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Electronic Catalog-Based Procurement of Clinical Laboratory Goods and Services: An Evaluation Study at Tabanan Regional General Hospital

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ABSTRACT

Procurement of clinical laboratory goods and services is a critical component in ensuring the continuity, quality, and efficiency of healthcare services. In Indonesia, electronic catalogs (e-catalogs) have been implemented as part of the government's digital procurement system to enhance transparency, accountability, and efficiency in public procurement. However, several studies have reported operational challenges that may affect procurement effectiveness, including limited product availability, system constraints, and procurement delays. This study aimed to evaluate the implementation of electronic catalog-based procurement for clinical laboratory goods and services at Tabanan Regional General Hospital. A quantitative observational study was conducted using procurement reports from January 2024 to June 2025. All procurement transactions conducted through the electronic catalog system were included using a total sampling approach. Data were analyzed descriptively to determine the percentage of successful procurement implementation and identify factors influencing procurement performance. The results showed that the average implementation rate of electronic catalog-based procurement reached 84.1%. Several factors contributed to procurement constraints, including frozen or unavailable products in the electronic catalog, minimum order quantity requirements, and automatic package cancellation due to negotiation time limits. Despite these challenges, the electronic catalog system provided significant advantages by offering standardized information on product specifications, pricing, domestic content requirements, supplier profiles, environmental certification, and other procurement-

related data. The study concludes that electronic catalog-based procurement is generally effective in supporting clinical laboratory procurement activities; however, system optimization and improved supplier participation are required to maximize procurement performance and service continuity.

Keywords: *Clinical Laboratory, Electronic Catalog, E-Purchasing, Healthcare Procurement, Procurement Evaluation*

ABSTRAK

Pengadaan barang dan jasa laboratorium klinik merupakan komponen penting dalam menjamin keberlangsungan, mutu, dan efisiensi pelayanan kesehatan. Di Indonesia, katalog elektronik (e-catalog) diterapkan sebagai bagian dari sistem pengadaan pemerintah berbasis digital untuk meningkatkan transparansi, akuntabilitas, dan efisiensi proses pengadaan. Namun, berbagai penelitian menunjukkan masih terdapat kendala operasional yang dapat memengaruhi efektivitas pengadaan, seperti keterbatasan ketersediaan produk, hambatan sistem, dan keterlambatan proses pengadaan. Penelitian ini bertujuan untuk mengevaluasi pelaksanaan pengadaan barang dan jasa laboratorium klinik melalui katalog elektronik di RSUD Tabanan. Penelitian menggunakan desain kuantitatif observasional dengan sumber data berupa laporan pengadaan periode Januari 2024 hingga Juni 2025. Seluruh transaksi pengadaan melalui katalog elektronik dianalisis menggunakan teknik total sampling. Analisis data dilakukan secara deskriptif untuk menentukan persentase keberhasilan pengadaan serta mengidentifikasi faktor-faktor yang memengaruhi kinerjanya. Hasil penelitian menunjukkan bahwa rata-rata tingkat pelaksanaan pengadaan melalui katalog elektronik mencapai 84,1%. Kendala yang ditemukan meliputi produk yang tidak tayang atau mengalami status freeze pada katalog elektronik, persyaratan minimum order quantity, serta pembatalan paket secara otomatis akibat melewati batas waktu negosiasi. Meskipun demikian, sistem katalog elektronik memberikan berbagai keuntungan melalui penyediaan informasi yang terstandarisasi mengenai spesifikasi produk, harga, tingkat komponen dalam negeri, profil penyedia, sertifikasi lingkungan, dan informasi pengadaan lainnya. Disimpulkan bahwa pengadaan berbasis katalog elektronik cukup efektif dalam mendukung kebutuhan laboratorium klinik, namun diperlukan optimalisasi sistem dan peningkatan partisipasi penyedia untuk memaksimalkan kinerja pengadaan serta menjamin kontinuitas pelayanan laboratorium.

Kata kunci: Evaluasi Pengadaan, E-Purchasing, Katalog Elektronik, Laboratorium Klinik, Pengadaan Kesehatan

INTRODUCTION

Procurement of goods and services is a strategic process in public sector management that encompasses activities beginning with needs identification and continuing through contract implementation and final delivery of goods or services. In Indonesia, government procurement is regulated through a series of policies designed to ensure efficiency, transparency, accountability, competitiveness, and value for money in the utilization of public funds(1). As part of procurement reform, the Indonesian government has implemented electronic procurement systems (e-procurement) to improve governance and reduce the risk of fraud, corruption, collusion, and nepotism in procurement activities(1).

One of the primary instruments supporting e-procurement is the electronic catalog (e-catalog), which facilitates procurement through an electronic purchasing (e-purchasing) mechanism. The electronic catalog provides comprehensive information regarding product

specifications, prices, suppliers, domestic content requirements, Indonesian National Standards (SNI), environmentally friendly products, countries of origin, and other procurement-related information(2). The availability of such information supports evidence-based procurement decisions while improving transparency and accountability in public procurement processes(3).

The establishment of the National Public Procurement Agency (Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah LKPP) marked a significant milestone in modernizing Indonesia's procurement system(4). Through electronic marketplaces (e-marketplaces), procurement transactions can be conducted digitally and integrated across government institutions, local governments, and suppliers. This transformation is expected to improve procurement efficiency, accelerate service delivery, strengthen budget accountability, and enhance public trust in government procurement practices(5).

Several studies have evaluated the implementation of electronic procurement systems and reported varying outcomes. Ariesta reported that electronic procurement implementation in public institutions was not fully effective, particularly in terms of productivity, adaptability, efficiency, user satisfaction, and system development(6). Similarly, Damayunita emphasized that transparent and accountable procurement systems constitute a fundamental component of good governance and contribute significantly to economic development and public service improvement(7). Clinical laboratories depend on reliable procurement systems to ensure the uninterrupted availability of reagents and consumables required for diagnostic testing. Procurement failures may directly affect laboratory performance, turnaround time, and patient care outcomes(8). Furthermore, Soesanto highlighted the importance of web-based procurement management systems in improving procurement monitoring and operational efficiency(9). Despite the advantages offered by electronic catalog procurement, several practical challenges remain, particularly within clinical laboratory services. Clinical laboratories require uninterrupted availability of reagents, consumables, and diagnostic equipment to ensure continuous patient care and accurate laboratory testing. However, procurement activities may be constrained by products that are temporarily unavailable or frozen within the electronic catalog, minimum order quantity requirements imposed by suppliers, and procurement packages automatically canceled due to negotiation time limitations. These challenges may force healthcare institutions to conduct procurement outside the electronic catalog system, potentially reducing the intended benefits of e-procurement implementation(10).

Although previous studies have examined electronic procurement systems in government institutions and healthcare settings, limited evidence is available regarding the effectiveness of electronic catalog-based procurement specifically within clinical laboratory services. Most existing studies focus on administrative efficiency, governance, and procurement management in general rather than on laboratory-specific procurement challenges(11). Therefore, this study offers a novel contribution by evaluating the implementation of electronic catalog-based procurement for clinical laboratory goods and services at Tabanan Regional General Hospital. Unlike previous studies, this research not only measures the proportion of procurement conducted through the electronic catalog but also identifies operational barriers that affect procurement performance and laboratory service continuity.

This study aimed to evaluate the implementation of electronic catalog-based procurement for clinical laboratory goods and services at Tabanan Regional General Hospital during the period January 2024 to June 2025. Specifically, the study sought to determine the percentage of procurement conducted through the electronic catalog system, assess the proportion of procurement conducted outside the electronic catalog, and identify factors that hinder the effectiveness of electronic catalog-based procurement. The findings

are expected to provide evidence-based recommendations for improving procurement management, strengthening laboratory operational efficiency, and supporting good governance practices in healthcare procurement.

METHODS

This study employed a quantitative observational design to evaluate the implementation of electronic catalog-based procurement for clinical laboratory goods and services at Tabanan Regional General Hospital. The study was conducted at the Clinical Laboratory Installation of Tabanan Regional General Hospital between September and November 2025. A retrospective approach was used to analyze procurement records covering the period from January 2024 to June 2025. The study population consisted of all procurement reports related to clinical laboratory goods and services at Tabanan Regional General Hospital during the study period. Total sampling was applied, whereby all procurement records from January 2024 to June 2025 were included in the analysis. The unit of analysis was each procurement package processed either through the electronic catalog platform (e-catalog) or through alternative procurement mechanisms.

The primary study variable was the procurement of clinical laboratory goods and services, defined as all procurement packages conducted by the Clinical Laboratory Installation during the study period. An additional variable included factors contributing to procurement constraints within the electronic catalog system, such as product unavailability, minimum order quantity requirements, and procurement package cancellations. Procurement data were obtained from secondary sources, specifically procurement reports maintained by the Clinical Laboratory Installation and the hospital procurement unit. Data collection was performed retrospectively through document review. Procurement records were extracted, verified, and compiled into a structured database using Microsoft Excel. The collected data included the total number of procurement packages, procurement methods utilized, and documented barriers encountered during the procurement process.

Data analysis was conducted using descriptive statistical methods. The proportion of clinical laboratory procurement conducted through the electronic catalog system was calculated by comparing the number of procurement packages completed through the electronic catalog with the total number of procurement packages during the study period. Results were presented as frequencies, percentages, and descriptive summaries to evaluate procurement performance and identify factors affecting the implementation of electronic catalog-based procurement.

This study received ethical approval and institutional permission from Tabanan Regional General Hospital under approval number 445/750/TIMKORDIK/RSUD/2025 and research permit number 445/768/TIMKORDIK/RSUD/2025. The study utilized secondary procurement data and adhered to ethical principles of confidentiality, data protection, non-maleficence, and responsible data management throughout the research process.

RESULTS

Study Setting

This study was conducted at the Clinical Laboratory Installation of Tabanan Regional General Hospital between September and November 2025. Tabanan Regional General Hospital is a Type B Teaching Hospital located in Tabanan Regency, Bali, Indonesia,

providing a wide range of medical, pharmaceutical, nursing, clinical support, and inpatient services. Clinical laboratory procurement activities are initiated through demand identification by the laboratory procurement team, followed by supplier selection, negotiation, and approval processes managed through the Government Procurement Unit before the delivery of goods and services.

Implementation of Electronic Catalog-Based Procurement

A total of 258 procurement packages for clinical laboratory goods and services were recorded between January 2024 and June 2025. Of these, 217 procurement packages were completed through the electronic catalog (e-catalog) system, while 41 packages were procured through alternative procurement mechanisms outside the electronic catalog platform. Six procurement packages were canceled during the study period.

Table 1 presents the monthly distribution of procurement activities conducted through the electronic catalog, outside the electronic catalog, and procurement package cancellations.

Table 1. Monthly Distribution of Clinical Laboratory Goods and Services Procurement at Tabanan Regional General Hospital (January 2024–June 2025)

Month	Electronic Catalog n (%)	Non-Electronic Catalog n (%)	Total Packages n (%)	Cancelled Packages n (%)
January 2024	0 (0.0)	2 (100.0)	2 (100.0)	0 (0.0)
February 2024	24 (80.0)	6 (20.0)	30 (100.0)	0 (0.0)
March 2024	19 (86.4)	3 (13.6)	22 (100.0)	0 (0.0)
April 2024	9 (75.0)	3 (25.0)	12 (100.0)	0 (0.0)
May 2024	16 (94.1)	1 (5.9)	17 (100.0)	0 (0.0)
June 2024	13 (81.2)	3 (18.8)	16 (100.0)	1 (6.3)
July 2024	19 (82.6)	4 (17.4)	23 (100.0)	1 (4.3)
August 2024	14 (93.3)	1 (6.7)	15 (100.0)	0 (0.0)
September 2024	9 (100.0)	0 (0.0)	9 (100.0)	0 (0.0)
October 2024	9 (75.0)	3 (25.0)	12 (100.0)	0 (0.0)
November 2024	7 (70.0)	3 (30.0)	10 (100.0)	0 (0.0)
December 2024	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
January 2025	5 (50.0)	5 (50.0)	10 (100.0)	0 (0.0)
February 2025	34 (97.1)	1 (2.9)	35 (100.0)	0 (0.0)
March 2025	13 (86.7)	2 (13.3)	15 (100.0)	1 (6.7)
April 2025	3 (100.0)	0 (0.0)	3 (100.0)	0 (0.0)
May 2025	9 (90.0)	1 (10.0)	10 (100.0)	2 (20.0)
June 2025	14 (82.4)	3 (17.6)	17 (100.0)	1 (5.9)

The highest implementation rate of electronic catalog-based procurement was observed in September 2024 and April 2025, during which all procurement packages (100%) were processed through the electronic catalog system. In contrast, no procurement packages were conducted through the electronic catalog in January 2024 and December 2024. Procurement activities conducted outside the electronic catalog reached their highest

proportion in January 2024 (100%), whereas no off-catalog procurement was recorded in September 2024, December 2024, and April 2025.

Procurement package cancellations occurred sporadically throughout the observation period. The highest cancellation rate was observed in May 2025, accounting for two canceled packages (20%), while no cancellations were reported during several months, including January–May 2024, August 2024–February 2025, and April 2025.

The overall procurement performance is summarized in Table 2.

Table 2. Overall Procurement Performance of Clinical Laboratory Goods and Services

Procurement Category	Number of Packages	Percentage (%)
Electronic Catalog Procurement	217	84.1
Non-Electronic Catalog Procurement	41	15.9
Total Procurement Packages	258	100.0
Cancelled Procurement Packages	6	2.3

The analysis demonstrated that electronic catalog procurement accounted for the majority of procurement activities, representing 84.1% of all procurement packages during the study period. Procurement conducted outside the electronic catalog accounted for 15.9%, while procurement package cancellations represented only 2.3% of total procurement activities.

Factors Affecting Electronic Catalog Procurement

Review of procurement records identified several factors that limited the implementation of electronic catalog-based procurement.

First, certain products were temporarily unavailable or classified as “frozen” within the electronic catalog system, preventing procurement through the e-catalog platform. This issue was particularly observed for vacutainer needles and blood collection tubes, requiring procurement through direct appointment mechanisms to ensure continuity of laboratory services. Second, several suppliers imposed minimum order quantity requirements that exceeded the actual needs of the laboratory. This condition was identified for specific laboratory reagents, including Widal and VDRL testing reagents, leading to procurement outside the electronic catalog system. Third, procurement packages were occasionally canceled automatically by the system because negotiations exceeded the permitted processing period. This issue was identified in the procurement of laboratory reagents used for Cardiac Marker testing.

Overall, the findings indicate that although electronic catalog procurement was successfully implemented for most procurement activities, operational constraints related to product availability, supplier policies, and system limitations continued to affect procurement efficiency and procurement completion rates.

DISCUSSION

This study evaluated the implementation of clinical laboratory procurement through the electronic catalog (e-catalog) system at Tabanan Regional General Hospital between January 2024 and June 2025. The findings revealed that 84.1% of procurement packages were processed through the electronic catalog platform, while 15.9% were conducted using alternative procurement mechanisms. These results indicate that the electronic catalog has become the primary procurement method for clinical laboratory goods and services in the hospital setting, reflecting a high level of adoption of Indonesia’s

digital procurement policy. The implementation rate observed in this study demonstrates the hospital's commitment to improving procurement efficiency, transparency, and accountability through electronic procurement systems.

The high proportion of e-catalog procurement can be attributed to the comprehensive information available within the platform, including product specifications, pricing, supplier information, domestic content requirements, Indonesian National Standards (SNI), and environmental sustainability indicators. These features support evidence-based purchasing decisions and reduce administrative complexity during procurement processes. Electronic procurement systems have been widely recognized as effective tools for enhancing transparency, reducing procurement costs, and minimizing opportunities for corruption in public sector procurement activities(12). Furthermore, the implementation of e-purchasing aligns with the objectives of Indonesia's public procurement reform, which aims to improve efficiency, accountability, and value for money in government-funded procurement programs(13).

The monthly procurement analysis showed considerable variation in e-catalog utilization. Full implementation (100%) was achieved in September 2024 and April 2025, indicating periods during which all required laboratory products were available within the electronic catalog system. In contrast, procurement through the e-catalog was not performed in January 2024 and December 2024. The absence of e-catalog procurement in January 2024 was primarily caused by product unavailability due to the "freeze" status of several laboratory reagents and consumables, including cardiac marker reagents, blue tips, and yellow tips. Similar challenges have been reported in previous studies, where limited product availability and supplier participation were identified as significant barriers to the effectiveness of electronic procurement systems(14). Meanwhile, the absence of procurement activities in December 2024 reflected strategic procurement planning, as all procurement packages had been completed before the end of the fiscal year to prevent delays in financial reporting and contract completion.

Despite the dominance of electronic catalog procurement, 41 procurement packages (15.9%) were still processed outside the e-catalog system. This finding suggests that although digital procurement systems improve efficiency, they may not yet fully accommodate the operational needs of clinical laboratories. Laboratory services require continuous availability of reagents, consumables, and diagnostic supplies to maintain uninterrupted healthcare delivery. Consequently, alternative procurement methods become necessary when products are unavailable, subject to minimum-order requirements, or removed from the catalog system. This finding supports previous research indicating that procurement flexibility remains essential in healthcare institutions to ensure continuity of laboratory operations and patient services(15).

Another important finding of this study was the occurrence of procurement package cancellations. A total of six procurement packages (2.3%) were canceled during the study period, with the highest cancellation rate recorded in May 2025 (20%). The canceled packages mainly involved laboratory reagents and consumables, including Widal, VDRL, HbA1c, Cardiac Marker, and Pathology Anatomy examination reagents. Analysis of procurement reports indicated that package cancellations were primarily associated with three factors: product freeze status, minimum-order requirements imposed by suppliers, and system-generated cancellations due to delayed negotiation processes. Previous studies have highlighted similar operational challenges in electronic procurement systems, where supplier-related constraints and administrative delays may adversely affect procurement performance and supply chain continuity(16).

The present study contributes novel evidence regarding the implementation of electronic procurement systems in clinical laboratory services, an area that remains

relatively underexplored in the literature. Most previous studies have focused on general public procurement performance, government procurement policies, or hospital procurement management. In contrast, this study specifically evaluates procurement patterns, cancellation rates, and operational barriers within a clinical laboratory setting. The findings demonstrate that although electronic catalog procurement achieves a high utilization rate, complete implementation remains constrained by supplier availability and system-related limitations. This represents the primary novelty of the study and provides practical insights for policymakers, hospital administrators, and procurement managers seeking to optimize laboratory supply chain management.

From a managerial perspective, the findings suggest that improvements are needed in the electronic catalog ecosystem to support healthcare procurement more effectively. Enhancing supplier participation, reducing product freeze occurrences, improving product availability, and optimizing negotiation timelines may increase procurement success rates and reduce package cancellations. Furthermore, strengthening coordination among hospitals, suppliers, and procurement authorities could improve responsiveness to laboratory supply demands and support uninterrupted diagnostic services. Given the critical role of laboratory testing in patient care, procurement systems must ensure both efficiency and reliability in supplying essential laboratory products(17). Finally, several limitations should be considered when interpreting the findings. First, the study was conducted in a single hospital and covered an 18-month observation period, which may limit the generalizability of the results. Second, the evaluation was performed using data generated from Electronic Catalog Version 5, whereas Electronic Catalog Version 6 was implemented nationally in October 2025. Future studies should assess the impact of the newer system version and compare procurement performance across multiple healthcare institutions to provide a broader understanding of electronic procurement effectiveness in laboratory services.

CONCLUSION

This study demonstrated that the implementation of electronic catalog-based procurement for clinical laboratory goods and services at Tabanan Regional General Hospital has been successfully adopted as the primary procurement mechanism, accounting for 84.1% of all procurement packages during the study period. The findings indicate that the electronic catalog system has contributed to improving procurement efficiency, transparency, and accessibility of procurement information. However, complete implementation has not yet been achieved, as 15.9% of procurement activities were still conducted outside the electronic catalog system.

The study further identified several operational barriers affecting the effectiveness of electronic catalog procurement, including product freeze status or temporary unavailability of products within the electronic catalog, supplier-imposed minimum order requirements, and automatic package cancellations resulting from delays in the negotiation process. These challenges highlight the need for greater system flexibility and stronger coordination among hospitals, suppliers, and procurement authorities to ensure the continuous availability of laboratory supplies.

A notable contribution of this study is the identification of operational factors that limit full utilization of the electronic catalog in a clinical laboratory setting. These findings provide evidence that, while electronic procurement systems support good governance principles

and procurement efficiency, operational constraints remain an important determinant of procurement performance in healthcare institutions.

Healthcare institutions should strengthen procurement planning and maintain effective communication with suppliers and procurement authorities to minimize procurement delays and package cancellations. Continuous monitoring of product availability within the electronic catalog is also necessary to ensure uninterrupted laboratory services.

Future studies are recommended to evaluate the implementation of Electronic Catalog Version 6, which became effective in October 2025, and to compare procurement performance across multiple healthcare facilities. Such studies would provide a broader understanding of the effectiveness, efficiency, and sustainability of electronic procurement systems in supporting laboratory service delivery and healthcare supply chain management.

REFERENCES

1. Kusumadewi M, Aseri A, Seff S. E-Procurement in the Procurement System for Goods/Services by the Government in Indonesia: Perspective of Saddu al-Dhariah. *Ulul Albab J Stud dan Penelit Huk Islam*. 2024;6:101.
2. Suryani E, Nugroho K, Cadith J. The Effect of e-Purchasing Implementation Through E-Catalogue on Procurement Performance. *J Bisnis Mhs*. 2025;5:1753–64.
3. Felizola H, Gomez C, Arrieta N, Jerez V, Erazo Y, Camacho G. Enhancing transparency in public procurement: A data-driven analytics approach. *Inf Syst [Internet]*. 2024;125:102430. Available from: <https://www.sciencedirect.com/science/article/pii/S0306437924000887>
4. LKPP. *Penyelenggaraan Katalog Elektronik Kepala Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah*. Jakarta: LKPP; 2024. 5 p.
5. Cano JA, Londoño-Pineda AA, Campo EA, Fernández SA. Sustainable business models of e-marketplaces: An analysis from the consumer perspective. *J Open Innov Technol Mark Complex [Internet]*. 2023;9(3):100121. Available from: <https://www.sciencedirect.com/science/article/pii/S2199853123002238>
6. Mohungoo I, Brown I, Kabanda S. A Systematic Review of Implementation Challenges in Public E-Procurement. Vol. 12067, *Responsible Design, Implementation and Use of Information and Communication Technology: 19th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society, I3E 2020, Skukuza, South Africa, April 6–8, 2020, Proceedings, Part II*. 2020. p. 46–58.
7. Success A, Maiyaki B. Public Procurement Reforms and Their Impact on Transparency in Developing Economies. *Sci Technol Public Policy*. 2025;9:98–116.
8. Zakir D, Mekonnen GK, Negash B, Marami D. Level of health laboratory service quality, service interruptions, and its predictors in public hospitals in Harar town, eastern Ethiopia. *Front Heal Serv*. 2024;4:1492766.
9. Tai YM, Ho CF, Wu WH. The performance impact of implementing Web-based e-procurement systems. *Int J Prod Res - INT J PROD RES*. 2010;48:5397–414.
10. Schito M, Peter TF, Cavanaugh S, Piatek AS, Young GJ, Alexander H, et al. Opportunities and challenges for cost-efficient implementation of new point-of-care diagnostics for HIV and tuberculosis. *J Infect Dis*. 2012 May;205 Suppl 2(Suppl 2):S169-80.
11. Ddamba A, Nsubuga B, Kamabare M, Abaho E, Alinda K, Arinaitwe D, et al. Factors influencing the availability and use of electronic medical records systems in public health facilities in Uganda: a cross-sectional assessment. *BMC Med*

- Inform Decis Mak. 2025 Oct;25(1):372.
12. Assyafaah N, Dompok T. Implementation Of E-Procurement Agreement Between Indonesian and Malaysia. JPAP J Penelit Adm Publik. 2024;10:156–67.
 13. Sa'adah N. The Implementation of E-Procurement in Indonesia: Benefits, Risks, and Problems. INFERENSI J Penelit Sos Keagamaan. 2020;14:283–304.
 14. Sitar C. THE BARRIERS OF IMPLEMENTING E-PROCUREMENT. Stud Univ Vasile Goldis Arad, Ser Stiint Econ. 2011;2.
 15. Khoshmaram N, Gholipour K, Farahbakhsh M, Tabrizi JS. Strategies and challenges for maintaining the continuity of essential health services during a pandemic: a scoping review. BMC Health Serv Res. 2025 May;25(1):691.
 16. Guo Y, Liu F, Song JS, Wang S. Supply chain resilience: A review from the inventory management perspective. Fundam Res. 2025 Mar;5(2):450–63.
 17. Mitra P, Gupta S, Sharma P. Role of Supply Chain Management in Clinical Laboratory. Vol. 39, Indian journal of clinical biochemistry : IJCB. India; 2024. p. 1–2.