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## Trends in Green Supply Chain Management: Insights from Bibliometric Analysis (2014-2023)

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### ABSTRACT

This research discusses the publication trend on the topic of green supply chain management with "Green Supply Chain Management" as the keyword. Search using the title and abstract categories listed in Dimension from 2014 to 2023 analyzed in a bibliometric study. This bibliometric study can guide academics and practitioners to take relevant steps in managing environmentally friendly supply chains. Therefore, this research could contribute to understanding developments and challenges in the green supply chain field. The results of this study are expected to provide insights for decision-makers and practitioners in managing supply chain sustainably. There are 4,017 articles. This number is very impressive and almost every year there is a significant development in this research topic. The analysis of this study is focused on the number of publications, authors, and journals. This study aims to observe the development map of Green Supply Chain Management research in the world. Results show that the number of publications on Green Supply Chain Management has increased quite steadily and was the most published in 2023 with a total of 803 journals. As for the lowest number of publications, there was in 2014 with the number of publications as many as 179. Thus, it can be concluded that the topic of this theme has developed from year to year, and this concept has great potential to develop further in the future.

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## Introduction

Green supply chain is a topic that is being discussed a lot, especially amid the current instability of the earth's climate (Fontoura & Coelho, 2022). Over the past few decades, many companies have begun to implement environmentally friendly environmental management practices and supply chains. Another thing that marks the development of the upward topic of green sustainability is the number of investment instruments related to the topic of green sustainability. Investment can be a good and promising means of managing personal surplus (Iman et al., 2022). In addition, several studies related to green supply chain (GSCs) have been conducted with significantly improved results over the past few decades. This research was conducted using a literature review. Each researcher analyzed the GSC literature from a different perspective (Qosim et al., 2023). By using bibliometric analysis, researchers can identify trends and patterns in publications, as well as the contributions of authors and journals in this field, thus providing a clearer picture of research developments and areas that need further exploration. With the development of this research topic, the government is expected to pay more attention to developments related to green sustainability. If done, this can be a good opportunity for Indonesia in the future (Wardhana & Ratnasari, 2022b).

The latest research (Mukhlif et al., 2019) uses a simpler bibliometric analysis by taking a period ranging from 1995-2017. In this study, it is known that, in the period 1995-2016, there were not too many publications on green supply chain management. However, there was an increase in 2012. This is a very significant development compared to the previous years. In this study, it is also known that from 2012 to 2017 GSC journals published more papers, with the highest number published in 2017, with a total of 469 articles. Through this research, we know that awareness of environmental sustainability, especially in the supply chain, began to increase in 2017.

Green Supply Chain Management (GSCM) integrates the concept aspect environment in management chain supply, including design of the product, procurement, selection of material, manufacturing process, delivery of product end to consumers, and setting channel product after use by consumers (Febriyanti et al., 2022). Several GSCM dimensions include green design, green procurement, green manufacturing, green distribution, reverse logistics, and internal environmental management. GSCM aims To minimize impact environment and achieve profit as well as the target market with a method of lower risk impact on the environment (Kanela, 2020).

Green Supply Chain Management (GSCM) is increasingly becoming a major focus for many companies around the world today, as awareness of the importance of environmental sustainability grows (Abbas, 2024). Countries that have implemented green supply chain management are Thailand, Malaysia, and Indonesia, which has also started to implement it since 2015 (Guild, 2020). The development of GSCM in Indonesia, Malaysia, and Thailand shows different factors affecting its adoption. In Indonesia, GSCM helps companies become more competitive and improves performance but it doesn't directly boost performance. Companies need to leverage GSCM advantages for better results, with government regulations being key in implementing GSCM and enhancing environmental performance. In Malaysia, factors like costs, management support, and organizational characteristics influence the decision to adopt GSCM, but government support isn't as significant (Tian & Sarkis, 2020). Meanwhile, in Thailand, many organizations understand the importance of eco-friendly practices, and customer involvement affects their green performance. Also, the impact of COVID-19 has increased the need for sustainable practices and a focus on clean energy (Hari Kristianto, 2020).

Research on the topic of green supply chain management is crucial because it can enhance environmental and economic performance, and foster the latest innovations in this field. However, studies that discuss bibliometrics analysis on this topic are still limited. Research using bibliometric analysis

provides a foundation for further studies in the green supply chain field. By understanding research trends and gaps, we can identify areas that need further exploration. This bibliometric study can guide academics and practitioners to take relevant steps in managing environmentally friendly supply chains. Therefore, this research could contribute to understanding developments and challenges in the green supply chain field. The results of this study are expected to provide insights for decision-makers and practitioners in managing supply chain sustainably.

## **Literature Review**

### **Green Supply Chain Management**

Business fields, such as entrepreneurship and MSEs are part of the pillars of Indonesia's economy (Muhaimin et al., 2023). Increasing competitive advantage that synergizes strategy and performance requires a good and targeted management system. One of them is Supply Chain Management which includes inventory management from upstream to end-user (Ab Talib et al., 2020). A general understanding of supply chain management is about the process of creating production that is created and delivered to consumers efficiently (Tumiwa et al., 2023). Supply Chain Management aims to build trust, exchange information about market needs, develop new products, and manage resources (Ryandono et al., 2022).

The Green Supply Chain Management (GSCM) design emerged due to concerns about environmental sustainability, a consequence of growing economic and industrial activities (Ryandono et al., 2020). The appearance paradigm just mentioned with green supply chain management (GSCM) or green supply chain management is gaining a high level of attention among researchers or practitioners in field management and supply chain operations (Yudha et al., 2024). In contrast to supply chain management in general, green supply chain management prioritizes environmental sustainability. Green Supply Chain Management (GSCM) is needed in Indonesia for several reasons, including the need for environmental efficiency, brand image and reputation in the global market, and increased global competitiveness (Lee et al., 2019).

According to (Asniwati et al., 2023), Supply Chain Management (SCM) is a purposeful approach to optimizing integration between suppliers, manufacturing, warehouse, and storage. The goal is for the production and distribution of goods to be done with the exact amount, location, and time while minimizing cost and delivering satisfactory service to consumers. Green supply chain management is a management chain supply used for reducing waste, increasing the quality ecosystem, efficient environment, and stages cycle material. Green supply chain management (Hariyani et al., 2020).

The Green Supply Chain was a concept introduced by the University of Michigan. Green Supply Chain Management (GSCM) includes design and production-friendly environments as well as function technology in recycling. The main purpose of the chain model supply is to minimize the consumption of source power and influence bad to the environment (Starostka-park, 2012). Chain model supply is also a something contributing concept for getting excess in a way competitive that can fulfill the expectation of the client to chain friendly supply environment (Ghifara et al., 2022)

Research conducted by (Tian & Sarkis, 2020) shows that there is an influence of positive performance operational on the performance of the business. Thereby, it can be concluded that organizations must apply performance operations to push the enhancement of performance business. In line with the study of (Pratiwi et al., 2022), the contribution of green supply chain management directly impacts the performance of company practice This becomes key in the development ability management environment that leads to more optimal performance. However, other research conducted by (Audhitiawaty & Murwaningsari, 2024) finds that implementing green supply chain management is not influential and significant to the performance company. This can happen because lack of awareness from the public

about the importance continuity environment.

### Analysis Bibliometrics

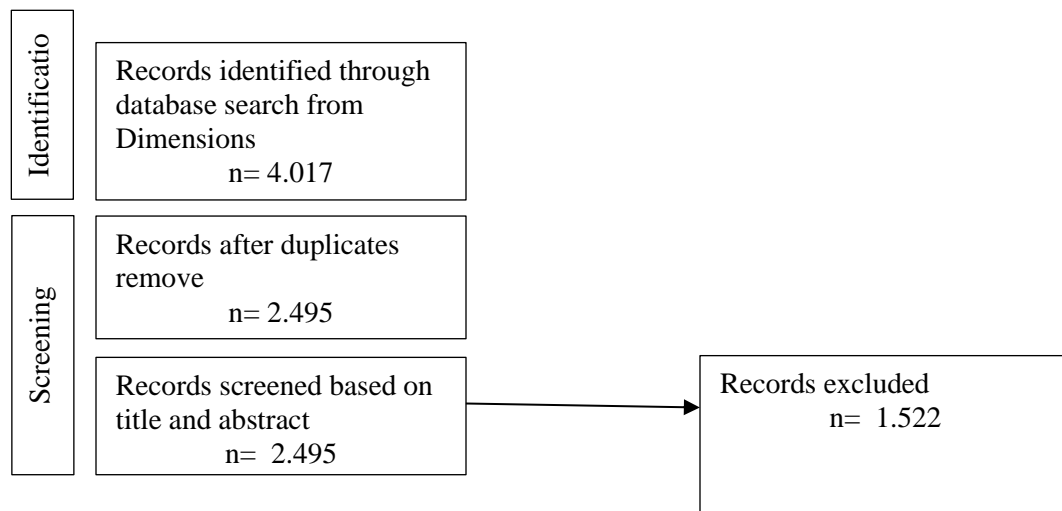
According to (Mafruchati, Othman, et al., 2023), bibliometrics is an analysis that uses both quantitative and qualitative methods based on sources related to the past. This method can serve as a tool to measure academic productivity quantitatively in discussing research related to a specific field by using citations to conclude trends related to that field. This approach differentiates bibliometric literature analysis from other types of literature reviews. Data collection is performed using triangulation, data analysis is inductive, and the outcome of qualitative studies emphasizes meaning rather than generalizations (Sugiono, 2013). For analyzing bibliometric data, there is a lot of software that can be used. But the most common and user-friendly software is Vosviewer (Mafruchati et al., 2022).

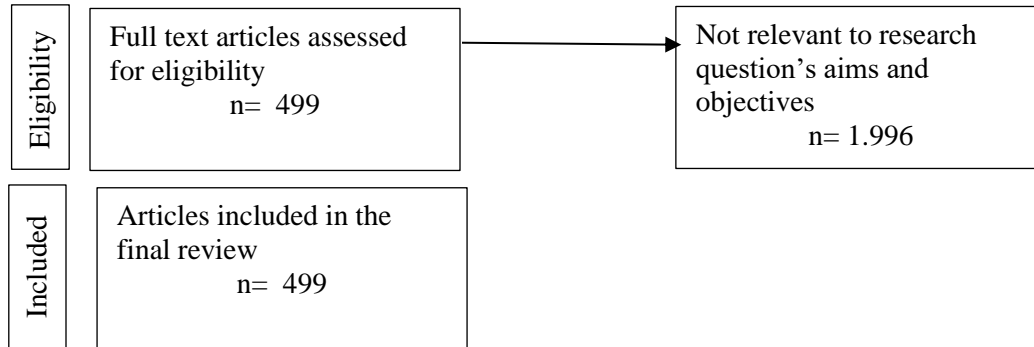
VOSviewer is a software developed for building and seeing map bibliometrics to visualize the publication data (Arruda et al., 2022). VOSviewer is available for free for the bibliometrics community (see [www.vosviewer.com](http://www.vosviewer.com)). VOSviewer can make a map writer or map journal based on author data and said key incident together. VOSviewer uses the VOS mapping technique, where VOS stands for visualization of similarity. The VOSviewer can display map data that has been built using the technique of scaling multidimensional (Mafruchati et al., 2024). Bibliometric analysis is important in research on Green Supply Chain Management (GSCM) for several reasons, such as mapping research trends, developing a theoretical framework, and as a guide for future research. Bibliometric studies can guide academics and practitioners to take relevant steps in managing a chain-friendly supply environment (Mafruchati, Ismail, et al., 2023). Thus, this research will make an important contribution to understanding developments and challenges in green supply chains. The expected outcome study can provide insights into the decisions of decision-makers and practitioners in sustainably managing the supply chain.

### Methodology

#### Data Collection

This study uses bibliometric analysis with VOSviewer software as an analysis tool. The data collected comes from journals published between 2014 to 2023 by utilizing metadata sourced from the Dimensions database. The data collection process involves searching with the keyword "Green Supply Chain Management". The search results resulted in a total of 4,017 research articles published in the last 10 years.





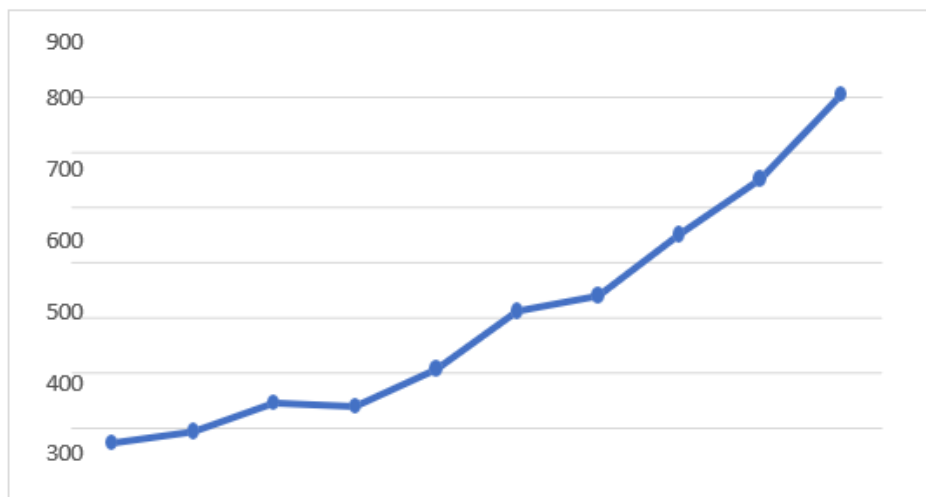
**Figure 1. Prisma Flow Diagram**

Source: Author (2024)

### Data Analysis

The analysis of trends in green supply chain management was conducted using Vosviewer software. Bibliometric analysis utilizes literature information from publication databases to create a scientific and reasonable description of networks and structures (Wardhana et al., n.d.). This method is effective for describing, analyzing, and summarizing previous studies in related fields. Through techniques such as cluster analysis, co-citation analysis, and visual analysis, bibliometrics can deeply analyze correlations between papers, authors, keywords, and more, providing reliable research information for scholars (Wardhana & Ratnasari, 2022a). In addition, Bibliometric analysis often involves studying complex scientific phenomena, such as research trends, collaboration patterns, and characteristics of scientific publications. Qualitative analysis allows researchers to reveal the meaning and context of the bibliographic data, which is crucial for determining the impact of the research and identifying areas needing further attention (Scarpa et al., 2018). Therefore, this study employs bibliometrics analysis to review the literature on green supply chain management.

### Results and Discussion



## Figure 2. Graph of number of publications per year

Source: [www.dimensions.ai](http://www.dimensions.ai)

The graph above shows the changes in the number of publications on Green Supply Chain Management (GSCM). Even though there's some variation in the number of publications each year, the overall trend shows a significant increase, with the highest number recorded in 2023 at a total of 803 articles. Table 1 breaks down the number of publications per year over the last ten years. The lowest number of publications was in 2014, with just 174 scientific papers. Since then, the number of publications has been increasing each year. However, it's worth noting that this growth hasn't been consistent, with drops seen in 2017 and 2020. Overall, this data reflects a positive growth in interest and attention toward GSCM research. Research by (Fontoura & Coelho, 2022) noted that between 1995-2016 the number of publications on GSCM was still relatively low, but there was a significant rise from 2012-2017, with the highest number of articles published in 2017 reaching 469. This shows that awareness of environmental sustainability, especially in the context of supply chains, started to grow around that time.

**Table 1. Amount Paper Issues (2014-2023)**

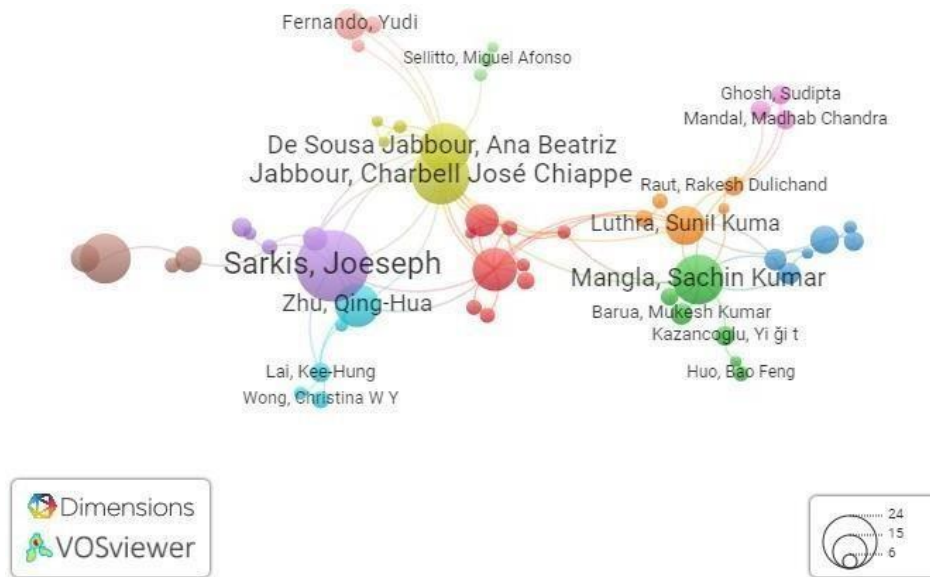
Year	Amount Publication
2014	174
2015	194
2016	246
2017	240
2018	307
2019	412
2020	440
2021	551
2022	650
2023	803
<b>Total</b>	<b>4,017</b>

Source: [www.dimensions.ai](http://www.dimensions.ai)

Based on the table and graph above, we can see that there is a significant increase in scientific research with the theme of Green Supply Chain Management. It can be seen that the highest publication is in 2023 with a total of 803 papers.

### Bibliometric Author Mapping Analysis

To find out more about the top authors who have published journal-related publications with Green Supply Chain Management, the authors use VOSViewer as an analysis software. A writer's productivity can be seen by how much and how often a writer produces or publishes a study. It can be seen in Figure 2 above, that there are 3 top prolific authors in the publication of scientific studies on Green Supply Chain Management. This mapping not only features the highest-ranked authors from the meta-analysis but also considers the number of links (relationships) between each author, and places co-authors close to the same one. As can be seen in Table 2 below, the third author who is a prolific author in scientific study publications on Green Supply Chain Management is Joeseph Sarkis with 33 scientific publications, Charbell José Chiappetta Jabbour with 26 scientific publications, and Ana Beatriz Lopes De Sousa De Sousa with 23 scientific publications.



**Figure 3. Author Mapping Visualization**

Source: VOSviewer

**Table 2. Classification Writer Top**

Writer	Number Of Publications
Joseph Sarkis	33
Charbell José Chiappetta Jabbour	26
Ana Beatriz Lopes De Sousa De Sousa	23

Source: www.dimensions.ai

Next is the journal mapping shown in Table 3. Based on Table 3 below, the journal that publishes the most articles on GSCM is the Journal of Cleaner Production, with 185 publications. This shows that there's a strong platform for publishing related to GSCM, and researchers and practitioners should take advantage of these journals to share knowledge and innovations in this field. By understanding the trends and gaps in GSCM research, we can identify areas that need further exploration and guide academics and practitioners in taking relevant steps toward environmentally friendly supply chain management.

**Table 3. Classification Journal Top**

Journal	Number Of Publications
Journal of Cleaner Production	185
Sustainability	184
Environmental Science and Pollution Research	72
Benchmarking An International Journal	46
SSRN Electronic Journal	45
International Journal of Logistics Systems And Management	44
International Journal of Production Economics	38

## Main Topics Discussed in GSCM Journals

Many studies on Green Supply Chain Management (GSCM) utilize the Resource-Based View (RBV) theory. According to the RBV framework, companies can achieve sustainable competitive advantage when they possess unique, valuable, rare, and hard-to-imitate resources (Freeman et al., 2021). One way companies attain this advantage is by managing their resources in an environmentally friendly and efficient manner within their supply chains (Shibin et al., 2020). Companies that integrate eco-friendly practices into their supply chain management can reduce negative environmental impacts while also improving operational efficiency. GSCM practices are crucial for companies aiming to be more environmentally conscious in their business operations, aligning with the principles of RBV (Li et al., 2020). A key aspect of the RBV theory is the importance of aligning a company's internal resources with the external natural environment. In the context of GSCM, companies need to adjust their strategies to minimize the environmental impacts resulting from their activities. This means companies should consider how their supply chain practices can contribute to environmental sustainability and how this interacts with the available natural resources (Cousins et al., 2019).

By adopting GSCM practices, companies not only comply with environmental regulations but also create value that's hard for competitors to imitate, thus enhancing their competitiveness in the market. The Resource-Based View (RBV) theory, when applied to Green Supply Chain Management (GSCM), contributes to achieving the Sustainable Development Goals (SDGs) (Ilyas et al., 2020; Zimon et al., 2020) by allowing companies to optimize environmentally friendly resources and improve operational efficiency, in line with SDG 12 (Sustainable Consumption and Production). Additionally, sustainable GSCM practices help reduce emissions and waste, supporting SDG 13 (Climate Action) and SDG 11 (Sustainable Cities and Communities) (Wijayanti et al., 2020).

Many journals discussing Green Supply Chain Management (GSCM) focus on three key areas that are crucial in its practice. The first is **green procurement**, which means buying eco-friendly goods or services. This involves choosing suppliers who follow good environmental practices, like using sustainable materials and reducing waste. Research by (Namazi & Khorramdel, 2022) mention that green procurement can improve product quality and lower the environmental impact of sourcing. The second key area is **green manufacturing**, which focuses on boosting production efficiency by using resources wisely and cutting down on harmful chemicals. Not only does this make operations more efficient, but it also helps set brands apart from the competition (Li et al., 2020).

Green manufacturing can reduce environmental risks while making production smoother. The third area is **reverse logistics**, which involves handling products after they've been used, like recycling, reusing, or properly disposing of them. reverse logistics can add value to products and reduce the amount of waste that ends up in landfills. On top of these, a lot of GSCM research also talks about **Environmental Management Systems (EMS)**. A study conducted by (Tarlani & Sirajuddin, 2020) explains that EMS helps integrate eco-friendly practices throughout all parts of the supply chain. In a study on Thai service organizations, 13 out of 17 cases had EMS in place, showing how important strong leadership and effective strategies are for improving the performance of green supply chains also stresses the need to consider environmental factors at every stage of the supply chain to ensure sustainability.

## Future Research Recommendations

Here are some of the things that are recommended by several journals for further research:

1. Development of more specific GSCM Scores, developing more specific and widely applicable GSCM scores. For example, a study that uses the SCOR (Plan, Source, Make, Deliver, and Return) model to develop a measurement matrix for the implementation level of GSCM.
2. Observation and Analysis of MSMEs, aiming to learn more about the implementation of GSCM in Micro,



small, and Medium Enterprises (MSMEs). For example, a study that identified the application of GSCM practices to MSMEs in the Special Region of Yogyakarta.

3. Conduct longitudinal studies to observe changes in GSCM practices in MSMEs over time. This will provide a better understanding of the dynamics of GSCM adoption and implementation and its impact on company performance.

## **Conclusion**

Based on the results of the analysis and discussion that has been carried out, it can be concluded that 4,017 scientific articles have been published in the last ten years (2014-2023). Additionally, the development of research trends regarding *green supply chain management* has also increased significantly, although there have been declines in certain years. Specifically, in 2017 and 2020. However, the declines in research trends during these years were not substantial. 2023 is the year when scientific publications regarding *green supply chain management* have been most productive. There are 803 articles on scientific-related issues published. Within the last ten years, the year with the fewest scientific publications was 2014. The positive development trend in research indicates an increasing awareness of the importance of environmental sustainability in companies, which is becoming more widely adopted and applied globally. The publication shows that the most productive author is Joseph Sarkis with 33 scientific publications, Charbell José Chiappetta Jabbour with 26 scientific publications, and Ana Beatriz Lopes De Sousa De Sousa with 23 scientific publications. The most productive journal in publishing scientific research is the Journal of Cleaner Production, which has published 185 articles related to *green supply chain management*. The findings of this study can be used as a reference for other researchers to be able to develop research related to green supply chain management using other more diverse methods. It should be noted that this study has limitations, as it only uses the Dimensions database for data collection. Future researchers are encouraged to use other databases, such as Google Scholar and Scopus, to ensure more comprehensive research results.

## **Author's Contribution**

All authors have contributed to the final manuscript. The contributions of each author are as follows, Hilda Wahyuni is responsible for collecting data, drafting manuscripts, and drafting drawings, drafting key conceptual ideas. Teti Haryati, M.Si provided excellent guidance and critical revisions of articles. Yudha Heryawan Asnawi responsible as proofreader.

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## **Declaration of Competing Interest**

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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