Impact of hybrid education in higher education: a systematic review

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Article Info

ABSTRACT

In recent times, educational initiatives such as hybrid education have positioned themselves as important approaches to ensure the continuity of education during a period as complicated as the COVID-19 pandemic. In this context, the objective of this article is to explore the rise and development of hybrid education worldwide in recent years as a viable alternative within higher education institutions, through a systematic review of the literature applying the preferred reporting items for systematic reviews and meta-analyses (PRISMA) method. From this review, it is observed that hybrid education has experienced significant progress during the COVID-19 pandemic, given the transition to virtuality that was experienced and the rise of new digital technologies that prove useful for this approach. At the same time, the interest shown by both students and teachers in adopting this new approach instead of a purely face-to-face or virtual one has become evident, although there are still several challenges to overcome before it can be properly implemented.

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1. INTRODUCTION

Since late 2019, a virus originating from China, known as COVID-19, managed to spread to various parts of the world and become a global health emergency, officially declared a pandemic by the World Health Organization (WHO) in March 2020 [1]. Globally, each country was compelled to try to halt the virus's spread within its respective territories. This necessitated the implementation of a series of restrictive measures, along with a period of lockdown and quarantine [2]. These measures taken profoundly affected various sectors of global society, including health, economy and education [3]. The COVID-19 pandemic, therefore, represented a significant challenge for most countries, facing difficulties in quickly adapting to this new reality. Due to this situation, educational institutions worldwide were forced to close indefinitely, unable to continue their academic activities in person [4].

The restrictive measures affected 94% of the global student population, causing substantial learning loss and raising serious concerns about the future of the education sector amid this problem. However, it also promoted the search for solutions to ensure the effective continuity of education [5]. The global education sector has been reinventing itself in recent years with the inclusion of information and communication technologies (ICT), creating opportunities for innovation in university teaching methods [6]. The COVID-19

pandemic accelerated the adoption of ICT in education, leading to the virtualization of education in response to restrictive measures globally. The purpose was to pursue a revolution within the educational sector through innovative proposals supported by technological advances [7]. In this context, a new alternative emerged known as the hybrid model, which acts as a middle ground between face-to-face and virtual learning [8].

Blended learning is emerging as one of the most important educational alternatives in the so-called new normal in a post-pandemic scenario [9]. The integration of this learning modality in university institutions has represented a challenge that universities abruptly faced, but research records successful implementations [10], [11]. Research conducted in the United Kingdom with university students showed that blended learning helped promote interactions between students and their peers, their teachers, and course materials [12]. For its part, in a study conducted in Hong Kong, it was shown that blended learning provided teachers with an authentic perspective of the student and supported decision making [13]. In this way, it has been shown that blended learning benefits both students and teachers, since the technologies used by teachers favor the evaluation and feedback of students [14].

The interest in blended learning in universities has been evidenced by the notable increase in research on the topic over the last 5 years [15]. Especially, researchers have shown a marked interest in the difficulties that this modality represented after the COVID-19 pandemic and how institutions overcame these difficulties [16]. In this context, the aim of this article is to explore the rise and development of hybrid education worldwide in recent years as a viable alternative within higher education institutions through a systematic literature review.

Hybrid education, also known as blended, mixed, semi-presential, or internationally as blended learning, often has various definitions, generally understood as the integration of both in-person and virtual experiences in learning, leveraging the use of new technologies. As an innovative proposal, it has gained great importance due to the impact caused by the pandemic in the educational field [17], [18]. Both purely in-person and virtual education have disadvantages and limitations, such as the forced time and space synchrony of in-person learning or technical and connectivity issues in virtual settings. Hybrid education emerges from this challenge as a proposal seeking to reconcile both modalities and leverage their main strengths [19].

It represents the latest iteration of academic models within the series of changes occurring in educational systems. By using scientific and technological advances, it aims to create a more dynamic and flexible educational environment that better adapts to students, allowing for more effective learning [20]. Harnessing the advantages offered by both the internet and current technological advances, hybrid education enables a more personalized educational experience tailored to each student's unique needs. In recent years, various methodologies designed for this modality have emerged, including project-based learning, collaborative learning, gamification, among others [21].

2. METHOD

For the development of this systematic literature review, the preferred reporting items for systematic reviews and meta-analyses (PRISMA) method was adhered to Page *et al.* [22]. This approach aims to delve deeper into the concept of hybrid education or blended learning and its recent development as a viable alternative to modernize the educational system in the post-pandemic era. The information retrieval focused on gathering works analyzing hybrid education and its scope, as well as studying the effects of its implementation in global educational systems. The search period for this review was limited to studies published from 2018 to the present to obtain recent information, allowing a comparison of the progress of this educational modality before and during the pandemic.

The two well-known bibliographic databases, SciELO and Science Direct, were used for the search. SciELO was chosen because organizations such as UNESCO have recognized the efforts of this and other Latin American databases in their scientific dissemination work [23]. On the other hand, Scopus was chosen because it is one of the most prestigious databases in the world and because of the multidisciplinary nature of its journals [24]. Initial bibliographic searches used keywords associated with hybrid education in both English and Spanish, taken from the ERIC specialized thesaurus. Synonyms for hybrid education, such as "mixta" or "semipresencial" in Spanish, and "blended" or "hybrid" in English, were employed.

The search within the databases involved combining the aforementioned keywords using Boolean operators like "AND" and "OR" [25], such as (("hybrid education") AND ("university")). Although only Spanish and English keywords were used, the search yielded results in other languages. Only articles in Portuguese were considered among these. After the initial search following the outlined steps, inclusion and exclusion criteria presented in Table 1 were applied for the final selection of articles.

The final selection of articles for inclusion in this systematic review was conducted based on the established criteria. Preference was given to articles with quantitative or qualitative research, providing more pertinent data for the analysis of the defined theme. Review articles were also considered to delve deeper into these concepts and explore their evolution in the context of the pandemic.

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Articles focusing on hybrid education, among other modalities, within higher education	Articles focusing on other educational modalities, excluding hybrid
Articles published from the year 2018 to the present	Articles published before the year 2018
Articles published in SciELO or Science Direct	Articles published in other databases
Review articles, quantitative or qualitative research articles	Book chapters, opinion articles, reviews, and theses
Articles crafted in Spanish, English, or Portuguese	Articles crafted in languages other than Spanish, English, or Portuguese

The selection process commenced with an initial database acquired through article searches in the two considered databases for the desired time frame. This involved the initial removal of duplicate articles. Subsequently, a substantial number of articles were excluded based on the previously established inclusion and exclusion criteria from Table 1. Finally, the articles from this refined selection underwent a comprehensive full-text review, resulting in the determination of the final number of articles to be included in this work. The flowchart illustrating this search and selection process is presented in Figure 1.
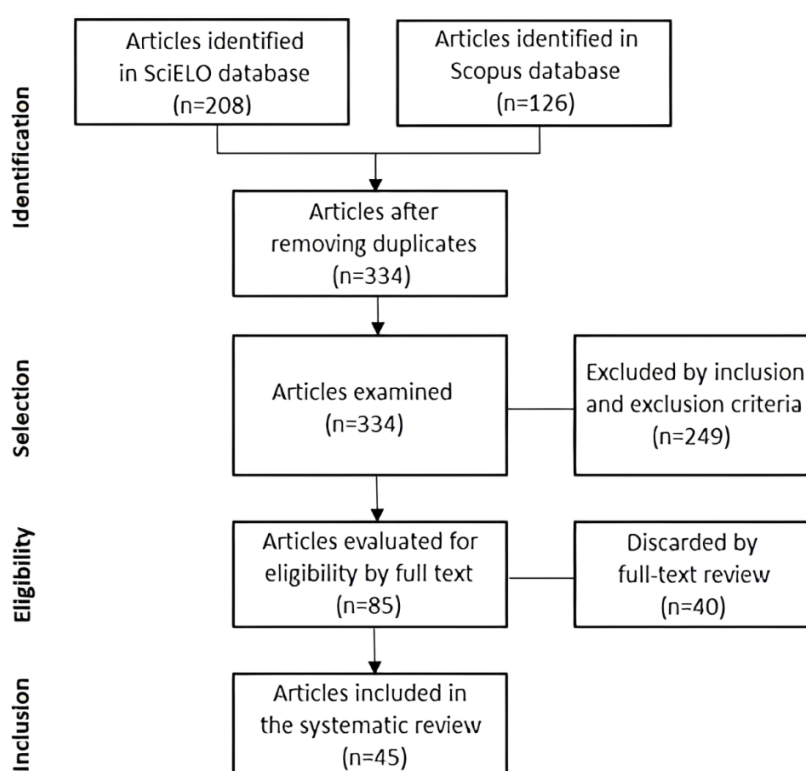

Figure 1. PRISMA flowchart

3. RESULTS AND DISCUSSION
3.1. Results

Following the selection process, 45 final publications were chosen based on the defined inclusion and exclusion criteria for this systematic review. These were organized into a matrix to facilitate subsequent analysis and the extraction of the most relevant information. It was determined that within the collected sample, 36 articles (89%) were sourced from the SciELO database, while the remaining 9 articles (11%) were obtained from Scopus.

Based on the inclusion and exclusion criteria, 37 articles (82.2%) in the selected group were research articles, while the remaining 8 articles (17.8%) were review articles. Among the research articles, it was observed that 33 of these (80%) focused on university students, while the remaining 4 (20%) focused on teachers. Additionally, within this group, 28 articles (62.2%) were in Spanish, 11 articles (24.5%) were in English, and 6 articles (13.3%) were in Portuguese. Furthermore, the selected articles were published between the years 2018 and 2023, with the distribution by each year, as depicted in Figure 2.
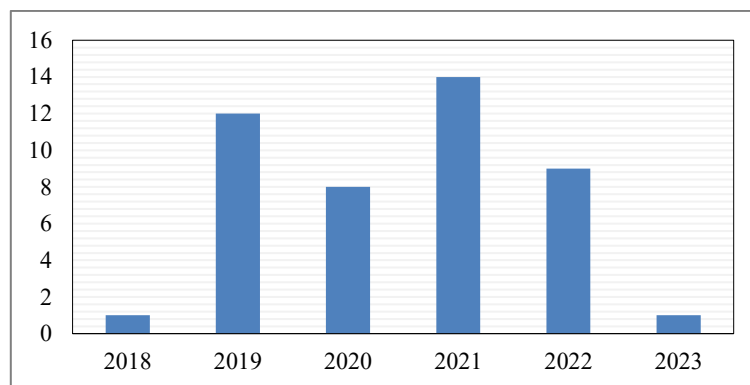
Figure 2. Number of publications per year

Figure 2 illustrates the trend in the quantity of selected publications per year. Within the selected group, articles from each year between 2018 and 2023 were included. Notably, there is a substantial increase in articles during the COVID-19 pandemic, with the highest number of articles obtained in 2021. This surge might be linked to the fact that innovative alternatives like hybrid education attracted researchers' interest amid the ongoing health crisis. This suggests that the interest in hybrid education did not originate with the pandemic but was, to some extent, accelerated by it. Additionally, the distribution of publications by country is depicted in Figure 3.
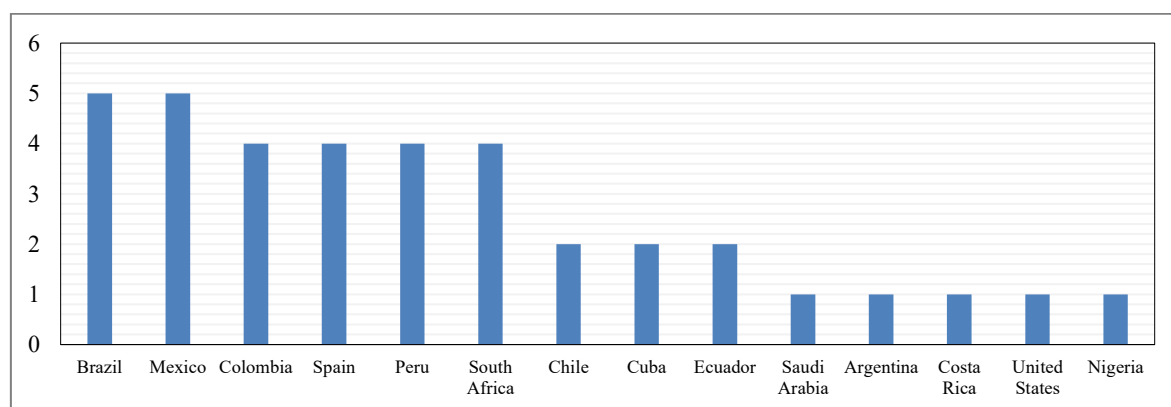

Figure 3. Distribution by country of compiled publications

Figure 3 illustrates that the publications were gathered from various parts of the world, including the America, Europe, Africa, and Asia. Considering that most of these articles were retrieved through the SciELO database, the substantial presence of Latin American countries is noteworthy. Brazil and Mexico have the highest number of selected articles, each contributing 5 articles (11.1%). Following closely are Colombia, Spain, Peru, and South Africa, with 4 articles (8.9%) each. Other countries with 1 or 2 articles include Chile, Cuba, Ecuador, Saudi Arabia, Argentina, Costa Rica, the United States, and Nigeria.

The content of the collected articles was initially analyzed based on keywords in English, Spanish, and Portuguese using VOSviewer software. A minimum occurrence value of three was established to relate keywords across different articles. Subsequently, less relevant keywords that deviated from the concept of hybrid education, the theme of this work, were filtered out. Once the most relevant terms, totaling 13, were identified, a bibliometric network was generated from this information, as shown in Figure 4.

The terms are grouped into four clusters differentiated by colors. Among the 45 selected articles, the keyword "blended learning" is present in 18 of them (40.0%), making it the most used. Following closely are the two most used keywords: "higher education" and "b-learning", appearing in 13 (28.9%) and 8 (17.8%) articles, respectively. Less common terms such as "Moodle", "flipped classroom", or "Ensino híbrido" are also observed.
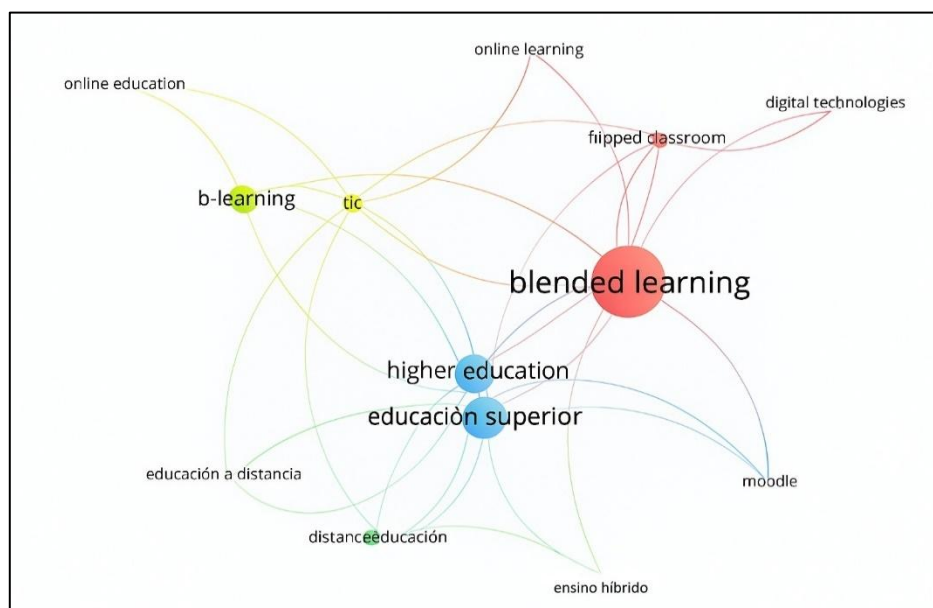
Figure 4. Bibliometric network with key words of highest occurrence

In general, the compiled publications focused on analyzing some aspect related to the application of hybrid education, through the evaluation of students or teachers from various higher education institutions. The analysis of this new educational modality aimed to measure its effectiveness when implemented in a group of students, sometimes with the purpose of conducting comparisons with a virtual or face-to-face modality. Additionally, another set of studies focused on examining the perception of both students and teachers regarding hybrid education, either to gauge their knowledge and interest in this modality before implementation or to measure their satisfaction level once implemented. It is highlighted that, within research studies, the survey method was the most commonly used for gathering information from both students and teachers.

The conducted studies focused on various university courses in which evaluations were carried out. These included courses in medicine [26]–[32], engineering [33], [34], social sciences [35], [36], languages [37]–[39], communication [40]–[42], audiology [43], exact sciences [44]–[46], teaching [47]–[49], and various other disciplines [50], [51]. Additionally, publications focused on teachers aimed to understand their perceptions regarding the implementation of hybrid education and its effectiveness [52]–[54] or to study their adaptation process to it.

Additionally, these studies mostly focused on the analysis of specific methods or tools. Among those presented in this group of publications are flipped classrooms [45], [55], [56], virtual classrooms [35], [52], Blackboard [34], [51], [57], Google Workspace [41], digital badges [58], Moodle [26], [30], [33], [42], [43], [59], [60], online platforms [27], [39], virtual resources [29], [38], [40], and online tests [36], [61]. Each platform obtained significant results for teachers and university students.

Based on the collected articles, it can be affirmed that hybrid education was not a new concept for the educational community. Initiatives had already emerged to explore its advantages compared to the traditional face-to-face and even virtual modalities. Before the COVID-19 pandemic, hybrid education was considered a promising alternative, recognizing the benefits of combining in-person activities with autonomous work and the interest it generated among both students and teachers [29], [30], [35], [36], [38], [42], [44], [47], [62]. However, as an emerging modality, several improvements were still necessary for it to be established as a viable alternative [34], [53], [54].

With the onset of the pandemic, education was forced to shift to a virtual modality, subsequently drawing attention to other alternatives such as hybrid education. Amidst this transition, issues were reported, such as the technological and social conditions of students limiting their access to virtual tools [27], [50]. Although it initially faced some disapproval, hybrid education during the pandemic proved to be a viable alternative to traditional in-person instruction or fully virtual approaches, often becoming the preferred modality for students [28], [51], [63]–[65].

On the other hand, this also entailed an adaptation process for teachers, who encountered difficulties implementing this new modality into their teaching styles. Within this context, it was important to study the phases through which a teacher goes until effectively adopting the hybrid modality, being able to exploit it efficiently for the benefit of their students [66]. Additionally, other studies on teachers have explored their

perception of hybrid education. From this, it was observed that, with proper training, teachers tend to embrace the hybrid modality, considering it excellent for learning and highly applicable to their classes [52].

From its inception, hybrid education has shown a positive impact on student motivation [38], [56]. A blended learning approach is appealing due to the flexibility and customization it allows [67], as well as other advantages such as improving digital skills [42], providing students with greater autonomy [45], a better understanding of the topics covered [40]. Based on these advantages, students tend to express approval for the implementation of a hybrid modality, seeking greater convenience alongside an improvement in their learning [36], [43], [52].

In particular, the Moodle platform is attracting the attention of various researchers within the hybrid modality, being the most used within the collected publications. This is because Moodle enables the stimulation of reflective thinking by incorporating didactic resources that result in a more interactive learning experience. Studies regarding the use of this platform have demonstrated its effectiveness in motivating students and enhancing both their educational experience and performance, influencing their preference for hybrid education. Additionally, other studies highlight the utility of a motivation manager to amplify the benefits of Moodle and improve students' interest levels [26], [30], [33], [42], [43], [59], [60], [68].

Blended education has experienced significant progress during the pandemic; however, studies have identified several aspects that need improvement within it. On the one hand, limitations related to internet access or suitable technological tools are highlighted [34]. Additionally, this type of education requires user-friendly digital platforms as well as clear and effective material within a well-structured blended course to provide a quality educational experience [46], [69]. The task of reinforcing this new modality largely falls on teachers and their desire to enhance their practice and digital knowledge. However, it is emphasized that they often lack the necessary support from their educational institutions [66].

3.2. Discussion

The analysis and narrative synthesis of the articles selected in this review allowed affirming that hybrid education had a positive impact on students' motivation, in addition to improving digital skills, enabling greater autonomy and increasing students' understanding. These results coincide with research conducted in Romania, where it is stated that technological media (such as virtual reality) have the potential to successfully motivate and engage university students [70]. Similarly, another study conducted in Turkey showed that hybrid learning can be used as a strategy that increases attention control and perceived learning of university students [71]. Another study accounted for the same results found in this review, however, the authors recommended that hybrid education should only be implemented in courses where courses cannot be taught entirely within faculties [72]. Thus, for educational practice, it is required to identify which are the courses in which students do not show interest and, from there, to implement hybrid education gradually to obtain the expected results in the teaching-learning process. The incorporation of social networks or platforms with which students feel familiar will facilitate the change of modality [73].

Another result obtained from the narrative synthesis was that, of the platforms used in hybrid education, the Moodle platform has gained the acceptance of teachers and students for its ease of use, in addition, it facilitates student feedback and reflection. These results coincide with those of another literature review, which identified Moodle's ease of use and interdisciplinarity as its main advantages [74]. A study conducted in Greece showed that students perceive that hybrid education allows immediacy with teachers, socialization and interactions, familiarity with digital technology, and the possibility of internships [75]. A study conducted in Turkey evidenced the preference that students had on the Moodle platform, as they found it simple to use and allowed their academic performance to improve [76]. On the other hand, another study affirms the need to implement other platforms besides Moodle to obtain the expected results from students [77]. Thus, for educational practice, Moodle seems to be the most beneficial option for students, so teachers should identify the subjects in which this platform can be successfully implemented [78].

Finally, difficulties related to hybrid education were identified, which were related to internet access, difficulty in using the platforms, and teachers' experience with the technology. These results are consistent with those of another literature review, which states that hybrid learning creates a more flexible and engaging learning environment compared to fully online or fully face-to-face instruction, but that the challenges it presents are pedagogical and technological in nature [79]. A previous study evidenced that higher education teachers face unfamiliarity with technologies, as abrupt changes in teaching modality hindered their adaptation process [80]. Likewise, a theoretical framework is necessarily required to guide teachers in the change of modality, in addition to constant training in the management of technologies or the creation of platforms for hybrid learning [81]–[83]. Faced with these difficulties, in educational practice it is suggested that initiatives be introduced by universities and teachers to reduce student demotivation, improve the technological knowledge of teachers and students, and allow the successful integration of hybrid education [84]–[86].

4.   CONCLUSION

Based on the findings of this systematic review, it can be seen that hybrid education has positioned itself as an efficient alternative for educational activities. Through the review of the collected articles, we explored the impact of the transition to a purely virtual mode due to the restrictive measures imposed, and how the idea of a blended learning approach has been attractive to students. Studies on hybrid education have reinforced the idea that hybrid education brings together beneficial aspects of face-to-face and virtual learning, providing greater advantages for learners. Through digital tools such as virtual platforms, online resources, and even online platforms such as Moodle, blended learning has seen a significant improvement in recent years, gradually taking hold in various parts of the world. However, it is still a work in progress, so there are several aspects that still need to be improved. Even if most students are willing to adopt this approach, it is essential that they have the necessary digital resources to do so. Similarly, it is essential that teachers have the necessary training and resources, as they are primarily responsible for implementing this type of education. Overall, the success of a hybrid model depends on both students and teachers, as well as higher education institutions themselves, working together to improve the educational experience for the benefit of students.

This review was carried out in the Scopus and SciELO databases and the time limit for publications was 5 years. Future reviews on hybrid education can be conducted in other databases such as Web of Sciences, EBSCO or ERIC, the latter mainly because it is entirely focused on education. Likewise, this study was conducted in the university population; other studies may address other educational levels or perform comparative analyses between the results obtained at each level. On the other hand, a narrative synthesis was performed, so other reviews may opt for a significant meta-analysis on the possible significant effects of hybrid education in higher education.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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Sergio Arturo Rojas Chacaltana	✓				✓		✓	✓	✓	✓				

C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author [VHH-E].

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