessed the intended aspects of ICT adoption. Additionally, the test-retest reliability index was calculated at 0.796, indicating a satisfactory level of consistency and reliability. This reliability coefficient exceeds the commonly accepted threshold of 0.70 for research instruments, thereby confirming the stability and dependability of the scale for measuring ICT adoption behaviour among secondary level students (Murphy, Coover, & Owen, 1989; Paraskeva, Bouta, & Papagianni, 2008).

Statistical Techniques Used

In the present study, a range of descriptive and inferential statistical techniques were employed for the analysis of data. Percentage analysis was used to describe the distribution of students across different levels of ICT adoptive behaviour. Mean and standard deviation were calculated to summarise the central tendency and dispersion of scores on both ICT adoptive behaviour and academic performance. Quartile deviation was applied to categorise students into high, moderate, and low levels of ICT adoptive behaviour.

To examine the significance of differences between groups, ANOVA was employed, followed by post hoc test (post t-test) for multiple comparisons. These techniques are widely recognised in educational research for their robustness in analysing group differences and are consistent with methodologies adopted in similar studies on ICT integration and academic performance (Gülbahar, 2007; Tondeur, van Braak, & Valcke, 2007).

Analysis and Interpretation

1. To study the ICT adoption behaviour of male and female secondary level students.

To evaluate the ICT adoption behaviour of male students as well as female students, the researcher used a self-developed ICT adoption behaviour scale. This scale was administered to senior secondary school students to collect their raw scores.

Furthermore, to better understand the variations in ICT adoption among students, the raw scores of students were categorised into three levels based on the quartile deviation method. This classification helped in analysing the distribution of students according to their ICT adaptability. The distribution of male and female students across these three categories, along with their respective percentages, is presented in Table 4.1. This table provides a clear overview of how students differ in their levels of ICT adoption, offering insights into patterns and trends in their technology usage.

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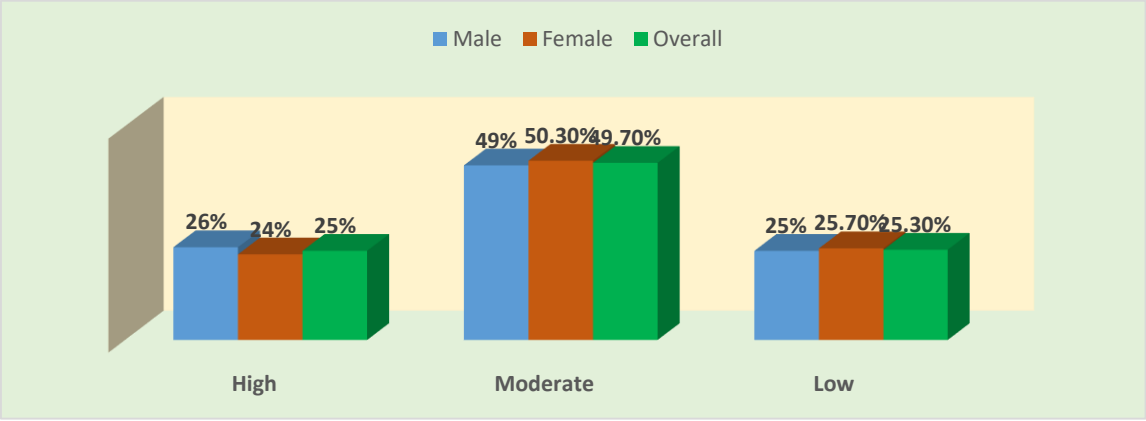
Table 4.1: Indicating the percentage of male and female students with respect to different levels of digital literacy

Group	Levels of ICT adoption behaviour		
	High	Average	Low
Male (N=300)	78 (26%)	147 (49%)	75 (25%)
Female (N=300)	72 (24%)	151 (50.3%)	77 (25.7%)
Overall	150 (25%)	298 (49.7%)	152 (25.3%)

Table 4.1 shows that 26 per cent of male students in secondary schools were found to have a high level of ICT adoptative behaviour, while a significant portion of male students (49%) were classified as having an average level of ICT adoptative behaviour. Similarly, it was found that 25 per cent of male students had low levels of ICT adoptative behaviour. In the same manner, according to observations about female students' ICT adoptative behaviour, a significant percentage of female students (50.3%) were categorised as having a moderate/average level of ICT adoptative behaviour, while 24% of female students enrolled in secondary schools were found to have a high level of ICT adoptative behaviour. Similarly, it was shown that 25.7% of female students had low levels of ICT adoptative behaviour. Overall, the statistical results regarding the ICT adoptative behaviour of the joint group of students showed that a significant percentage of the sampled students (49.7%) had an average level of digital literacy, while 25% of students (overall) enrolled in secondary schools were found to have a high level of ICT adoptative behaviour. Similarly, 25.3 per cent of students were shown to exhibit poor levels of ICT adoptative behaviour. From the discussion above, it can be inferred that a significant percentage of the sampled students exhibited a moderate/average level of ICT adoptative behaviour, and that there were few differences in the percentage of students with respect to gender (male and female) who displayed different degrees of ICT adoptative behaviour. The mean values of ICT adoptative behaviour of male and female secondary level students shown using a diagram 01 looks like this:



Graph 01: Showing the % of male students and female students under different levels of ICT adoptive behaviour

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Furthermore, the researcher aimed to examine whether there was a significant difference in the mean values of ICT adoptive behaviour between male and female senior secondary students. To assess this, relevant statistical values were calculated and are presented in Table 4.2 below.

Table 4.2: Showing M, S.D., and CR-value for ICT adoptive behaviour of male and female students of secondary level

Groups	Results of ICT adoptive behaviour			CR-value	p-value
	N	M	S.D		
Male	300	77.93	9.28	1.90	p>0.05
Female	300	76.45	9.76		df=598

*significant at 0.05 and **significant at 0.01 level

The analysis of Table 4.2 indicates that the mean scores for ICT adoptive behaviour among male and female senior secondary students were 77.93 and 76.45, respectively. Additionally, the standard deviation values for male and female students were 9.28 and 9.76, respectively. The mean scores of both groups were found to be very close, suggesting that their ICT adoptive behaviour levels were quite similar.

To further examine whether a significant difference exists between the mean scores of students with respect to gender, the critical ratio (CR-value) was calculated. The obtained CR-value was 1.90 with degrees of freedom (df) = 598 and $p > 0.05$, indicating that the difference was statistically insignificant. Based on this result, the null hypothesis, stating that "There is no significant difference between the ICT adoptive behaviour of male and female secondary level students," was accepted at the 0.05 significance level.

This analysis clearly shows that students without showing gender influence exhibit similar ICT adoption behaviour. One possible reason for this could be the increasing integration of digital technology into daily life. In the modern era, where science and technology play a crucial role, both male and female students are equally exposed to digitalisation. Digital devices have become essential tools in education, communication, and daily activities, making them a fundamental part of students' lifestyles. As a result, there is no significant gender-based difference in ICT adoption at the senior secondary level. The mean values of ICT adoption behaviour for both groups are visually represented in Diagram 02 to illustrate these findings.

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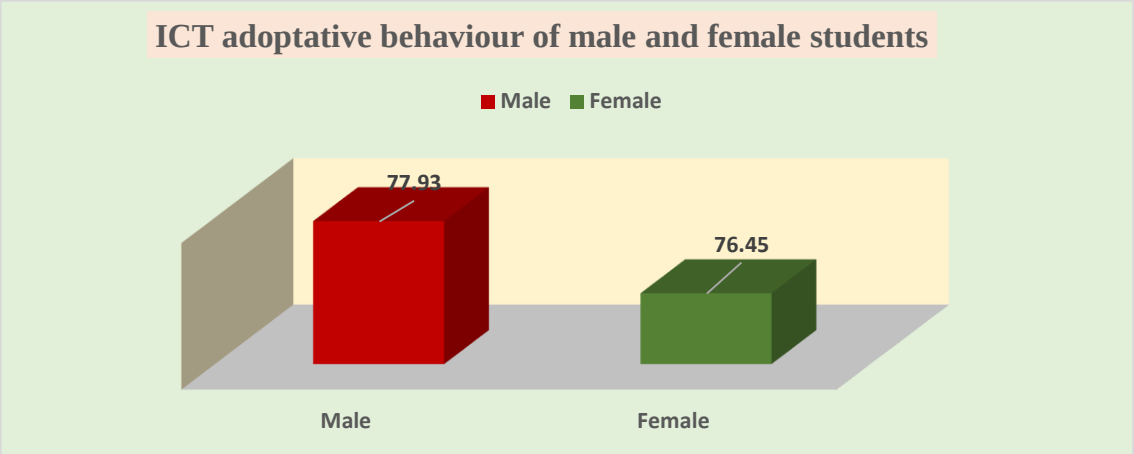

Graph 02: Showing the mean value (s) of ICT adoptative behaviour of students (Male/Female) of senior secondary level

2. To study the impact of ICT adaptive behaviour of male secondary level students on their academic performance.

In relation to the impact of ICT adaptive behaviour of male secondary level students on their Academic performance, the researcher performed one-way ANOVA to study the statistical differences in mean value(s) of academic performance among groups of students having low, moderate and high levels of ICT adaptive behaviour. ANOVA summary table 4.3 is cited as under

Table 4.3: Showing ANOVA summary table in relation to impact of ICT adaptive behaviour of secondary level students on their academic performance

Sources	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	14.621	2	7.311	8.582	.000
Within Groups	508.565	597	0.852		
Total	523.186	599			
Sign at 0.01					

It is evident from Table 4.3 that, in relation to the impact of ICT adaptive behaviour of secondary level students on their academic performance, the F-value was found to be 8.582, which is significant at the 0.01 level. Thus, it is stated that there is a significant impact of ICT adaptive behaviour of secondary level students on their academic performance. Thus, the null hypothesis "There is no significant impact of ICT adaptive behaviour of secondary level students on their academic performance" is rejected at the 0.01 level. Here, a significant value of the F-test was found with reference to the impact of ICT adaptive behaviour of male secondary level students on their Academic performance; thus, there is a necessity to perform the post hoc analysis. Further,

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the researcher studied multi-comparison of academic performance of students in the light of different groups of ICT adaptive behaviour (Low v/s Moderate, Low v/s High and Moderate v/s High) using post hoc analysis to understand the trends/flow of mean score(s) of academic performance of students with respect to their different levels of ICT adaptive behaviour. Post hoc analysis (Mean, S.D., CR-value) Table 4.4 cited as under-

Table 4.4: Post hoc analysis in relation to impact of ICT adoptive behaviour of secondary level students on their Academic performance

Levels of ICT adoptive behaviour	Statistical data of Academic performance			CR-value	p-value
	N	M	S.D		
High	150	7.72	0.89	1.65	p=.101
Moderate	298	7.57	0.92		(p>0.05)
High	150	7.72	0.89	4.04	p=.000
Low	152	7.29	0.96		(p<0.01)
Moderate	298	7.57	0.92	3.01	p=.002
Low	152	7.29	0.96		(p<0.01)

Table 4.4 presents data on how ICT adoption behaviour (students' ability to use technology) influences their academic performance at the secondary level.

Students with low ICT adoption had an average academic performance score of 7.29, with a standard deviation of 0.96. Students with moderate ICT adoption had a slightly higher average score of 7.57, with a standard deviation of 0.92. Students with high ICT adoption had the highest average academic score of 7.72, with a standard deviation of 0.89.

This data suggests that students who are more comfortable using ICT tend to perform better academically, though the differences between the groups are not very large.

Further, Table 4.4 presents the results focused on how students' ICT (Information and Communication Technology) adoptive behaviour, meaning how well they adapt to using technology, affects their academic performance. The researcher compared students with high, moderate, and low ICT adoptive behaviour to see if there are significant differences in their academic performance.

Comparison between High and Moderate ICT Users

- Students who frequently use ICT (high ICT adoptive behaviour) had a higher average academic performance than those who sometimes use ICT (moderate ICT adoptive behaviour).
- To check if this difference is significant, a CR test was conducted, which resulted in CR = 1.65 ($p > 0.01$).
- Since the result was not significant at the 0.05 level, it means that there is no meaningful difference in academic performance between students with high and moderate ICT usage.

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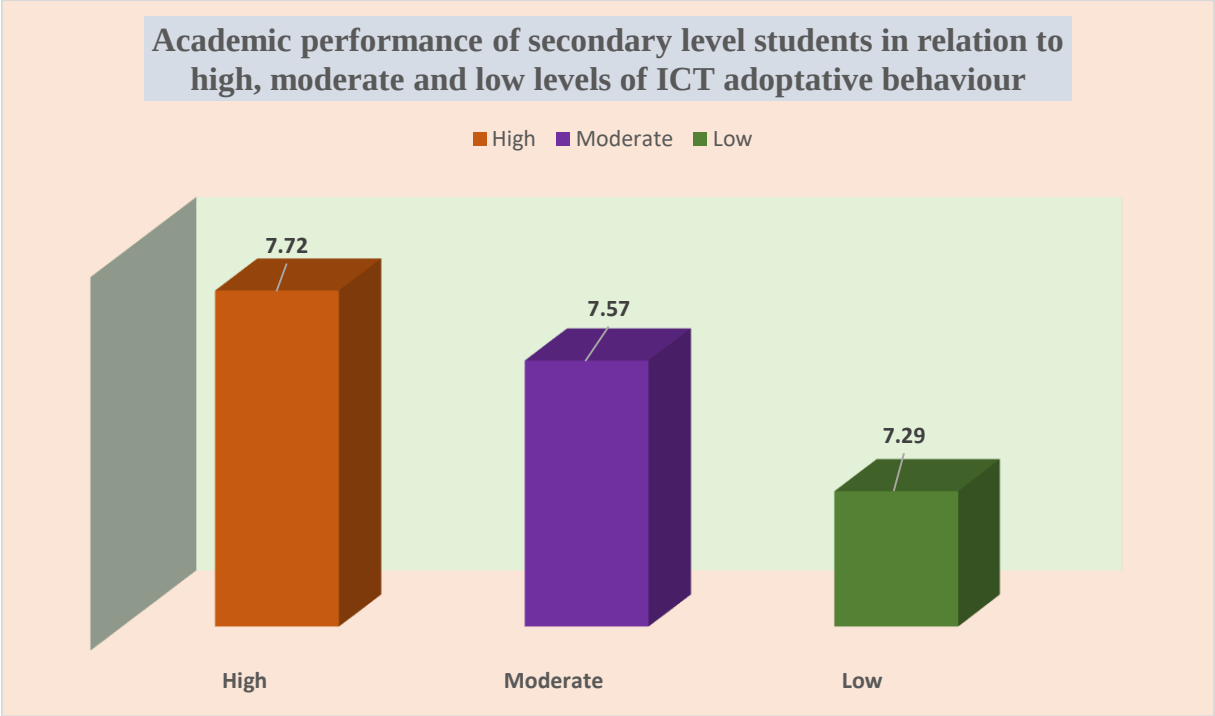
Comparison between High and Low ICT Users

- Students with high ICT adoption behaviour had a higher academic performance than those with low ICT adoption behaviour (students who rarely use ICT).
- The CR test was performed and gave a CR value of 4.04 ($p < 0.01$).
- Since this result is significant at the 0.01 level, it means that students with high ICT adoption perform significantly better than those with low ICT adoption.

Comparison between Moderate and Low ICT Users

- Students who use ICT moderately had a higher academic performance than students with low ICT usage.
- A CR test was performed, and the CR value was 3.01 ($p < 0.01$).
- Since this result is also significant at the 0.01 level, it confirms that students with moderate ICT usage perform significantly better than those with low ICT usage.

Thus, it is inferred that Students with high ICT usage tend to have better academic performance compared to those with moderate or low ICT usage. However, there is no major difference between students with high and moderate ICT usage in terms of academic performance. Students with low ICT adoption have significantly lower academic performance than both moderate and high ICT users. A visual representation (Diagram 03) is used to illustrate these findings.



Graph 03: Showing the mean value(s) of academic performance of students with respect to different levels of their ICT adoption behaviour

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Conclusion

It is concluded that a significant percentage of the sampled students (both male and female) exhibited an average level of ICT adoption behaviour, and no significant difference was observed between male and female students in relation to their ICT adoption behaviour. Further, it was also found that those students have high level of ICT adoption behaviour possessed higher grades as compared to the grades of those students having a low level of ICT adoption behaviour. Thus, it is concluded that the students of secondary level exhibited a moderate level of ICT adoption behaviour, and the impact of ICT adoption behaviour of the students was found to be significant on their academic performance. That could be because ICT's contribution to education goes beyond providing students with access to technology; it includes a revolutionary method of instruction that encourages student participation, critical thinking, and teamwork (Somekh, 2007). ICT tools and resources, such as digital textbooks, interactive multimedia, and e-learning platforms, give students a variety of options to learn and access knowledge outside traditional classroom settings. For example, secondary schools are increasingly using online learning platforms like Google Classroom and Moodle, which allow teachers to present material, monitor student progress, and lead conversations in real time (Robertson, Fluck, & Webb, 2007). It is recommended that teachers and parents should provide the opportunities to the students for adopting the ICT in daily life.

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Conflict of Interest Declaration

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.

Author Contributions:

- **Dr. Kunwar Kuldeep Chauhan:** Conceptualization, Methodology, Data Collection, Formal Analysis, Writing – Original Draft
- **Prof. (Dr.) Harishankar Singh:** Supervision, Validation, Writing – Review & Editing, Project Administration

Declaration of AI Use

During the preparation of this work, the authors used a large language model for language editing, structuring, and refinement of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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