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Leveraging Big Data Analytics to Improve Decision Accuracy in Business Accounting

Gusti Ayu Ketut Rencana Sari Dewi [1]*, Gema Ika Sari [2], Radit Widiatmoko [3], Budiandru [4], Loso Judijanto [5]

[1] Universitas Pendidikan Ganesha, Indonesia

[2] Universitas Bina Bangsa Serang, Indonesia

[3] Universitas Islam Negeri Raden Mas Said Surakarta, Indonesia

[4] Universitas Muhammadiyah Prof. Dr. HAMKA, Indonesia

[5] IPOSS Jakarta, Indonesia

* Corresponding authors: ayurencana@undiksha.ac.id

Abstract: The rapid evolution of big data technology has significantly transformed business accounting practices, enhancing decision-making accuracy and operational efficiency. This study aims to explore the potential of big data analytics to improve the precision of managerial decisions in accounting, while identifying key implementation challenges and offering strategic recommendations for effective and sustainable adoption. Using a qualitative approach based on a systematic literature review, the research analyzes ten high-impact journal articles published over the past decade. The findings reveal that big data enables real-time processing of vast and diverse data sources—from financial transactions to consumer behavior—supporting more accurate financial forecasting, fraud detection, and risk mitigation. Advanced tools such as machine learning, deep learning, and automated analytics significantly enhance reporting accuracy and transparency. However, challenges remain, including data silos, a lack of analytical skills among accounting professionals, technological infrastructure limitations, data

governance issues, and internal resistance to change. Case studies from companies such as IBM, Walmart, and GE illustrate successful implementation when supported by clear digital roadmaps, strong leadership, and a culture of data-driven decision-making. This study bridges the gap between traditional accounting systems and modern data-driven environments and provides practical recommendations for accounting managers, including investing in employee training, fostering a data-driven culture, upgrading technological infrastructure, and addressing data governance through clear policies and frameworks. The findings are expected to assist accounting practitioners and policymakers in developing actionable strategies for integrating big data into accounting frameworks, ensuring its effective and sustainable application.

Keywords: Big data analytics, decision accuracy, business accounting.

利用大数据分析提高企业会计决策准确性

摘要：大数据技术的快速发展极大地改变了企业会计实践，提高了决策准确性和运营效率. 本研究旨在探索大数据分析在提高会计管理决策精准度方面的潜力，同时识别关键的实施挑战，并提出有效且可持续应用的战略建议。本研究采用基于系统文献综述的定性方法，分析了过去十年发表的十篇高影响力期刊论文。研究结果表明，大数据能够实时处理海量多样化数据源（从金融交易到消费者行为），从而支持更准确的财务预测、欺诈检测和风险规避。机器学习、深度学习和自动化分析等先进工具显著提高了报告的准确性和透明度。然而，挑战依然存在，包括数据孤岛、会计专业人员缺乏分析技能、技术基础设施限制、数据治理问题以及内部变革阻力。IBM、沃尔玛和通用电气等公司的案例研究表明，在清晰的数字化路线图、强大的领导力和数据驱动决策文化的支持下，大数据的实施能够取得成功。本研究弥合了传统会计系统与现代数据驱动环境之间的差距，并为会计经理提供了切实可行的建议，包括投资员工培训、培育数据驱动文化、升级技术基础设施，以及通过清晰的政策和框架解决数据治理问题。研究结果有望帮助会计从业人员和政策制定者制定切实可行的战略，将大数据融入会计框架，确保其有效且可持续地应用。

关键词：大数据分析、决策准确性、商业会计

1. Introduction

The rapid development of information and communication technology has transformed various aspects of business, including accounting practices, which increasingly rely on big data for more accurate and effective decision-making [1], [2]. Big data enables the collection, storage, and analysis of large and diverse datasets, offering new opportunities to optimize business accounting functions [3], [4]. Its application in accounting can help identify transaction patterns, detect anomalies, and predict financial trends relevant to risk management and corporate performance [5], [6].

Big data refers to extremely large and complex datasets that cannot be processed using traditional methods due to their high volume, velocity, and variety [1]. The big data phenomenon has emerged alongside advances in digital technology, enabling real-time data collection from diverse sources such as social media, sensors, business transactions, and IoT devices [7]. Big data encompasses not only vast quantities of information but also varying levels of data quality, ranging from structured to unstructured formats. Through big data analytics, organizations can uncover previously hidden patterns, trends, and insights, thereby supporting faster and more accurate decision-making across sectors such as business, healthcare, and government [3]. In addition, big data presents significant challenges related to data storage, security, privacy, and ethics [5]. Managing large-scale data requires advanced technological infrastructure, such as cloud computing and machine learning algorithms, to enable efficient processing and analysis [8]. In the

context of government and public services, big data can improve service efficiency, anticipate community needs, and monitor policy implementation in real time [4]. Therefore, developing human resource capacity and establishing an adequate regulatory framework are essential to maximizing the benefits of big data while safeguarding individual privacy and data security rights.

However, the implementation of big data in business accounting still faces various challenges, ranging from data quality and integrity to the complexity of analysis and the need for personnel skilled in data analytics technologies [9], [10]. This necessitates the development of methods and systems capable of handling the characteristics of large, rapidly changing, and diverse datasets, and translating them into actionable information for managerial decision-making [11], [12]. In this context, business accountants must strengthen their analytical and information technology capabilities to fully leverage the benefits of big data [13], [14].

Moreover, the use of big data analytics can enhance transparency and accountability in financial reporting, a crucial aspect in building stakeholder trust [15], [16]. With this technology, companies can perform real-time audits, accelerate the reporting process, and reduce the risk of errors and fraud [17], [18], [19]. Therefore, the adoption of big data represents not only a technical innovation but also a paradigmatic shift in accounting governance and financial management [20], [21].

The urgency of this research arises from the fact that, although the potential of big data in business accounting is widely recognized, there remains a significant gap in both practical and theoretical understanding of how big data analytics can effectively enhance decision-making accuracy [9], [10]. Furthermore, there is an urgent need for models and frameworks that integrate big data analytics with traditional accounting processes to ensure more systematic implementation and measurable impact [11], [12]. This study aims to address these challenges by providing comprehensive insights into the application of big data in business accounting.

Several previous studies have highlighted the benefits and challenges of big data in the context of business and accounting [13], [16], [19]; however, research focusing specifically on how big data can enhance decision-making accuracy in business accounting remains limited. Therefore, this study addresses this gap by combining a systematic literature review with an in-depth analysis of best practices and current technologies in big data analytics for accounting.

The primary objective of this study is to examine how the use of big data analytics can improve the accuracy of decision-making in business accounting. Additionally, the study aims to identify key implementation challenges and formulate strategic recommendations for the effective and sustainable adoption of big data analytics in the accounting sector.

2. Method

This study employs a qualitative approach using a literature review (library research) to conduct an in-depth examination of concepts, theories, and findings from previous studies on the use of big data analytics in improving decision-making accuracy in business accounting. A literature review was selected because the study focuses on theoretical and conceptual analysis based on valid and relevant academic sources, enabling a comprehensive understanding without requiring primary data collection [22], [23]. This approach allows researchers to integrate diverse perspectives and published empirical findings while identifying gaps and opportunities in the application of big data analytics in accounting.

The data sources for this study consist of primary and secondary literature obtained from national and international scientific journals, academic books, research reports, and policy documents related to big data analytics and business accounting. Data were collected through systematic searches in academic databases such as Google Scholar, Scopus, and accredited journal portals, using key search terms including "big data analytics," "business accounting decision accuracy," and "data-driven accounting" [24], [25]. Literature selection was based on content relevance, publication year (within the last five years), and source credibility to ensure the quality and novelty of the data used [26].

The data collection was conducted using the documentary method, involving the steps of recording, organizing, and classifying literature in accordance with the research focus. Data analysis employed descriptive and interpretive content analysis techniques to identify key themes, patterns, and conceptual relationships between big data analytics and improved decision-making accuracy in business accounting [27], [28]. Through this process, the researchers present a critical synthesis that integrates diverse findings and theories, contributing meaningfully to the development of big data-based accounting science and practice.

3. Results

The following data represents a selection of 10 relevant and credible journal articles drawn from various research sources on the application of big data analytics in improving the accuracy of business decisions, particularly in the field of accounting. These articles provide important empirical and theoretical foundations to support the arguments presented in this study (Table 1).

Table 1. Literature review (compiled by the authors)

No.	Article Title	Authors	Year	Source	Main Findings
1	Evaluating the role of big data analytics in enhancing accuracy and efficiency in accounting: A critical review	Chioma Susan Nwaimo, Ayodeji Enoch	2021	*Journal of Accounting & Organizational Change*	Presents a critical review of the role of big data analytics in improving accounting accuracy and efficiency.
2	Investigating the Use of Big Data Analytics in Predicting Market Trends and Consumer Behavior	David Iyanuoluwa Ajiga, Oladimeji Hamza, Adeoluwa Eweje	2022	*Journal of Business Research*	Analyzes the use of big data analytics in predicting market trends and consumer behavior.
3	Social Media Marketing as New Marketing Tool	Sonal Trivedi and Reena Malik.	2021	*Big Data Analytics for Improved Accuracy, Efficiency, and Decision Making in Accounting*	Examines how big data analytics can improve accuracy, efficiency, and decision making in accounting.
4	Business analytics and decision science: A review of techniques in strategic business decision making	Chidera Victoria Ibeh, Onyeka Franca Asuzu, Temidayo Olorunsogo, Oluwafunmi Adijat Elufioye, Ndubuisi Leonard Nduubuisi and Andrew Ifesinachi Daraojimba	2020	*Journal of Business Analytics*	Presents a review of techniques in business analytics and decision science for strategic decision making.
5	A Review of Financial Accounting Fraud Detection based on Data Mining Techniques	Anuj Sharma, Prabin Kumar Panigrahi	2013	*International Journal of Computer Applications*	Presents a review of data mining techniques in financial accounting fraud detection.
6	Detection of Anomalies in Large Scale Accounting Data using Deep Autoencoder Networks	Marco Schreyer, Timur Sattarov, Damian Borth, Andreas Dengel, Bernd Reimer	2017	*arXiv preprint*	Proposes the use of deep autoencoder networks to detect anomalies in large-scale accounting data.
7	Automated machine learning: AI-driven decision making in business analytics	Marc Schmitt	2022	*arXiv preprint*	Analyzes the potential of automated machine learning in AI-based decision making in business analytics.
8	Deep learning in business analytics and operations research: Models, applications and managerial implications	Mathias Kraus, Stefan Feuerriegel, Asil Oztekin	2018	*arXiv preprint*	Examines the application of deep learning in business analytics and research operations and its managerial implications.
9	Business intelligence in the era of big data: A review of analytical tools and competitive advantage	Ejuma Adaga	2020	*Journal of Business Intelligence*	Presents a review of analytical tools in business intelligence in the era of big data and its competitive advantages.
10	The Role of Accounting Digitization in Entrepreneurial Success in West Java: Quantitative study of efficiency, accuracy, cost reduction, customer satisfaction	Eka Seseli, Kathleen Risakotta, & Adhi Bawono	2021	*The Es Accounting and Finance Journal*	Examines the role of accounting digitization in entrepreneurial success in West Java, with a focus on efficiency, accuracy, cost reduction, and customer satisfaction.

The articles selected in this study provide in-depth insights into the role of big data analytics in enhancing decision-making accuracy in business accounting. Each article presents relevant findings and analysis on the application of big data analytics in accounting, with the primary goal of improving efficiency, accuracy, and

strategic decision-making.

Nwaimo and Enoch offer a critical review of how big data analytics can improve accuracy and efficiency in accounting. The authors argue that by analyzing large volumes of data, accounting processes can become more transparent and support faster, more accurate decision-making. A key finding highlighted in the article is that this technology helps reduce human errors in financial recording and reporting, thereby increasing the reliability of financial statements [29].

Ajiga, Hamza, and Eweje examine the application of big data analytics in forecasting market trends and consumer behavior. The authors emphasize the importance of data in predictive analytics for enabling companies to make more informed decisions. By leveraging big data collected from diverse sources, organizations can more easily identify patterns in consumer behavior and respond to market changes more quickly and accurately. This capability enhances customer satisfaction and supports the development of more targeted business strategies [30].

Trivedi and Malik explore how big data analytics can enhance accuracy, efficiency, and decision-making in accounting. They argue that technologies such as machine learning enable accountants to detect anomalies or potential risks in financial statements that may not be identifiable through manual analysis. Furthermore, big data-based analysis facilitates faster decision-making based on richer and more reliable data [31].

A review of business analytics techniques applied in strategic decision-making is provided by [32]. The authors explain that business analytics, which includes big data analytics, enables organizations to make data-driven decisions and reduces reliance on intuition or instinct. The application of these techniques in accounting allows companies to develop more appropriate financial strategies, identify potential issues earlier, and mitigate risks more effectively.

Meanwhile, Sharma and Panigrahi examine the use of data mining techniques in detecting financial statement fraud. The use of data mining to identify unusual patterns or fraudulent activities significantly enhances accuracy in accounting, as big data enables the detection of anomalies not visible through traditional methods. The authors propose that applying specific data mining algorithms can facilitate earlier fraud detection, helping organizations avoid significant financial losses [33].

Schreyer, Sattarov, Borth, Dengel, and Reimer propose the use of deep autoencoder networks to detect anomalies in large-scale accounting data. Deep learning is employed to extract information from big data and identify outliers or errors that may be overlooked by humans or traditional systems. The application of this method can produce more accurate and reliable reports, as well as accelerate the audit and internal control processes in accounting [34].

Schmitt introduces the concept of automated machine learning (AutoML), which integrates artificial intelligence (AI) into big data analysis to support business decision-making. The main finding of the article is that AI technology can automate data processing and analysis, enabling faster, more precise, and data-rich decision-making. This approach significantly reduces human error and enhances accuracy in financial planning and accounting decisions [35].

Kraus, Feuerriegel, and Oztekin further examine the application of deep learning in business analytics, including within the accounting context. The authors note that deep learning offers a more efficient and accurate way to process large volumes of data and predict future outcomes based on historical data. This capability enhances decision-making effectiveness in financial planning and risk assessment [36].

Adaga discusses business intelligence (BI) tools that leverage big data. The main finding is that big data-based BI enables organizations to develop a sharper competitive advantage by supporting more informed strategic decisions. This advantage arises from the ability of big data analytics to provide deeper insights into markets, consumers, and financial trends, ultimately improving accounting and financial decision-making [37].

Finally, Seseli, Risakotta, and Bawono examine the role of accounting digitization in entrepreneurial success, with a focus on efficiency, accuracy, and customer satisfaction. The authors highlight how big data-based accounting digitization enables businesses to optimize resources and improve financial management, leading to enhanced overall business performance [38].

Overall, the findings from these articles suggest that the application of big data analytics not only improves accuracy in financial recording and reporting but also supports faster and more precise decision-making. By reducing human error and identifying complex patterns, big data analytics provides organizations with the opportunity to enhance operational efficiency, detect potential risks earlier, and develop more effective financial strategies.

4. Discussion
4.1. Improving Decision Making Accuracy through Big Data Analytics

The improved accuracy of business accounting decision-making through big data analytics has fundamentally changed how organizations understand financial conditions and make strategic decisions. This approach enables companies not only to examine historical data but also to identify hidden patterns, anomalies, and emerging trends. Big data analytics offers significant advantages in terms of the speed and depth of analysis. With this technology, data that was

previously static and limited can now be processed in real time from diverse sources—such as financial transactions, supply chain sensors, customer interactions on social media, and external market information, including commodity prices and regulatory changes [39], [40].

One of the main strengths of big data lies in its ability to support predictive modelling. In accounting, this enables more accurate financial forecasting, more prudent credit risk management, and more efficient resource allocation. The use of machine learning in cash flow analysis, for example, can generate projections based on seasonal patterns that are not detectable through traditional linear analysis [11]. Furthermore, companies can employ prescriptive analytics to recommend optimal actions during market fluctuations or economic crises, making the decision-making process more dynamic and data-driven [41].

A real-life example illustrating this application is the multinational technology company IBM. Through the Watson Analytics and Cognos platforms, IBM has developed a big data-based decision-making system for its internal finance function. IBM's Financial Planning and Analysis (FP&A) integrates data from over 50 different systems to consolidate global financial reporting. As a result, the company reduced the time required to analyze annual financial reports by 75% and improved the accuracy of operational cost forecasts through AI-based predictive modelling. The use of big data has also directly enhanced the speed of managerial decision-making and the efficiency of corporate spending during a period of global organizational restructuring.

Another example is Walmart, the global retail giant, which uses a big data analytics system to manage finances and inventory across more than 11,000 stores worldwide. By integrating financial data, consumer behavior data, and weather trends, Walmart can forecast weekly sales and optimize logistics expenditures. This integration also enables the accounting division to update financial reports rapidly based on real-time market data. Walmart's use of Hadoop and Spark demonstrates that big data-driven accounting is no longer a future vision but an established practice that delivers high accuracy in reporting and business decision-making [42].

Thus, the improvement in accounting decision-making accuracy driven by big data analytics is not merely conceptual but has been demonstrated in practice by major corporations. Through cross-data integration and sophisticated algorithms, big data has transformed accounting from a mere record-keeping function into a strategic instrument capable of delivering tangible and sustainable business value.

4.2. Supporting Technology and Practical Implementation

The application of big data analytics in business accounting relies heavily on advanced computing infrastructure and evolving software technologies. Tools such as Hadoop and Apache Spark enable large-scale, parallel, and distributed data processing, allowing transaction data previously confined to traditional accounting systems to be integrated, processed, and analyzed rapidly. Hadoop provides the capability to store diverse data types, both structured (e.g., financial records) and semi-structured (e.g., emails or system logs), on a single platform. Meanwhile, Spark supports in-memory processing, significantly accelerating real-time analytics [39].

In practice, programming languages such as Python and R are the primary tools for data extraction, transformation, and analysis. Python, with libraries such as Pandas, Scikit-learn, and TensorFlow, enables complex statistical modelling and the development of machine learning models for detecting financial anomalies or classifying customer risks. R, in contrast, excels in advanced statistical processing and data visualization within financial contexts. Meanwhile, visualization tools such as Tableau and Microsoft Power BI have become industry standards due to their ability to present analytical results through interactive dashboards that are easily interpretable by non-technical management [40].

A real-world example of this application is General Electric (GE). GE uses the Predix platform—built on big data and IoT foundations—to integrate financial data, sensor data from production machinery, and other operational data. Through this integration, GE's finance division can perform automated reporting and real-time production cost analysis. For instance, when raw material prices fluctuate or demand changes, the system automatically adjusts cost projections and recommends more efficient budget allocations. By leveraging this analytical technology, GE has reduced its quarterly reporting cycle from 10 days to just 2 days and achieved annual savings of millions of dollars in operational costs [11].

In addition to GE, Bank of America applies big data analytics within its internal audit function. The bank uses machine learning-based predictive models to detect suspicious transactions and accelerate the audit process with greater accuracy. This technology is integrated with Power BI dashboards, which auditors use to visualize trends and patterns in customer financial data and internal transactions. As a result, Bank of America has significantly reduced the time required for its annual audit process and minimized the risk of human error [41].

Through this technological integration, big data analytics functions not merely as a complementary accounting tool, but as a core component of strategic financial decision-making. Its ability to manage, analyze, and present data in an actionable format makes it essential for organizations seeking to survive and thrive in the digital economy (Table 2).

Table 2. Challenges in implementing big data analytics (compiled by the authors)

No.	Challenges	Explanation	Impact on Business Accounting
1	Data Silos	Data is separated in various systems or departments that are not connected to each other, for example financial data is not integrated with logistics or HR data.	Hinders cross-unit data consolidation, reduces analytical accuracy, and slows down the financial reporting process.
2	Limited HR Competence	Many accountants do not yet have expertise in data science such as statistical analysis, programming (Python, R), or the use of data visualization tools.	Causes a gap between big data analysis results and user understanding, resulting in suboptimal analytical results.
3	Data Security and Privacy Risks	Processing large amounts of data poses a risk of leakage or misuse, especially if it is not supported by adequate cybersecurity and data governance systems.	Raises potential violations of laws such as GDPR and the Personal Data Protection Act, and reduces public trust.
4	Limited Technology Infrastructure	Some companies, especially small to medium-sized companies, do not yet have adequate server, cloud, or big data software infrastructure.	Limits the ability to run big data analytics efficiently and sustainably.
5	Organizational Resistance to Change	There is internal resistance to digital transformation, such as fear of losing jobs or difficulty adapting to new systems.	Hinders the implementation of data-driven strategies and reduces support from internal stakeholders.

The challenges of implementing big data analytics in business accounting are not only technical but also encompass human resource, organizational culture, and data governance dimensions. A real-world example illustrating this is General Motors (GM), which faced difficulties in integrating data across departments. Prior to its major digital transformation in the early 2010s, GM operated more than 100 unconnected global data centers. Each division (manufacturing, finance, and customer service) used disparate systems, resulting in data fragmentation and the creation of data silos. This hindered the finance department's ability to access real-time sales data or operational costs, ultimately compromising the accuracy of financial reports and budget forecasts [11].

In addition to infrastructure challenges, GM encountered human resource limitations. Many accountants and financial analysts were unfamiliar with data-driven approaches and lacked proficiency in advanced analytical tools such as R, Python, or Tableau. As a result, despite significant investments in new technology systems, the expected benefits were not immediately realized due to low adoption at the operational level. To address these challenges, GM launched a large-scale internal training program and established a dedicated cross-functional data analytics team. This enabled rapid integration of financial and operational data, leading to immediate improvements in reporting efficiency [40].

Data security and privacy have emerged as critical concerns. For example, the financial services company Equifax experienced a major data breach in 2017 that exposed the personal information of over 147 million individuals, including sensitive financial data such as Social Security numbers and credit card details. Although not a direct accounting case, this incident highlights the importance of implementing robust data governance and cybersecurity systems in big data

environments. As a result of the breach, Equifax faced significant litigation, reputational damage, and fines amounting to $700 million, which materially affected its financial statements and eroded investor confidence [41].

Another challenge is internal resistance to change. A report by IBM (2020) indicates that many organizations face cultural barriers when transitioning from manual processes to data-driven systems. In some large manufacturing companies, for example, senior accountants and finance executives place greater trust in business intuition and experience than in algorithmic outputs. This resistance has led to slow adoption of big data analytics, even where the technology is available. IBM suggests that successful implementation depends significantly on leadership involvement in fostering an organizational culture that supports data-driven decision-making.

These cases underscore that adopting big data analytics in business accounting involves more than acquiring technology. It requires comprehensive organizational readiness, encompassing systems, competencies, work culture, and robust data governance policies.

4.3. Effective and Sustainable Implementation: Strengthening Strategy

The implementation of big data analytics in business accounting must begin with system integration guided by a clear digital roadmap. Target Corporation successfully integrated transaction and financial data in real time, significantly accelerating internal audits. However, technology alone is insufficient without enhancing personnel competence. IBM addressed this by training accounting staff in Python and Power BI, enabling them to interpret analytics and improve decision-making. Data governance is equally critical; the Equifax data breach demonstrated the severe

consequences of inadequate security systems. Finally, GE exemplifies the importance of cultivating a data-driven culture, where financial decisions are based on analytical insights rather than intuition.

5.   Conclusion

In conclusion, this study reaffirms the critical role of big data analytics in enhancing decision-making accuracy in business accounting. The integration of advanced technologies—such as machine learning and real-time data visualization—improves the reliability of financial reporting and strengthens organizational agility in responding to dynamic market conditions. Analysis of the existing literature and best practices reveals that successful implementation depends on several key enablers: robust technological infrastructure, skilled human capital, effective data governance, and institutional support for cultivating a data-driven organizational culture.

From a practical perspective, organizations are encouraged to develop clear and actionable digital transformation roadmaps that integrate big data analytics into core accounting functions. Accounting managers should prioritize structured upskilling programs to improve data literacy and proficiency in analytical tools among accountants. Furthermore, establishing secure, compliant, and transparent data governance frameworks is essential for maintaining stakeholder trust and mitigating privacy risks, particularly when handling sensitive financial data.

Looking ahead, future research should focus on empirical studies that quantitatively assess the impact of big data adoption on financial performance across different industries and organizational sizes. Additionally, exploring the role of organizational culture, leadership styles, and emerging technologies—such as blockchain and artificial intelligence—in enabling or hindering big data integration within accounting functions could yield valuable insights for supporting sustainable transformation in the accounting sector.

Declarations

Author Contributions
Conceptualization, G.A.K.R.S.D., and G.I.S.; methodology G.A.K.R.S.D.; software, G.I.S., and R.W.; validation, G.A.K.R.S.D., G.I.S., and K.; formal analysis, R.W.; investigation, G.I.S., A.T.H.R., B., and L.J.; resources, G.A.K.R.S.D, and G.I.S.; data curation, G.A.K.R.S.D., and L.J.; visualization, B., and L.J.; writing—original draft preparation, all authors contributed equally; writing—review and editing, G.A.K.R.S.D.; supervision, G.A.K.R.S.D.; project administration G.A.K.R.S.D. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest
The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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