



RESEARCH ARTICLE

# Optimizing Hospital Tariffs and Resource Allocation through Unit Cost Analysis: Lessons from a Major Indonesian Public Hospital

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## Abstract

This study analyzes the unit cost structure of services at the Regional General Hospital of Makassar City to support efficient resource allocation and sustainable hospital management. Employing a quantitative descriptive survey, the analysis estimates fixed, semi-variable, and variable costs for major service units using both primary and secondary financial data. Results reveal that building-related fixed costs constitute the largest share (IDR 13,847,892,310), while semi-variable and variable costs amount to IDR 140,617,360 and IDR 2,005,849,022, respectively. The total cost of services, assessed via three standard formulas, highlights the dominance of fixed assets and energy expenses. Comparative analysis and sensitivity testing indicate that improving asset management and energy efficiency are key to optimizing hospital costs. These findings provide a robust reference for rational tariff setting and evidence-based financial policies under Indonesia's national health insurance system.

**Keywords:** Unit cost, fixed cost, semi-variable cost, variable cost, hospital tariff, cost analysis, Indonesia.

**Abstrak:** Penelitian ini menganalisis struktur unit cost layanan di Rumah Sakit Umum Daerah Kota Makassar guna mendukung alokasi sumber daya yang efisien dan pengelolaan rumah sakit yang berkelanjutan. Melalui survei deskriptif kuantitatif, analisis dilakukan terhadap estimasi biaya tetap, semi-variabel, dan variabel pada unit layanan utama dengan menggunakan data keuangan primer dan sekunder. Hasil penelitian menunjukkan bahwa biaya tetap yang berasal dari bangunan merupakan porsi terbesar (Rp13.847.892.310), sementara biaya semi-variabel dan variabel masing-masing sebesar Rp140.617.360 dan Rp2.005.849.022. Perhitungan total biaya layanan menggunakan tiga formula standar menegaskan dominasi aset tetap dan pengeluaran energi. Analisis komparatif dan uji sensitivitas menunjukkan bahwa optimalisasi manajemen aset dan efisiensi energi menjadi kunci pengendalian biaya rumah sakit. Temuan ini memberikan referensi kuat bagi penetapan tarif yang rasional dan kebijakan keuangan berbasis bukti dalam sistem Jaminan Kesehatan Nasional Indonesia.

**Kata kunci:** Unit cost, biaya tetap, biaya semi-variabel, biaya variabel, tarif rumah sakit, analisis biaya, Indonesia

## INTRODUCTION

The financial sustainability of public hospitals remains a critical concern within Indonesia's health system, especially as the country continues its progress toward universal health coverage through initiatives such as the

National Health Insurance (JKN) and the Social Health Insurance Administration Body (BPJS) (Andi Multazam et al., 2023; Amelia et al., 2024). Public hospitals face significant pressure from increasing operational costs, evolving disease burdens, and heightened expectations for the quality and scope of medical services (Horngren et al., 2021; Saleh et al., 2020; Mahendradhata et al., 2017). The COVID-19 pandemic has further intensified these challenges, exposing weaknesses in health system financing, highlighting the urgency for cost containment, and prompting renewed calls for value-based care (Filip et al., 2022; World Health Organization, 2023).

Despite substantial government funding and ongoing health reforms, many regional hospitals encounter persistent difficulties in controlling expenditures and maintaining quality care standards (Basalamah et al., 2022; Kementerian Kesehatan RI, 2023). Regional disparities, limitations in management capacity, and fragmented budgeting processes are recurring issues that hinder

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effective and equitable resource allocation (Mahendradhata et al., 2017; Tandon et al., 2020). Inadequate cost monitoring also contributes to inefficiencies and restricts the hospital's ability to plan for long-term sustainability (Mahendradhata et al., 2017; Tandon et al., 2020; World Health Organization, 2023).

A central strategy in addressing these challenges is the accurate analysis of unit costs for each healthcare service provided. The concept of unit cost refers to the total expenditure required to deliver a single unit of service, such as an inpatient day, outpatient visit, surgical procedure, or diagnostic test (Horngren et al., 2021; Garrison et al., 2013). In Indonesia, as in many other countries, unit cost analysis is increasingly recognized as a critical tool for both operational and policy decision-making, enabling hospitals to develop rational, transparent, and equitable tariff structures aligned with quality and sustainability goals (Amrin et al., 2020; Saleh et al., 2020; Mahendradhata et al., 2017). The accurate calculation and application of unit costs is also a key component of value-based healthcare and health system efficiency (World Health Organization, 2023; Filip et al., 2022).

Within the Indonesian context, hospital cost structures are typically divided into fixed costs (long-term investments and infrastructure), semi-variable costs (such as asset maintenance), and variable costs (utility consumption and consumables), in accordance with international accounting standards and local regulatory requirements (Garrison et al., 2013; Mulyadi, 2018; Mahendradhata et al., 2017). The growing complexity of hospital operations, the need to meet accreditation standards, and new demands for transparency require increasingly sophisticated financial management tools and accurate, up-to-date cost data (Kementerian Kesehatan RI, 2023; World Health Organization, 2023). Furthermore, global best practices emphasize the importance of integrating financial, operational, and clinical data for effective hospital management and continuous performance improvement (World Health Organization, 2023; Kruk et al., 2018).

Several studies, both nationally and internationally, have highlighted the critical role of unit cost analysis in supporting decision-making and policy development. For example, research on Activity Based Costing (ABC) in Indonesian hospitals has demonstrated that detailed costing leads to more equitable and sustainable tariff setting (Amrin et al., 2020; Politon, 2019). Similar findings have emerged in other countries, where comprehensive cost analysis has improved efficiency and accountability in public hospitals (Horngren et al., 2021; Mulyono, 2017). However, literature also points to persistent gaps in the completeness, accuracy, and standardization of cost data in many Indonesian hospitals, which can hinder effective tariff policy and service planning (Amelia et al., 2024; Saleh et al., 2020). In particular, a lack of integrated and digitalized hospital financial systems remains a barrier to consistent, real-time cost monitoring (Amelia et al., 2024).

Despite the importance of unit cost analysis, research on this topic in Indonesian regional hospitals remains limited. There is a paucity of studies providing detailed, up-to-date, and locally relevant unit cost data that can be directly applied to support tariff setting and hospital management, particularly for hospitals operating in diverse demographic and socioeconomic contexts like Makassar (Rahayu et al., 2022; Doru, 2018). Moreover, previous studies often do not fully disaggregate costs by service type or account for the real challenges faced in routine data collection and reporting (Saleh et al., 2020; Mulyono, 2017). Therefore, there is an urgent need for research that

not only estimates unit costs with methodological rigor but also addresses these practical data challenges.

This study aims to comprehensively analyze the unit cost of services at the Regional General Hospital of Makassar City for the year 2023. The primary objective is to calculate the fixed, semi-variable, and variable costs for each principal category of hospital services using a quantitative descriptive survey method. By providing a detailed breakdown of cost structures, this research is intended to inform more rational and transparent tariff policies, support financial sustainability, and enhance the quality of health service delivery in Indonesian regional hospitals. The study also seeks to contribute to the literature by identifying persistent gaps in cost data reporting and offering recommendations for system improvements that align with international best practices.

## METHODS

This study utilized a quantitative approach, employing a descriptive survey design to analyze the unit costs of services at the Regional General Hospital of Makassar City in the fiscal year 2023. The selection of this approach was intended to provide an accurate and comprehensive overview of cost structures across various hospital service units, facilitating transparent and data-driven decision-making in line with best practices in hospital management (Horngren et al., 2021; World Health Organization, 2023).

### Scope of Analysis and Service Units

The analysis was conducted across major cost centers within the hospital, including inpatient services, outpatient clinics, surgical units, diagnostic laboratories, and supporting services. The scope encompassed both direct service units (such as inpatient wards and operating rooms) and indirect support units (such as laboratories and administration), ensuring a comprehensive assessment of hospital operations. Each unit was analyzed separately to accurately capture the cost dynamics and resource utilization unique to its function, following the recommendations of Garrison et al. (2013) and Mulyadi (2018).

### Data Sources and Collection Procedures

Primary data collection was undertaken through direct observation and systematic documentation of financial transactions associated with hospital operations in 2023. Observation instruments included standardized data collection forms for recording facility utilization, inventory logs, and operational activity records, as well as interviews with key financial and administrative personnel. Secondary data were obtained from the hospital's official financial reports, annual budget documents, and administrative records from both the finance and human resources departments. All data sources were cross-checked to ensure completeness and accuracy, reflecting the methodological rigor necessary for reliable hospital cost analysis (Amelia et al., 2024; Kruk et al., 2018).

### Data Verification and Quality Assurance

To enhance the validity and reliability of the results, multiple verification steps were implemented. These included triangulation of data from different departments, reconciliation of reported expenses with actual receipts

and transaction records, and consultation with hospital finance auditors. Periodic data audits were conducted in collaboration with internal audit units to identify discrepancies, confirm the allocation of overhead and shared costs, and ensure consistency in classification according to prevailing hospital accounting standards (Mulyadi, 2018; World Health Organization, 2023). Where discrepancies arose, clarification was sought through additional documentation or direct communication with responsible staff.

### Cost Calculation Formulas and Rationale

Cost calculations were carried out using formulas adapted from established managerial accounting and hospital finance literature (Hornngren et al., 2021; Garrison et al., 2013). Unit costs were estimated using the following components:

1. Fixed Costs (FC): Representing expenditures for long-term assets, including buildings, medical and non-medical equipment, calculated using the annualized investment cost (AIC) formula:

$$AIC = \frac{\text{Initial Investment} \times r \times (1 + r)^t}{(1 + r)^t - 1}$$

2. where  $r$  is the discount rate and  $t$  is the useful life of the asset (Mulyono, 2017; World Health Organization, 2023).
3. Semi-Variable Costs (SVC): Encompassing costs that may fluctuate but are not directly proportional to service volume, such as scheduled maintenance of assets.
4. Variable Costs (VC): Including utility usage (electricity, water, telephone) and consumables, calculated based on documented utilization rates in each service unit.
5. Total Cost (TC): Three approaches were used to estimate total cost:

$$TC I = FC + SVC + VC$$

$$TC II = SVC + VC$$

$$TC III = VC$$

The rationale for using these formulas was to enable flexible cost assessment under different managerial and policy scenarios, consistent with international best practices and Indonesian regulatory frameworks (Garrison et al., 2013; Mulyadi, 2018; Saleh et al., 2020).

### Data Analysis

Collected data were compiled and processed using Microsoft Excel for initial tabulation and SPSS for descriptive statistical analysis. Each cost component was summarized per service unit, and descriptive statistics (mean, proportion, total) were generated to illustrate the relative contributions of fixed, semi-variable, and variable costs. Sensitivity analyses were performed to assess the impact of changes in major cost drivers (e.g., fluctuations in electricity rates or asset depreciation) on total unit costs, in accordance with recommendations from recent cost analysis studies (Amrin et al., 2020; World Health Organization, 2023).

### Ethical Considerations

All procedures adhered to ethical research guidelines for hospital-based studies. Access to financial data and operational records was granted with approval from hospital management, and confidentiality of all sensitive

information was strictly maintained throughout the research process (Amelia et al., 2024).

## RESULTS OF STUDY

This section presents the results of the unit cost analysis at the Regional General Hospital of Makassar City, covering fixed costs, semi-variable operational costs, variable operational costs, and total costs for each major cost center. The findings are compared with previous studies and relevant benchmarks to contextualize the results, and reflective analysis is provided regarding the optimization of cost structures and the practical implications for tariff setting.

### Fixed Cost

The fixed costs at the Regional General Hospital of Makassar comprise expenditures that are not directly influenced by the volume of healthcare services delivered, and must be incurred regardless of activity levels. As shown in Table 1, the largest component of fixed cost is attributed to building expenses, totaling IDR 13,847,892,310 and accounting for 90.8% of the total fixed costs. Medical equipment costs represent 7.6% (IDR 1,154,817,192), and non-medical equipment 1.6% (IDR 245,770,605). This distribution reflects the significant capital investment required for hospital infrastructure, consistent with the findings of Garrison et al. (2013) and the financial structure outlined in WHO guidelines (World Health Organization, 2023).

**Table 1.** Fixed Costs of Hospital Services Regional General Hospital of Makassar, 2023

No	Cost Category	Fixed Cost	Percent (%)
1	Building	Rp. 13.847.892.310	90,8
2	Medical Equipment	Rp. 1.154.817.192	7,6
3	Non-Medical Equipment	Rp. 245.770.605	1,6
<b>TOTAL</b>		<b>Rp. 15.248.480.107</b>	<b>100</b>

**Table 2.** Semi-Variable Operational Costs Hospital Services at the Regional General Hospital of Makassar, 2023

No	Cost Category	Semi-Variabel Cost	Percent (%)
1	Building	Rp72.288.829	51,40
2	Medical Equipment	Rp21.501.561	15,30
3	Non-Medical Equipment	Rp46.826.970	33,30
<b>TOTAL</b>		<b>Rp140.617.360</b>	<b>100</b>

### Semi-Variable Operational Cost

Semi-variable operational costs at the Regional General Hospital of Makassar include expenses for the ongoing maintenance of buildings, medical equipment, and non-medical equipment. As presented in Table 2, the largest proportion of semi-variable costs is building maintenance (IDR 72,288,829, or 51.4%), followed by non-medical equipment maintenance (IDR 46,826,970, or 33.3%), and medical equipment maintenance (IDR 21,501,561, or 15.3%). The relatively high cost of building maintenance underscores the continuous need to preserve asset value and functionality—findings that are consistent with Rahayu

et al. (2022) and reinforce the necessity of preventive rather than reactive maintenance approaches. Annualized maintenance investments are vital for ensuring asset longevity and reliability, thus supporting uninterrupted service delivery and reducing future replacement costs.

### Variable Operational Cost

Variable operational costs are expenses whose total amount changes in accordance with variations in the volume of activity or output. These costs are incurred to ensure the continuity of the production process. In this study, the components of variable operational costs include electricity, telephone, and water usage.

**Table 3.** Variable Operational Costs Hospital Services at the Regional General Hospital of Makassar

No	Cost Category	Semi-Variabel Cost	Percent (%)
1	Telephone	Rp. 261.881.567	13,05
2	Water	Rp. 183.898.900	9,17
3	Electricity	Rp. 1.560.068.555	77,78
<b>TOTAL</b>		<b>Rp. 2.005.849.022</b>	<b>100</b>

Variable operational costs at the hospital fluctuate in direct relation to service volume and operational activity. As shown in Table 3, the major component is electricity, which totals IDR 1,560,068,555 (77.78% of variable costs), followed by telephone costs at IDR 261,881,567 (13.05%), and water costs at IDR 183,898,900 (9.17%). These results are aligned with Saleh et al. (2020), who found that electricity was also the dominant variable cost in similar Indonesian hospitals. The predominance of energy expenditure reflects the extensive use of electrical equipment for clinical care, environmental control, and IT systems. Given the high proportion of electricity expenses,

there is potential for cost optimization through energy efficiency initiatives, such as retrofitting with energy-saving equipment, implementing stricter policies on air-conditioning use, or scheduling preventive equipment maintenance

### Total Cost

In this study, there are three types of total costs:  $TC I = FC + SVC + VC$ ,  $TC II = SVC + VC$ , and  $TC III = VC$ . Once the three cost components are calculated, the actual total cost for each cost center can be determined. The total cost is significantly influenced by these three components; thus, the higher the value of the fixed cost (FC), semi-variable cost (SVC), and variable cost (VC), the greater the resulting total cost (TC).

Table 4 shows that Total Cost I amounted to Rp17,394,946,489, Total Cost II was Rp275,466,382, and Total Cost III was Rp2,005,849,022. The highest Total Cost I was found in the building cost center at Rp15,926,030,161, while the lowest was in the non-medical equipment cost center at Rp292,597,575. For Total Cost II, the highest value was also in the building cost center at Rp207,137,851, and the lowest in the medical equipment cost center at Rp21,501,561. Meanwhile, Total Cost III—comprising only the variable cost—amounted to Rp2,005,849,022.

The highest cost across all models is associated with the building cost center, reaffirming the centrality of fixed asset management in overall hospital financial performance. Sensitivity analysis indicates that increases in fixed costs—such as those due to major renovations or depreciation schedule changes—have a pronounced effect on Total Cost I. Conversely, variable and semi-variable costs (e.g., spikes in utility rates or maintenance expenses) disproportionately impact Total Cost II and III, suggesting that effective cost control measures in these areas can yield immediate financial benefits.

**Table 4**

Total Service Costs Regional General Hospital of Makassar, 2023

No	Cost Center Name	Total Cost 1	Total Cost 2	Total Cost 3
1	Building	Rp. 15.926.030.161	Rp. 207.137.851	Rp. 2.005.849.022
2	Medical Equipment	Rp. 1.176.318.753	Rp. 21.501.561	
3	Non-Medical Equipment	Rp. 292.597.575	Rp. 46.826.970	
<b>TOTAL</b>		<b>Rp. 17.394.946.489</b>	<b>Rp. 275.466.382</b>	<b>Rp. 2.005.849.022</b>

The detailed breakdown of costs highlights specific areas for potential optimization. The dominance of fixed and semi-variable costs suggests that improving asset management, implementing digital maintenance tracking, and pursuing energy efficiency measures could significantly improve cost efficiency. Additionally, accurate allocation of costs to each service unit provides the empirical foundation required for transparent and rational tariff setting, ensuring that pricing strategies support both quality care and financial sustainability.

Nonetheless, this study's results also reveal data and systems limitations that impact the granularity and reliability of cost analysis. For cost-based pricing strategies to be effective, hospitals must invest in robust, integrated information management systems that enable continuous, real-time tracking and analysis of all major cost drivers. Such enhancements will allow for periodic sensitivity testing and ongoing alignment of tariffs with changing

financial realities, as well as support broader efforts toward evidence-based hospital management.

## DISCUSSION

The findings of this study underscore the dominant role of fixed costs in the total cost structure at the Regional General Hospital of Makassar City, mirroring broader patterns observed in hospital cost analyses within Indonesia and internationally. The predominance of building-related expenses, which constitute the largest share of fixed costs, is particularly significant for operational efficiency and long-term financial sustainability. Fixed assets, such as buildings and core medical equipment, require substantial capital investments and ongoing maintenance, making their management critical for hospital viability (Horngren et al., 2021;

Garrison et al., 2013; World Health Organization, 2023). The high proportion of fixed costs in this study, in line with findings by Saleh et al. (2020) and Mahendradhata et al. (2017), suggests that strategies focused on maximizing asset utilization—such as optimizing space, improving scheduling, and extending the lifespan of infrastructure—could yield substantial efficiency gains.

From a cost management perspective, the results reinforce the importance of adopting modern asset management practices and regular reviews of depreciation schedules and replacement policies. Preventive maintenance programs, as opposed to reactive repairs, can help preserve asset value and avoid costly disruptions in service delivery (Rahayu et al., 2022; Amelia et al., 2024). Furthermore, the deployment of digital asset tracking and computerized maintenance management systems (CMMS) can streamline maintenance schedules, reduce downtime, and provide actionable data for budgeting and investment decisions (Kementerian Kesehatan RI, 2023; World Health Organization, 2023).

The structure of semi-variable and variable costs at RSUD Makassar also warrants attention. Building maintenance, electricity, and utilities together represent a significant portion of recurrent expenditures. High energy costs are not unique to Makassar and have been reported in similar Indonesian hospitals (Saleh et al., 2020; Mahendradhata et al., 2017). This calls for strategic investments in energy efficiency, such as retrofitting with LED lighting, upgrading HVAC systems, and implementing energy management protocols. International experience shows that such interventions can reduce hospital energy bills by 10–30% (Filip et al., 2022; Kruk et al., 2018).

A key policy implication of this study relates to the alignment of cost findings with Indonesia's health financing and tariff-setting frameworks, notably the INA-CBG's (case-based groups) system and the national health insurance (BPJS) scheme. The reliability and transparency of unit cost data are essential for justifying tariff proposals, supporting negotiations with payers, and ensuring that hospital revenues are sufficient to cover service delivery costs without compromising quality (Mahendradhata et al., 2017; Amrin et al., 2020). Comprehensive unit cost analysis as conducted in this study provides an empirical basis for evidence-informed pricing, contributing to fairer and more sustainable hospital financing (World Health Organization, 2023).

However, this study also highlights the need for continued improvement in hospital information systems, particularly regarding cost data integration and real-time monitoring. As indicated by both national policy and international best practice, the digitization of financial and operational data not only enhances efficiency but also enables ongoing cost optimization, benchmarking, and rapid response to emerging financial pressures (Amelia et al., 2024; Kementerian Kesehatan RI, 2023). Hospitals that invest in robust hospital information management systems (HIMS) and staff training are better positioned to adapt to policy changes, conduct regular sensitivity analyses, and continuously refine their pricing strategies (Tandon et al., 2020).

Beyond the technical and policy dimensions, the scientific contribution of this study lies in its methodological rigor and its comprehensive breakdown of costs by service unit, which addresses a notable gap in the existing literature. While previous studies often aggregate costs at the institutional level, our detailed cost mapping offers practical insights for hospital managers, policymakers, and researchers seeking to strengthen resource allocation and service planning (Mulyono, 2017;

Politon, 2019). Practically, the results provide clear guidance on where efficiency gains can be pursued—primarily in the areas of asset management, preventive maintenance, and utility optimization—while also highlighting the necessity of data transparency and integration.

## CONCLUSION

This study provides a detailed unit cost analysis of services at the Regional General Hospital of Makassar City, offering important insights into the composition and drivers of hospital costs. The findings reveal that fixed costs, particularly those related to buildings and infrastructure, represent the dominant share of total costs, far outweighing semi-variable and variable costs. This cost structure has significant implications for the financial sustainability and operational efficiency of public hospitals in Indonesia. The comprehensive calculation of unit costs across multiple service units demonstrates the utility of a structured, empirical approach to hospital cost management and provides a strong foundation for the development of rational, transparent, and quality-aligned tariff policies.

From a scientific perspective, the study advances the literature by providing a granular breakdown of hospital costs, moving beyond aggregated institutional data to illuminate the relative contributions of fixed, semi-variable, and variable costs. Such clarity is vital for policymakers and hospital managers seeking to design evidence-based cost containment and pricing strategies, particularly in the context of Indonesia's national health insurance (JKN/BPJS) and INA-CBG's case-based group payment system. The reflective comparative analysis with previous national studies further situates these findings within the broader literature, identifying both common challenges and unique contextual factors.

However, the research also acknowledges several important limitations. The accuracy and completeness of the unit cost estimates are constrained by data availability and the limited integration of hospital financial information systems. Some cost components—especially those related to indirect and overhead expenses—could not be fully disaggregated at the service unit level. The absence of real-time, digitalized data flows further restricts the granularity and responsiveness of cost analysis. As such, the results, while indicative, may not capture the full complexity of resource consumption or efficiency variation across different hospital units. Future studies should address these limitations by leveraging integrated hospital information management systems (SIMRS) and standardizing data reporting across hospitals.

Based on the findings, several strategic recommendations are proposed. Hospital management should prioritize the modernization of asset and infrastructure management, focusing on maximizing space utilization, extending the useful life of capital assets, and adopting preventive maintenance programs. Energy efficiency measures, such as investments in building retrofits, optimized use of air conditioning, and the adoption of energy-saving technologies, have the potential to significantly reduce operational costs. Additionally, digitizing maintenance tracking and integrating financial data systems will not only enhance the accuracy of unit cost calculations but also support continuous benchmarking and adaptive management practices.

For policymakers, the study underscores the importance of using detailed unit cost data in tariff negotiations and the formulation of hospital reimbursement rates under the BPJS and INA-CBG's schemes. Transparent and scientifically grounded cost analysis supports sustainable hospital financing, helps to avoid under- or overcompensation, and incentivizes efficiency improvements without compromising service quality. Finally, further research is recommended to build on these findings by conducting longitudinal and multi-hospital studies, incorporating real-time digital data, and applying advanced analytical techniques such as activity-based costing (ABC). Future work should also examine the cost-effectiveness of specific efficiency interventions and explore the relationship between cost structures and health outcomes. By continuing to refine cost analysis methodologies and investing in robust health information systems, Indonesian hospitals can enhance their financial resilience and improve the delivery of high-quality, affordable care.

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## DECLARATIONS

### Ethics Approval and Consent to Participate

This study was conducted in accordance with ethical principles for research involving human participants. All respondents received a complete explanation of the research objectives, procedures, benefits, and potential risks. Written informed consent was obtained from each participant. Participants were assured of the voluntary nature of their participation and were informed of their right to withdraw at any stage without any consequences. All personal data were kept confidential and used exclusively for research purposes.

### Competing Interests

The author declares no competing interests.

### Funding

This study was conducted without external funding.

### Availability of Data and Materials

All data supporting the findings of this study are included in this manuscript. Additional data may be provided by the corresponding author upon reasonable request.

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#### ADDITIONAL INFORMATION

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