Biodiversity Governance Outside Protected Areas in the Context of Other Effective Area-Based Conservation Measures (OECMs): A Systematic Review

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Received: 22 January 2025 Revised: 30 July 2025 Accepted: 5 September 2025 Published: 30 September 2025

The Other Effective Area-Based Conservation Measures (OECMs) have recently been recognized as a viable tool for conserving biodiversity beyond protected areas. As a new concept, it is essential to evaluate the current knowledge on OECMs and their prospects for conserving biodiversity resources outside protected areas. We conducted a systematic review of the literature on key concepts, including OECMs, governance, and biodiversity, using the Publish or Perish Software Program in Google Scholar. Out of the total 200 articles identified through the keywords, 54 were shortlisted for a comprehensive full-text review. Based on the closeness of the study objectives to our research questions, 27 articles were selected for detailed analysis. As no journal articles related to the OECM in Nepal were found within the set time frame, contemporary policies and legal documents of Nepal were also reviewed. Additionally, to account for the lengthy publication process, a few more recent journal articles were also reviewed. The review revealed that nearly half of the studies (13) focused on global and regional scales, while eight studies were conducted in eight different countries, and two studies in each of three additional countries. Recent studies on the integration of OECM principles in Nepal's forestry sector policies and practices were also reviewed. Community-led conservation, supported by coordination and collaboration among multilevel governance systems-including both state and non-state actors-has been found effective in conserving biodiversity resources outside protected areas. However, further studies on natural resources governance beyond protected areas are needed to ensure long-term in-situ conservation of biodiversity through the OECM model.

***Keywords*:** Biodiversity, Governance, Other effective conservation measures

The global community is moving towards conserving 30% of the terrestrial land by 2030 through the adoption of the Kunming-Montreal Global Biodiversity Framework. Other Effective Area-based Conservation Measures (OECMs) have been considered as a governing tool to complement the protected areas (PAs) and help achieve this global target (CBD, 2022).

Parties to the Convention on Biological Diversity (CBD) committed to conserving 17% of terrestrial and inland water areas and 10% of coastal and marine areas by the end of 2020 (CBD, 2010). The concept of OECM was introduced in 2010 and further defined in 2018, emphasizing the effective and equitable management of biodiversity outside protected areas to achieve the 30% target. However, it is known to only a limited group of experts (Gurney et al., 2021). The 14th conference of the parties to the CBD defined OECM as, *"a geographically defined area other than a Protected Area (PA), which is governed and managed in ways that achieve positive and sustained*

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long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values".

With proper recognition, sound management, equitable participation, and support, OECMs have the potential to promote biodiversity conservation. For instance, a study conducted by Kshettry et al. (2020) provides evidence of the significance of governing interconnected non-forested landscapes, forest patches, and tea-plantation sites for wildlife habitat outside the protected area system. Effective administration, policy implementations, and governance tools are equally essential to ensure the ecological integrity in conservation programs (Lazdinis et al., 2007).

In the context of OECMs, the governance needs to be participatory and should incorporate the local cultural values and rights (Springer et al., 2021). Indigenous people and local communities are key governance entities of OECMs (Borrini-Feyerabend et al., 2010). The management of natural resources by indigenous communities is more effective than stringent government policies (Hayes & Ostrom, 2005; Nolte et al., 2013). Furthermore, the OECM could encompass the ecosystems that are not adequately conserved within the protected areas. There is a plethora of literature (Cox & Underwood, 2011; Penjor et al., 2021; Renwick et al., 2017) highlighting the significance of land and other natural resources outside formal protected areas, managed by local communities, in achieving biodiversity gains, including those of threatened species. Nepal, as a party to the CBD, has an obligation to comply with the global commitment to bring 30% of its landmass under conservation areas. However, Nepal's commitment to promoting and mainstreaming OECMs is not known.

The IUCN has highlighted ten key governance principles essential for the effective implementation of OECMs. These principles primarily focus on an inclusive and decentralized decision-making process that involves all concerned stakeholders, the recognition of the rights of indigenous communities, and the empowerment of local communities. It also highlights the importance of collaboration among stakeholders in developing governance strategies, ensuring equitable benefit sharing, and managing resources sustainably (Springer et al., 2021).

In this review article, we revisit and analyse the recent studies on OECM, focusing on its significance in promoting biodiversity. We also examine its prospects and a potential pathway for countries like Nepal, where local communities manage many patches of forest and natural resources outside the protected areas.

The key questions examined include: i) how biodiversity is governed outside protected areas, ii) how biodiversity governance has evolved in the context of OECMs, iii) how OECMs promote biodiversity, iv) which governance arrangement has been found more effective, and v) what is the prospect of OECMs in Nepal, where key biodiversity areas outside formal protected areas have yet to be conserved effectively and equitably?

Methodology

We performed a systematic review of articles using Publish or Perish software. We established the research aim and objectives and conducted an article search within the Google Scholar search engine component of the software on July 6th, 2023. The keywords used for article retrieval were as follows:

Other effective conservation measures" and *"Conservation"* and *"Governance"* and *"Biodiversity types"*

A total of 200 research articles were retrieved using the above-mentioned keywords. We then evaluated these articles using inclusion and exclusion criteria by initially reviewing their titles and abstracts. Following this preliminary assessment, 54 articles were selected for a comprehensive full-text review.

The selection of articles excluded inferior journals, duplicate studies, and irrelevant publications (Table 1). During the thorough full-text review, we eliminated articles with marginal relevance to our objectives, ultimately retaining 27 articles that were most closely aligned with the research objectives (refer to Figure 1).

As we were unable to find any journal articles related to the OECMs in Nepal within the specified time frame, we also reviewed contemporary policies and legal documents of Nepal. Furthermore, to capitalize on the lengthy publication process, a few recent journal articles were reviewed, primarily to enhance the results and discussion sections of the article.

To collect data from these selected articles, we created an MS Excel workbook containing categories such as biodiversity types, good governance, and inclusiveness variables. We then meticulously

examined and interpreted the research articles, extracting and coding relevant information into the workbook. We conducted Sen's slope and Mann-Kendall trend test to analyze trends in publications related to biodiversity governance outside protected areas over the years.

Results

Increasing coverage of biodiversity conservation outside protected areas

The spatial distribution of articles related tc biodiversity governance in the context of OECMs reveals that most studies included in the review were conducted at the global (n=7) or regional scale (n=6). We found an equal number of studies (n=1) from eight different countries (Mozambique, United States, Scotland, Laos, Kenya, Australia, Romania Zimbabwe). Similarly, we found two studies from each of Brazil, Finland, and South Africa.

Sen's slope and Mann-Kendall trend tests were conducted to analyze further the temporal trend of publications related to biodiversity governance outside protected areas. The positive value of Sen's slope (0.095) indicates that the trend of publications on biodiversity governance outside protected areas is gradually increasing over the years. The Mann-Kendall trend test ($p = 0.0046$) revealed a statistically significant increasing trend at the 5% level ($p < 0.05$) (Figure 2).

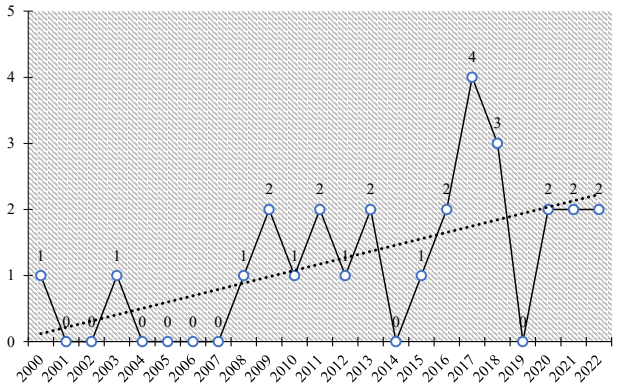

Figure 2: Frequency of articles per year

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Article published in Q1 Journal	Low-ranked journal
Primary research article	Review paper, Books
Article published in the English language only	Duplicate articles
Article containing the term Biodiversity, Governance, and OECM phrase in the title and abstract of the study	Essays, Analysis, Opinions, Perspectives, and Synthesis article

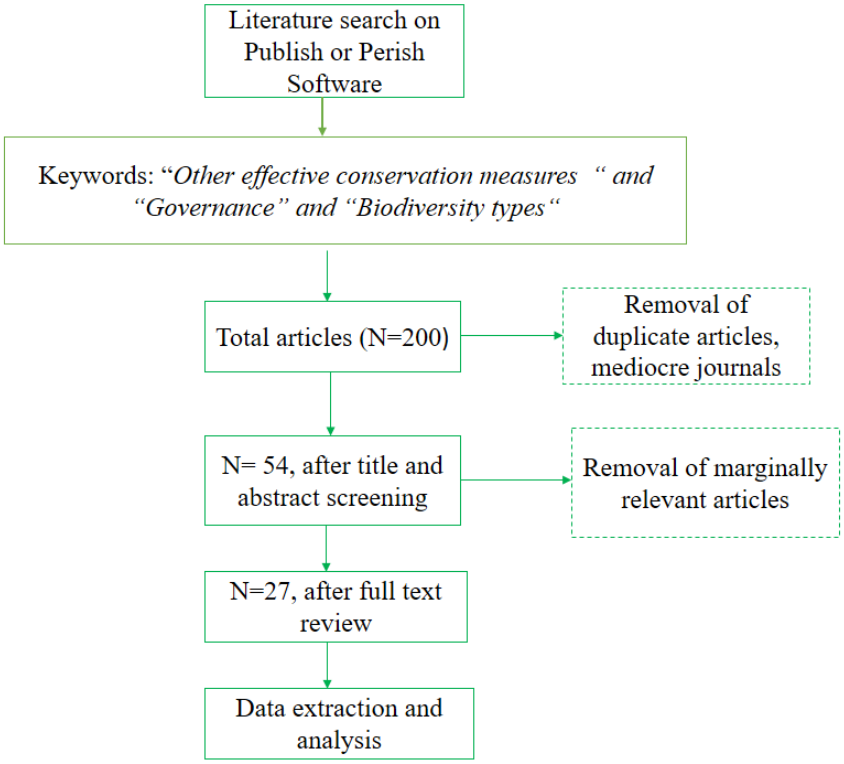

Figure 1: Flowchart showing the initial stage of literature search to data extraction and analysis

Diversity of governance regimes in operation

Biodiversity has been managed mainly through five governance types in the articles reviewed for area-based conservation. These include government, non-governmental organizations, the private sector, indigenous peoples, and local communities, through shared management. Local or central governments managed the highest number of potential OECMs, followed by local and indigenous communities and private landowners across the 10 countries studied (Donald et al., 2019).

The most common type of regime for managing biodiversity was a government-led regime, reported in approximately 74% (n = 20) of the articles, followed by a shared regime at 52% (n = 14). In a shared regime, biodiversity conservation was managed collaboratively by local communities, organizations, and the government. Community-managed areas were mentioned in 48% (n = 13) of the articles, while organizations such as NGOs/INGOs, and the private sector were reported in 37% (n = 10). Only six articles discussed governance by Indigenous communities (Figure 3).

About 30% of the articles assessed the conservation effectiveness of various governance models. The articles stress that effective conservation outcomes can be achieved by adopting different types of governance models (Table 2). This highlights that the contributions of communities and the private sector in conserving biodiversity outside protected areas are highly valuable and should be recognized. Thus, the concept of OECMs in such areas offers a novel tool for acknowledging and supporting these contributions.

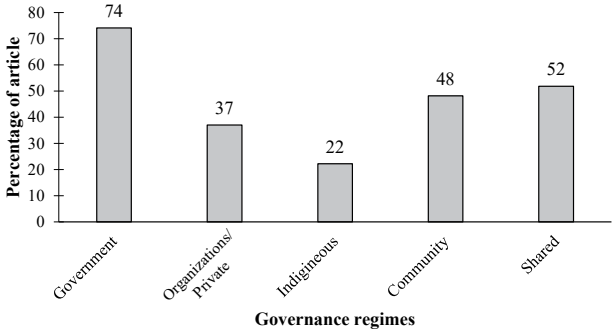

Figure 3: Governance regime across studied articles

Indigenous people, local communities, and privately managed resources are effective in conserving biodiversity. Additionally, multilevel governance, joint management, and collaboration and coordination between state and non-state actors have also contributed to the successful conservation of biodiversity resources.

Likewise, of the 27 articles analyzed, only four assessed the relationship between governance and biodiversity outcomes. The review suggests that inadequate governance contributes to poor biodiversity conservation in developing countries (Eklund et al., 2011). For example, weak governance has contributed to the degradation of forest conditions in Zimbabwe (Mutekwa & Gambiza, 2016).

Table 2: Conservation effectiveness of various governance modalities

Governance	Impact on biodiversity	Author
Community managed	Management of forest commons through community forestry could play a prominent role in biodiversity conservation	Persha et al. (2011)
Multi-level governance	Effective for biodiversity conservation in protected areas	Young et al. (2013)
Collaboration among farmers	Better agro-biodiversity	Leventon et al. (2017)
Indigenous people and the local community (IPLC) managed	An effective mechanism for conserving natural land cover and biodiversity intactness. Highly relevant in long-term biodiversity conservation	Shumba et al. (2020)
Private Management	Private conservation areas were critical in conserving lower elevation habitat, and by association, endangered vegetation in the Little Karoo region, South Africa	Shumba et al. (2020)
Joint Management	State and private management of protected areas, and their extension governance, can be more effective if the state and private sectors manage jointly	Onditi et al. (2021)
Indigenous people and the local community (IPLC) managed	Effective in curbing native vegetation conversion and promoting regrowth	Alves-Pinto (2021)
Coordination	Federal, provincial, and territorial governments' coordination is necessary for the effective conservation of biodiversity	Schuster et al. (2023)

Similarly, governance alone has been identified as a precondition for achieving Target 11 of the Global Biodiversity Framework, which was later redefined as OECM (Onditi et al., 2021). Inclusive governance that devolves authority, responsibility, and accountability of natural resource management to the local community level, particularly within protected areas, can address conservation challenges while also contributing to poverty alleviation by ensuring a fair share of benefits to local people (Ullah & Kim, 2021). Six articles reported biodiversity loss resulting from the exclusion of indigenous and marginalized communities in conservation efforts.

Effective biodiversity governance

Studies on the implications of governance on biodiversity richness, specifically in the context of OECMs, have primarily focused on the global and regional level, with very few studies conducted at the national level. A very few studies have been carried out in Southeast Asian, African, and other Asian countries (Abas et al., 2022).

Various aspects of governance and their impact on conservation have been examined (Figure 4). Inclusive decision-making was identified as the most important governance factor (63%, n = 17), followed by sustainable resource use (56%, n = 15), for effective biodiversity conservation. Devolution and accountability were each reported by 44% of the articles as key components of biodiversity conservation. OECMs can be governed in any form, from state-owned areas to community-managed areas, areas under land stewardship, or privately owned areas, as long as they deliver effective conservation outcomes (Borrini et al., 2013; Armitage et al., 2020)

The least reported governance elements in the articles were tenure rights (11%, n = 3), cultural preservation (15%, n = 4), coordination (22%, n = 6), and conflict resolution (22%, n = 6).

Unaccountable governance (Smith et al., 2003; Eklund et al., 2011; Dawson et al., 2018), inefficient and inadequate laws and policies (Smith et al., 2003; Eklund et al., 2011), lack of tenure rights (Dawson et al., 2018), ineffective coordination among the local communities and governing bodies (Leventon et al., 2017), and conflicts surrounding conservation areas (Dawson et al., 2018) contribute to environment and biodiversity degradation (Figure 4).

Inclusive governance, or local participation and collaboration, was highlighted by 47% (n = 8) of articles. The inclusion of indigenous and economically marginalized people in the decision-making process, who are most dependent on the resources, was emphasized in about 29% (n=5) of the articles. Local people's and community engagement were identified as key drivers of positive biodiversity conservation outcomes, which were reported by 18% (n=3) of the studies (Figure 5).

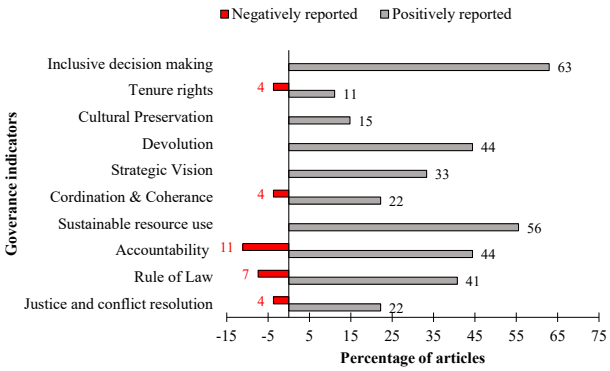

Figure 4: Governance principle reported in the articles

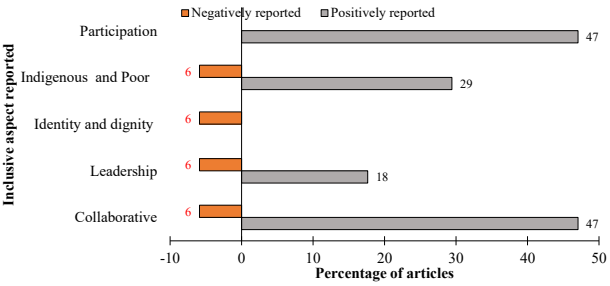

Figure 5: Various types of inclusivity discussed in the articles

Governance impact on biodiversity types

The impact of governance on species diversity and richness was reported by 44% (n = 12) of the articles. Good governance has been shown to improve species richness, enhance forest coverage, and maintain tree species diversity (Zumeta & Ellefson, 2000; Paloniemi & Tikka, 2008; Persha et al., 2011; Shumba et al., 2020; Alves-Pinto et al., 2021), improve aquatic animals and fisheries resources (Diz et al., 2018; Kenward et al., 2011), increase bird species diversity (Amano et al., 2018; Schuster et al., 2023), enable mammal conservation (Lockie, 2009; Faleiro & Loyola, 2013; Onditi et al., 2021; Schuster et al., 2023), and improved habitats for reptiles and amphibians (Schuster et al., 2023).

Further, the articles argue that good governance has improved the status of threatened and endemic species, biodiversity hot-spots, and ecosystem services. In total, 19% (n = 5) of the articles argued

for the positive impact of governance on ecosystem diversity and connectivity, which accounted for approximately 15% (n = 4) of the total articles.

The least covered area for biodiversity conservation was invasive species and their management, covered by just one article (Gogaladze et al., 2020), whereas genetic diversity and ecosystem function were covered by 11% (n = 3) of the articles. A few articles have demonstrated the negative impacts of governance on biodiversity (Figure 6). The negative impacts were manifested in decreasing species diversity (McPherson & Simpson, 1999; Smith et al., 2003; Eklund et al., 2011; Leventon et al., 2017), depleting ecosystem diversity (Eklund et al., 2011; Leventon et al., 2017), disrupting connectivity due to degradation of habitat (Mutekwa & Gambiza, 2016; Leventon et al., 2017), and weakening ecosystem services and functions (Mutekwa & Gambiza, 2016). Even one article claimed that due to weak governance, it has jeopardized the population of vulnerable black African elephants and rhinos (Smith et al., 2003).

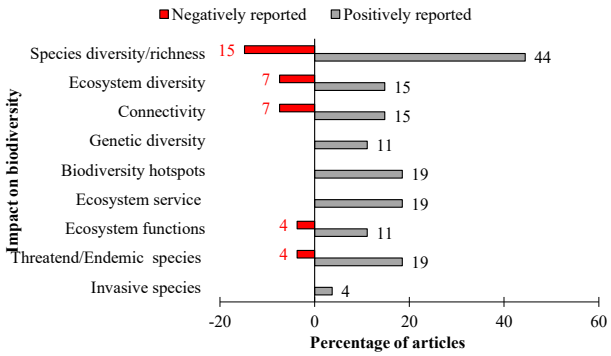

Figure 6: The impact of governance on biodiversity

Policy perspective of OECM

Very few articles mentioned conserving biodiversity resources outside protected areas in the context of OECM policy. Although the concept of OECMs has emerged as a viable strategy in global conservation efforts, policy development has been slow to keep pace (Cook, 2024). The study shows a disproportionately low focus on biodiversity conservation in non-protected areas in Nepal (Paudel et al., 2023). Some important natural areas in Nepal that are currently excluded from the protected area system should be considered for protected status through policy reform (Heinen & Yonzon, 1994). Ecosystem degradation and the loss of environmental services have multiple causes and therefore must be addressed through coordination and diverse policies, legislation, and institutional responses (Nepal et al., 2025). There is also a lack of a specific policy agenda and responsive policies at the federal, provincial, and local government levels to promote conservation (Baral et al., 2022). Ensuring effective biodiversity conservation outside protected areas requires policies that promote equitable governance and effective conservation outcomes, which are the key components of the OECM approach.

Discussion

The plurality of governance types is appreciated for effective biodiversity conservation

Effective conservation outcomes can be achieved by adopting different governance models, including multilayer governance approaches. Five different types of biodiversity governance are prevalent worldwide: government, non-governmental organizations (NGOs/INGOs), the private sector, indigenous peoples, local communities, and shared management. The most common model is government management, followed by a shared regime involving local communities, non-government organizations, and the government. Only six articles described the governance of biodiversity resources by indigenous communities. State-community-managed protected areas are more successful in conserving biodiversity compared to NGO-managed and community-managed protected areas (Nyaupane et al., 2020). It is suggested that conserving biodiversity outside protected areas, such as in community-managed forests, can contribute to broader biodiversity conservation impacts through enhancing collaboration between community forest user groups and local governments (Sharma et al., 2021).

Inclusion and equity are at the core, irrespective of governance type

A strong relation has been found between biodiversity richness and cultures, traditional knowledge, and practices of indigenous people (Armitage et al., 2020). To halt the loss of biodiversity and ecosystem services, "transformative change" is needed, which requires inclusive governance (IIED, 2021). Nepal's constitution guarantees livelihood rights and participation in governance for various groups, including women, indigenous peoples, local communities, youth, and marginalized groups, in environmental management and biodiversity conservation. An empirical evaluation of state PAs, Indigenous Territories (ITs), and civil society

and private Conservation Concessions (CCs) in the Peruvian Amazon revealed that CCs and ITs were, on average, more equitable and effective in conserving biodiversity than state-government PAs (Schleicher, 2017). The loss of natural resources is often the result of excluding indigenous and poor communities, disregarding local tradition (Dawson et al., 2018), and lacking leadership and collaboration, which leads to the fragmentation of major bio-reserves (Leventon et al., 2017). Natural resources management led by indigenous communities has proven effective in conserving biodiversity resources outside protected areas. Conserving Key Biodiversity Areas under OECMs contributes to maintaining greater biodiversity richness compared to managing them under the protected area system (Donald et al., 2019). However, there is a clear need for more studies to build a robust evidence base evaluating the suitability of different conservation measures as OECMs (Cook, 2024).

Policy coordination prerequisite among different governments

Natural resource management issues, such as ensuring equitable benefits for all, regardless of income level, ethnicity, or marginalization, are key characteristics of OECMs that require policy coordination among different levels of government. Collaboration among diverse stakeholders is generally considered necessary for developing legitimate and sustainable biodiversity conservation policy. Policy provision and coordination among federal, provincial, and territorial governments is necessary for effective conservation of biodiversity (Schuster et al., 2023). Since ecosystem degradation and the loss of environmental services arise from multiple drivers, they must be addressed through integrated and diverse policies, legislation, and institutional responses (Nepal et al., 2025). However, significant knowledge gaps remain regarding how effectively policies can be coordinated in the federal context, particularly in adopting OECMs and managing natural resources, specifically in community forests of Nepal.

Conclusion

Knowledge of biodiversity governance outside of protected areas, particularly in the context of OECMs, remains very limited. however, interest in this area has been growing in recent years. Effective biodiversity conservation outside protected areas requires a governance structure that extends beyond state-led approaches. Policies that promote multilevel governance, encourage collaboration among state and non-state actors, indigenous people, and local communities, are more likely to deliver positive conservation outcomes. Therefore, a policy that promotes polycentric governance could be effective for conserving biodiversity in the context of OECMs, although further investigation is required.

Acknowledgement

We gratefully acknowledge the partial financial support provided by Forest Action Nepal through the International Development Research Centre (IDRC) under the *project Economic Empowerment of Women through Forest Solution (WEE-FS)*, Grant No. 109772 – 001.

Author contribution

All authors have made substantial contributions to the conception, design, execution, analysis, and/or interpretation of the study. Each author has reviewed and approved the final version of the manuscript.

Conflict of interest

The authors declare that there are no conflicts of interest that could have influenced the work presented in this study.

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