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Designing a Lean–World-Class Model in Electric Power Distribution

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ABSTRACT

The primary objective of this study is to design a lean–world-class model in electric power distribution to evaluate the efficiency of Iran's electricity distribution chain, with the aim of improving the reliability and service quality of the electric power distribution network. Fuzzy logic-based methods enable the mathematical formulation of vague concepts and prediction. A comprehensive literature review was conducted to identify key indicators influencing lean and world-class production in electric power distribution. Face-to-face interviews were conducted, in line with the sample size required for each research method, with managers and experts at the Tehran Electricity Distribution Company. Fourteen indicators were identified, and through the fuzzy Delphi method, the extent to which Iran's electricity distribution industry aligns with lean principles and world-class standards was assessed. In this qualitative study, the snowball sampling method was applied. The sample consisted of 26 specialists and experts. After interviewing these 26 experts from fields such as consumption management, customer services, Tehran electricity distribution dispatching, operation, and preventive maintenance (PM), 14 indicators were identified under the theme of "Designing a Lean–World-Class Model in Electric Power Distribution." Additionally, 54 concepts were extracted from the interview content and the body of existing literature and academic articles. The gender distribution among the experts interviewed comprised 12 women and 14 men, of whom 18 held master's degrees and 8 held doctorates. Through the fuzzy Delphi method and by identifying 14 key indicators and their associated concepts, this study evaluates the lean and world-class attributes of electricity distribution. It concludes that the designed lean–world-class model, with indicators such as loss reduction, value creation, enhanced reliability, and service quality in the distribution network, can significantly contribute to improving the efficiency of the electricity distribution chain in Iran.

Keywords: *Model design; lean production; energy losses; loss reduction; electric power distribution; distribution automation; smart grid; continuous improvement in electricity distribution; world-class approach.*

1. Introduction

The rapid evolution of the global economy, fueled by advances in digitalization, environmental concerns, and market liberalization, has compelled industries to adopt more agile and efficient operational models. Among these, the electricity distribution sector—traditionally characterized by heavy infrastructure and bureaucratic inertia—faces increasing pressure to modernize its systems in line with lean thinking and world-class performance standards. In this context, the integration of lean management principles with a world-class operations approach has emerged as a strategic necessity to enhance efficiency, reduce losses, and meet consumer expectations in a dynamic environment (Asiyachi, 2024; Ghaem Maghami et al., 2022).

Lean thinking, which originated from the Toyota Production System, emphasizes the elimination of waste, continuous improvement, and customer-centric value creation. Its application in manufacturing is well-established, but its adaptation to service-oriented and infrastructure-intensive sectors like power distribution has only recently gained traction (Parsa Rad & Azizi, 2021). While lean approaches in such contexts often require reinterpretation due to sectoral complexity and public service obligations, they nonetheless provide a valuable framework for efficiency improvement and performance excellence (Jalalion & Farsijani, 2020).

In the case of Iran, the electricity distribution industry is undergoing a critical transformation to align with these global paradigms. The challenges of energy loss, aging infrastructure, non-technical inefficiencies, and inconsistent service delivery call for robust performance models rooted in both lean and world-class principles (Fallahi et al., 2019; Pourabadolahankooch et al., 2021). However, the development of such a model requires not only a theoretical framework but also empirical validation to ensure practical feasibility.

Prior research has underscored the value of integrating Data Envelopment Analysis (DEA) and fuzzy methodologies to assess the performance of electricity distribution companies in uncertain and multi-input environments (Fallahi et al., 2019; Khodadadi Pour et al., 2023). These methodologies facilitate decision-making under ambiguity and allow for the incorporation of qualitative expert opinions, making them particularly suited for complex sectors like energy distribution (Ahmadi et al., 2016; Habibi et al., 2015). In particular, the Fuzzy Delphi Method (FDM) has become an increasingly popular technique for identifying consensus-based performance criteria and screening key indicators in uncertain decision contexts (Habibi et al., 2015; Saffie & Rasmani, 2016).

To implement a comprehensive model of lean–world-class electricity distribution, it is essential to define critical indicators and validate them through structured expert consensus. For this purpose, the Fuzzy Delphi Method serves as a rigorous technique to capture expert judgment and prioritize criteria while accounting for linguistic vagueness and qualitative nuances (Ahmadi et al., 2016; Habibi et al., 2015). This is particularly relevant in Iranian electricity distribution networks, where operational standards, regional constraints, and stakeholder expectations can vary significantly (Pourabadolahankooch et al., 2021).

In this study, 14 indicators and 54 underlying concepts were identified and validated using the Fuzzy Delphi Method and subsequently tested through Structural Equation Modeling (SEM) using SmartPLS software. This methodological integration enables the assessment of both convergent and discriminant validity and ensures that the selected indicators contribute meaningfully to the model's construct validity (Habibi & Adanvar, 2017; Henseler et al., 2016). As recommended by Henseler et al. (2016), statistical thresholds such as AVE > 0.5, CR > AVE, Rho_A > 0.7, and HTMT < 0.9 were adopted to confirm the reliability and validity of the model constructs (Henseler et al., 2016).

The dual emphasis on lean distribution and world-class performance aligns with broader trends in performance optimization seen across various infrastructure sectors globally. For instance, Ghaem Maghami et al. (2022) proposed a sustainable performance evaluation model for the global automotive industry, emphasizing the convergence of economic, environmental, and technological metrics—a perspective equally applicable to the power distribution sector (Ghaem Maghami et al., 2022). Similarly, studies on wireless telecommunications for smart grid measurement systems highlight the critical role of technological criteria in achieving distribution efficiency (Tanakian et al., 2021).

World-class electricity distribution systems are characterized by automated infrastructure, reduced technical and non-technical losses, enhanced customer services, and data-driven decision-making mechanisms. In this regard, Asiyachi (2024) emphasizes the need for management systems that are not only lean in operation but also adaptable, innovative, and globally benchmarked (Asiyachi, 2024). This orientation is critical for Iranian electricity companies as they strive to meet rising consumer demands and align with international service standards (Parsa Rad & Azizi, 2021).

Moreover, lean principles cannot be effectively institutionalized without a strong measurement framework. Mahmoudi and Mahmoud Oghati (2021) demonstrated how fuzzy logic can be applied for optimal placement of distributed generation resources and switches, which directly affects the performance of power distribution networks (Mahmoudi & Mahmoud Oghati, 2021). Their research provides further justification for embedding fuzzy-based modeling into lean distribution frameworks.

Furthermore, the importance of expert-driven consensus in identifying and validating performance indicators has been validated across sectors. Ahmadi et al. (2016) employed Fuzzy Delphi to capture the perspectives of ergonomics experts on intervention goals, providing a methodological precedent for the present study's approach in capturing expert insights in power distribution (Ahmadi et al., 2016). Similarly, Habibi et al. (2015) and Saffie (2016) emphasized the methodological rigor and transparency of the Fuzzy Delphi process in forecasting and decision modeling under ambiguity (Habibi et al., 2015; Saffie & Rasmani, 2016).

Another key aspect of this study is the use of the SmartPLS software to evaluate the measurement model's fit and to validate the structural relationships among indicators. SmartPLS supports the partial least squares path modeling technique, which is well-suited for exploratory research and is widely adopted in new technology and operations research (Habibi & Adanvar, 2017; Henseler et al., 2016). By applying the Fornell–Larcker criterion and HTMT ratio, the study ensures that discriminant validity is preserved, which is crucial for construct-specific accuracy in a multi-dimensional evaluation model.

Finally, the inclusion of operational and financial indicators, alongside technical and quality-related dimensions, positions this study within the broader literature on multi-criteria performance evaluation. As demonstrated by Sagarra et al. (2017), the integration of DEA with other dimensionality reduction techniques allows for a more holistic understanding of organizational efficiency, particularly in public utility contexts (Sagarra et al., 2017). The methodology adopted in this study—anchored in FDM and PLS-SEM—serves as a replicable framework for similar analyses in electricity and other infrastructure sectors.

In conclusion, the design of a lean–world-class model for electricity distribution in Iran represents a strategic initiative grounded in both theoretical rigor and empirical evidence. Drawing upon lean production philosophy, world-class management standards, fuzzy logic, and structural equation modeling, the study offers a validated and actionable framework to enhance the performance of Iran's electricity distribution companies. By leveraging insights from global and local research, and through systematic engagement with expert perspectives, the study contributes to the growing body of knowledge on performance excellence in critical public infrastructure sectors.

2. Methods and Materials

The present study is cross-sectional in nature, conducted through a qualitative approach, and implemented using a survey method based on interviews. Furthermore, the study is applied in terms of purpose. The focus of this research is the design of a lean–world-class production model in electric power distribution. Initially, a conceptual model was developed comprising two main indicators: lean distribution, associated with seven directly related concepts, and the world-class approach, also connected to seven directly related concepts. These two components were interrelated in a bidirectional manner.

Step One: Initially, experts in the relevant subject area were selected using the snowball sampling method. The level of expertise and knowledge of the selected individuals was of critical importance.

Subsequently, a questionnaire was developed based on a five-point Likert scale to assess the importance of each factor. The options for measuring the importance of each element were: 1) Very Low, 2) Low, 3) Moderate, 4) High, and 5) Very High. This questionnaire was distributed among a group of experts, consisting of 26 specialists in the Tehran electricity distribution industry, including professionals in consumption management, customer services, Tehran distribution dispatching, operations, and preventive maintenance (PM).

The expert group completed the questionnaire anonymously and returned it to the researcher. The questionnaires were designed to collect detailed information—through qualitative expert input—on indicators influencing lean and world-class production in electric power distribution. The researcher then quantified the responses using coded or numerical values based on the five-point Likert scale, thus entering the quantitative (statistical) analysis stage of the fuzzy Delphi process.

Table 1

Linguistic Terms and Fuzzy Delphi Numbers

Linguistic Term	Triangular Fuzzy Numbers
Very Low (1)	(0.00, 0.00, 0.25)
Low (2)	(0.00, 0.25, 0.50)
Moderate (3)	(0.25, 0.50, 0.75)
High (4)	(0.50, 0.75, 1.00)
Very High (5)	(0.75, 1.00, 1.00)

Table 2

The 14 Extracted Indicators and 54 Concepts Derived from the Interviews

No.	Extracted Indicators	Concepts	Codes
1	Implementation of Value Creation in Electricity Distribution Companies	4 Concepts	A1 to A4
2	Reduction or Elimination of Waste	3 Concepts	B1 to B3
3	Financial Performance and Cost	4 Concepts	C1 to C4
4	Increase in Production Speed	5 Concepts	D1 to D5
5	Identification of ISO 9000 Implementation in Electricity Distribution Companies	4 Concepts	E1 to E4
6	Timely Operation of Dispatching Projects: Telecommunications and IT	5 Concepts	F1 to F5
7	Improvement of Power Plant Efficiency	3 Concepts	H1 to H3
8	Consumption Management: Reduction of Non-Technical Losses	4 Concepts	G1 to G4
9	Distribution Automation as a Prerequisite for Smart Grid Development	3 Concepts	I1 to I3
10	Replacement of Manual Medium Voltage Grid Switching with Automation Instead of System 121	3 Concepts	J1 to J3
11	Collective Efforts Toward Continuous Improvement	3 Concepts	K1 to K3
12	Quality Management	4 Concepts	L1 to L4
13	Distribution Services	5 Concepts	M1 to M5
14	Utilization of Technology in the Distribution Network	4 Concepts	N1 to N4

Step Two: This step includes the aggregation of fuzzified values that have been recorded as fuzzy numbers. In this study, triangular fuzzy numbers were used.

Step Three: This stage involves the defuzzification process, i.e., converting fuzzy numbers into crisp (definite) values.

Step Four: This stage consists of selecting a threshold value or Cronbach's alpha for the purpose of indicator screening, which is commonly set at 0.7. At this stage, if a calculated value is smaller than the threshold, the corresponding indicator is eliminated. Only those values that are equal to or greater than the threshold are retained and validated.

3. Findings and Results

The consensus and completion phase of the fuzzy Delphi process represents the final stage, indicating that the experts have reached a general agreement regarding the indicators and that no further significant changes are expected in the indicators or criteria.

Table 3

Results of Interviews on the Implementation of Value Creation in Electricity Distribution Companies

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
1	A4 A3 A2 A1	0.74 0.77 0.72 0.71

Table 4

Results of Interviews on Waste Reduction or Elimination

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
2	B3 B2 B1	0.78 0.76 0.77

Table 5

Results of Interviews on Financial Performance and Cost

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
3	C4 C3 C2 C1	0.70 0.72 0.74 0.76

Table 6

Results of Interviews on Increasing Production Speed

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
4	D5 D4 D3 D2 D1	0.72 0.70 0.75 0.73 0.76

Table 7

Results of Interviews on ISO 9000 Implementation in Electricity Distribution Companies

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
5	E4 E3 E2 E1	0.72 0.71 0.73 0.72

Table 8

Results of Interviews on Timely Operation of Dispatching Projects: Telecommunications and IT

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
6	F5 F4 F3 F2 F1	0.73 0.74 0.70 0.74 0.71

Table 9

Results of Interviews on Consumption Management: Reduction of Non-Technical Losses

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
8	G4 G3 G2 G1	0.76 0.76 0.71 0.74

Table 10

Results of Interviews on Power Plant Efficiency Improvement

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
7	H3 H2 H1	0.72 0.75 0.75

Table 11

Results of Interviews on Distribution Automation as a Prerequisite for Smart Grid Development

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
9	I3 I2 I1	0.72 0.72 0.80

Table 12

Results of Interviews on Replacement of Manual Medium Voltage Grid Switching with Automation Instead of System 121

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
10	J3 J2 J1	0.73 0.70 0.71

Table 13

Results of Interviews on Collective Efforts Toward Continuous Improvement

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
11	K3 K2 K1	0.73 0.79 0.75

Table 14

Results of Interviews on Quality Management

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
12	L4 L3 L2 L1	0.71 0.74 0.71 0.73

Table 15

Results of Interviews on Distribution Services

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
13	M5 M4 M3 M2 M1	0.74 0.77 0.77 0.73 0.75

Table 16

Results of Interviews on the Use of Technology in the Distribution Network

No.	All concepts yielded defuzzified values greater than 0.70 and were therefore validated.	Extracted Concepts
14	N4 N3 N2 N1	0.75 0.70 0.73 0.76

The findings derived from the fuzzy Delphi steps indicate that all indicators were confirmed by the experts, as the defuzzified values exceeded the threshold of 0.70. Among them, the highest values were assigned to the indicators of continuous improvement (0.79), waste reduction or elimination (0.78), and distribution services (0.77).

To confirm the extracted indicators from the questionnaire through exploratory factor analysis, confirmatory factor analysis was conducted using SMART PLS 4. SmartPLS is a statistical software with a graphical user interface used for Structural Equation Modeling (SEM) based on the Partial Least Squares (PLS) method (Habibi et al., 2017).

To assess construct validity and test the measurement models, reliability was evaluated through composite reliability (CR) and Cronbach's alpha, both of which should exceed 0.70. For convergent validity, the analysis required that factor loadings be statistically significant ($t > 1.96$), standardized factor loadings be greater than 0.40, CR be greater than AVE, AVE exceed 0.50, and Rho_A surpass 0.70.

For discriminant validity, the Fornell–Larcker criterion was used, which requires that AVE > MSV. Moreover, if the HTMT (Heterotrait–Monotrait Ratio of Correlations) is less than the critical value of 0.90, discriminant validity is established, confirming the uni-dimensional–bi-dimensional validity index (HTMT).

Lastly, the cross-loading test was performed. According to this criterion, the factor loading of each observable variable on its associated latent variable should be higher than its loading on other latent variables.

Table 17

Study Fit Indices

Index	Acceptable Threshold
Reliability	Composite Reliability and Cronbach's Alpha > 0.70
Convergent Validity	Significant factor loadings (t > 1.96); Standardized loadings > 0.40; CR > AVE; AVE > 0.50; Rho_A > 0.70
Discriminant Validity	AVE > MSV
Model Fit Indices	GOF > 0.36; SRMR < 0.10

The results of the t-statistic significance test showed that all indicators had t-values greater than 2.58, indicating that the relationship between each indicator and its associated latent variable is statistically significant at the 99% confidence level.

The results of Cronbach's alpha and composite reliability analysis indicated that all latent variables had reliability coefficients greater than 0.70, thereby confirming the reliability of the measurement tools using both indices.

Accordingly, discriminant validity of the measurement model was confirmed using the Fornell–Larcker test.

Discriminant validity was also confirmed through the HTMT index, thereby validating the differential validity of the measurement instruments using cross-factor loading indicators.

4. Discussion and Conclusion

The aim of this study was to design and validate a lean–world-class model tailored for the Iranian electricity distribution sector by identifying, screening, and confirming the key performance indicators and associated concepts through expert consensus using the Fuzzy Delphi Method (FDM) and confirmatory factor analysis via SmartPLS. The results revealed that all 14 identified indicators, encompassing 54 distinct concepts, achieved defuzzified values exceeding the minimum threshold of 0.70, confirming their relevance and validity from the perspective of industry experts. This consensus was further reinforced by statistical validation procedures, where reliability coefficients such as Cronbach's alpha and composite reliability surpassed 0.70, and factor loadings met the significance and strength criteria ($t > 1.96$, standardized loadings > 0.4). These findings affirm the robustness of the proposed model in aligning with both lean principles and world-class performance dimensions.

Among the validated indicators, continuous improvement (mean defuzzified value = 0.79), waste reduction (0.78), and distribution service quality (0.77) emerged as the most prominent contributors to achieving lean–world-class distribution systems. These results are consistent with previous literature emphasizing continuous improvement as a cornerstone of lean transformation (Jalalion & Farsijani, 2020), especially within industries characterized by infrastructural rigidity and service complexity. In line with this, Parsa Rad and Azizi (2021) emphasized that while lean approaches are necessary for process optimization, continuous feedback loops and iterative refinements are essential to maintain operational excellence (Parsa Rad & Azizi, 2021).

The high prioritization of waste reduction reflects the growing importance of energy efficiency in electricity distribution systems, particularly in developing economies where technical and non-technical losses remain substantial challenges. The integration of lean waste elimination strategies with network-level optimizations, such as those proposed by Mahmoudi and Mahmoud Oghati (2021), supports the finding that efficiency improvements are crucial for enhancing both sustainability and economic viability (Mahmoudi & Mahmoud Oghati, 2021). Moreover, Pourabadolahankooch et al. (2021) demonstrated that efficient distribution networks directly correlate with scale performance, reinforcing the importance of eliminating losses in lean–world-class frameworks (Pourabadolahankooch et al., 2021).

Service quality in electricity distribution—captured as a core indicator in this study—has also received increasing scholarly attention. Ghaem Maghami et al. (2022) stressed that customer-centric service indicators, especially those related to reliability, response time, and transparency, are integral to sustainable and globally competitive operations (Ghaem Maghami et al., 2022). The emphasis on service delivery in the current model aligns with global benchmarks and supports the strategic transition from a purely infrastructure-focused model to a service-oriented paradigm in electricity utilities (Asiyachi, 2024).

The methodological rigor of this study was further reinforced by the use of SmartPLS for confirmatory factor analysis, ensuring both convergent and discriminant validity. The AVE values exceeded 0.5, CR values were greater than AVE, and Rho_A values were above 0.7, thus supporting the internal consistency and convergent validity of the measurement model (Habibi & Adanvar, 2017; Henseler et al., 2016). The Fornell–Larcker criterion confirmed discriminant validity as AVE > MSV for all constructs, and HTMT values remained below the critical value of 0.90, indicating that the constructs were sufficiently distinct from one another (Henseler et al., 2016).

These statistical findings mirror prior recommendations by Henseler et al. (2016), who advocated for rigorous testing of SEM models in management and operations research to ensure theoretical constructs are empirically distinguishable and meaningfully interpretable (Henseler et al., 2016). Additionally, the use of FDM as a consensus-building tool among electricity distribution experts is in line with previous studies on fuzzy modeling in uncertain or subjective domains. Ahmadi et al. (2016) and Habibi et al. (2015) have both confirmed the effectiveness of the Fuzzy Delphi method in capturing expert judgment and reducing ambiguity in complex decision-making environments (Ahmadi et al., 2016; Habibi et al., 2015).

Furthermore, this study confirms that the use of fuzzy logic in electricity performance modeling is not only methodologically sound but also necessary given the multifactorial and often subjective nature of efficiency metrics in this sector. The findings echo Fallahi et al. (2019), who utilized robust data envelopment analysis to evaluate electricity distribution companies, demonstrating the importance of data-driven and flexible methodologies for performance evaluation (Fallahi et al., 2019). Likewise, Khodadadi Pour et al. (2023) applied random cross-efficiency models to better handle undesirable outputs in performance assessments, reinforcing the view that traditional metrics are often insufficient in capturing the nuanced dynamics of electricity distribution (Khodadadi Pour et al., 2023).

The inclusion of automation, ISO 9000 implementation, and the use of technology as validated indicators in this study highlights the ongoing transformation of electricity distribution companies into technologically sophisticated entities. As Tanakian et al. (2021) noted in their study on smart grid measurement systems, the selection of suitable wireless technologies is pivotal for enabling data-driven and real-time management of distribution networks (Tanakian et al., 2021). This further validates the model's emphasis on automation and IT infrastructure as core to world-class distribution practices.

Another noteworthy contribution of this study is the alignment of its findings with theoretical and empirical literature from global contexts. For instance, the inclusion of performance-related dimensions such as financial cost, operational speed, and quality management reflects similar variables used by Sagarra et al. (2017) in evaluating Mexican universities, suggesting that lean–world-class criteria are not sector-specific but rather adaptable to various organizational environments (Sagarra et al., 2017).

In summary, the findings from this study reinforce the notion that lean and world-class indicators are both valid and essential for improving electricity distribution performance. The successful validation of 14 indicators—ranging from loss reduction and service improvement to technological integration and quality management—confirms the multifaceted nature of excellence in this sector. The methodological contributions, especially the integration of FDM and SEM via SmartPLS, provide a replicable and reliable framework for other researchers and practitioners in the field.

Despite its contributions, this study is not without limitations. First, the expert sample was geographically limited to Tehran, which may constrain the generalizability of the findings to other regional or rural electricity distribution contexts in Iran. Second, although the fuzzy Delphi method is robust in capturing expert consensus, it is inherently subjective and may overlook emergent or disruptive indicators not currently within the domain of expert familiarity. Third, the model's validation was based on cross-sectional data, and longitudinal validation would be necessary to confirm the model's stability and adaptability over time.

Future research should expand the geographical scope of expert participants to include distribution companies from other provinces and countries with similar infrastructural and regulatory conditions. Additionally, integrating real-time operational data from smart grid systems could enhance the model's accuracy and applicability in digital environments. Researchers may also consider longitudinal studies to assess how the model evolves over time in response to technological disruptions, policy shifts, or changing consumer behavior. Lastly, hybrid methodologies combining fuzzy modeling with machine learning could offer predictive capabilities alongside structural validity.

Practitioners in the electricity distribution sector can use the validated model as a diagnostic and strategic tool to benchmark their current performance against lean and world-class standards. The 14 validated indicators can be embedded into performance dashboards, enabling managers to identify gaps and prioritize interventions. Training programs should be designed to enhance employee awareness and competencies around continuous improvement, service excellence, and technological integration. Furthermore, regulatory bodies can incorporate the model into national energy policy frameworks to align performance evaluation with strategic modernization goals.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

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