

Addis Ababa University College of Business and Economics

School of Commerce

Department of Logistics and Supply chain Management

The Effect of Pharmaceutical Procurement Practice on Medicine Availability: The Case of Ethiopian Pharmaceutical Supply Service (EPSS) Head Office.

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Logistics and Supply Chain Management

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This is to certify that the thesis prepared by Mr.Birhanemeskel Hailu, entitled ‘‘**The Effect of Pharmaceutical Procurement Practice on Medicine Availability: The Case of Ethiopian Pharmaceutical Supply Service (EPSS) Head Office.** ’’, a thesis submitted to Addis Ababa University, school of commerce, department of logistics and supply chain management in partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply chain Management (MA - LSCM), complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

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I, the undersigned, declare that this MA - Thesis On ‘‘ **The Effect of Pharmaceutical Procurement Practice on Medicine Availability: The Case of Ethiopian Pharmaceutical Supply Service (EPSS) Head Office.** ’’ is my original work and has not been presented for a degree in any other University, and that all sources of material used for the study have been duly acknowledged.

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This is to certify that the above declaration made by the candidate is correct to the best of my knowledge

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Aknowledgement

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List of Acronyms and Abbreviations

Abbreviation	Full Meaning
AAU	Addis Ababa University
CDSS	Committed Demand and Supply System
E.C.	Ethiopian Calendar
eGP	Electronic Government Procurement
EPSS	Ethiopian Pharmaceutical Supply Service
EPSA	Ethiopian Pharmaceutical Supply Agency
FMoH / MOH	Federal Ministry of Health
GMP	Good Manufacturing Practice
HCMIS	Health Commodity Management Information System
HSTP	Health Sector Transformation Plan
LC	Letter of Credit
LMICs	Low- and Middle-Income Countries
MTaPS	Medicines, Technologies, and Pharmaceutical Services
PPL	Pharmaceutical Procurement List
PSDIP	Pharmaceutical Sector Development and Investment Plan
PSTP	Pharmaceutical Supply Transformation Plan
RBV	Resource-Based View
RDF	Revolving Drug Fund
SAP	Systems, Applications, and Products in Data Processing
SDG	Sustainable Development Goal
TCE	Transaction Cost Economics
WHO	World Health Organization

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Abstract

The purposes of this research were to analyse how pharmaceutical procurement practices affects medicines availability at EPSS Head Office. Agency theory, resource based view theory, and transaction cost economics were the theoretical frameworks of this research. The study analysed quantitative data were collected from EPSS using structured questionnaire and available records are reviewed for verification along with qualitative data collected from key informants. A facility-based cross-sectional study using a mixed-methods approach was conducted at Ethiopian pharmaceutical supply service (EPSS) head office and respondents were selected through stratified random sampling. For analysis four independent variables including demand forecasting accuracy, procurement lead time management, supplier reliability and contract fulfilment and operational and structural efficiency were included in the study. Descriptive statistics showed that the Demand Forecasting Accuracy have the composite mean of 3.51 (High), Procurement Lead Time Management 3.25 (Moderate), Supplier Reliability & Contractfulfillment 3.35 (Moderate), Operational & Structural Efficiency 3.30 (Moderate) and fina Medicine Availability (DV) which have composite mean of 3.10 (Moderate). Inferential analysis revealed significant positive relationship between procurement practices and medicine availability at the EPSS Head Office ($R^2 = 0.378$, $p < 0.05$) and linier regression was done and found that all the four variables have effect on medicne availability. Stock-outs of medicines seem to be rooted from both sequential and simultaneous bottlenecks occurred due to inaccurate forecasting, unreliable facility level data on medicine consumption and stock, unpredictable lead-times and poor supplier fulfilment of the set contract scores or minimum expected requirements.

Keywords: Pharmaceutical Procurement, Medicine Availability, EPSS, Demand Forecasting, Lead Time

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

One of the SDG aims for universal health care is having access to essential pharmaceuticals, which is now essential for receiving high-quality medical care. Pharmaceutical procurement practice includes the organised processes of acquiring pharmaceuticals and health products, including supplier selection, tendering, contract negotiation, quality assurance, and delivery.
The fundamental problem of medicine availability is the steady supply of essential medications in usable form, quality, and quantity at medical facilities when patients need them directly affects treatment outcomes and the confidence of the pharmaceutical supply chain system (Kibiti & Njau, 2021; Pereira-Silva et al., 2024). In the middle of the 20th century, pharmaceutical procurement was decentralised and transactional in many LMICs, including Ethiopia, prioritising the lowest unit pricing over long-term supply security or supplier dependability. Chronic stock-outs and expired inventories were often the result of this (Jima University, 2022; Drug Patent Watch, 2026). In order to increase efficiency and equity, centralised agencies, bulk procurement, and performance-based contracts were adopted in the 1980s and 1990s after international organisations like the World Health Organization introduced essential medicine lists and pharmaceutical supply-chain guidelines (WHO, 2021; WHO-EURO, 2024).

Pharmaceutical procurement practices and medicine availability are strongly linked in contemporary literature. Organisations that adhere to standard operating procedures experience significantly fewer stock-outs than those that have delays or insufficient planning, according to cross-sectional research carried out in East Africa (Ngere, 2019; Kibiti & Njau, 2021). For instance, research done in hospitals in Tanzania and Ethiopia shows that the primary reasons for unavailability are supplier non-performance, delayed requisitioning, and inadequate funding, which often leads to emergency procurements that increase costs by 15–25% (Ambaw et al., 2022; Birhanu et al., 2023). Systematic reviews show that centralised or pooled models through framework agreements minimise lead times by one to two months, boost supply regularity for essential pharmaceuticals, and reduce prices by ten to fifteen percent (Blanchet et al., 2022; Enyedi et al., 2014).

According to recent research, preserving drug supply depends on effective procurement procedures such contract management, supplier selection, and quantification (Vledder et al., 2019). The principal-agent relationships present in Ethiopia's pharmaceutical procurement

system are directly addressed by Agency Theory, one of the theoretical underpinnings. At the macro level, EPSS (agent) is given the authority to acquire medications by the Ethiopian Ministry of Health (principal). In order to provide quality-assured medications, EPSS (principal) enters into contracts with both domestic and foreign suppliers (agents) at the micro level. Transaction cost economics (Kumar et al., 2025; Blanchet et al., 2022) and resource-based theories (Enyedi et al., 2014; Kumar et al., 2025) contend that the impact of procurement on availability is mediated by organisational capacities such as IT systems and skilled personnel.

Overall, evidence positions procurement as a modifiable determinant of access, with strategic upgrades promising systemic gains (Ngere, 2019; Pereira-Silva et al., 2024). By addressing gaps This study equips policymakers with evidence for reforms like pooled platforms, potentially slashing shortages 20-40% based on priors (BMJ Global Health, 2017; Journal on procurement institutions, 2025). Practically, findings enhance coordination between EPSS, facilities, and stakeholders, aligning with Ethiopia's Health Sector Transformation Plan (Jimma University thesis, 2022; MTaPS, 2023). Ultimately, better procurement yields fewer disruptions and lives saved answering questions through efficiency and improved procurement performance (Health-Procurement-Africa, 2024; WHO, 2023). Being a major determinant of total pharmaceutical costs and drug availability, pharmaceutical procurement system determines whether or not a country's populations had access to essential medicines. Pharmaceuticals constitute the second largest expenditure in most developing nations, after staffing costs, with pharmaceutical purchase accounting for the single largest share of health expenditure (Quick et al., 1997).

The Ethiopian Pharmaceutical Supply Service (EPSS), formerly known as the Ethiopian Pharmaceutical Supply Agency (EPSA), is a semi-autonomous Governmental organization established in the year 1939 E.C then re-established for the second time in 2017 E.C by new proclamation No. 1354/2017 which was mandated to ensure consistent and reliable access to essential medicines and other health commodities for the public health facilities in Ethiopia. EPSS procures about 80% of all medicines used in the public health facilities in the country. Though there are some progresses on Ethiopia's pharmaceutical supply chain management in general, evidence showed that public health facilities still encounter regular stock outs and therefore unable to meet patients' needs with often falling below international standards (Bilal et al., 2024; Eshetu, 2020). These evidences made a significant link between poor procurement practice and low medicines availability forcing users for high cost, and sometimes poor quality, medicines from the private drug outlets. Despite all improvements made by EPSS in procurement practice for the last five years, a big gap still exists in providing the continuous availability of medicines to the public (Bilal et al., 2024; Eshetu, 2020).

Ethiopia's pharmaceutical supply chain has three major gaps that this proposed study sought to fill, including the lack of dedicated, comprehensive research on the implementation and evaluation of operations and policies conducted at the country's central warehouse (EPSS Head Office), which is the nationwide focal point for strategic procurement of pharmaceuticals (FMoH, 2018; EPSS, 2020). Moreover, as addressed in the knowledge gaps section above, filling these gaps is of considerable importance for Ethiopia's pharmaceutical supply chain because such knowledge can inform evidence-based solutions to remedy stock-outs associated with deficient procurement practices at the EPSS Head Office and support continuous availability of essential medicines (Adinew et al., 2025; Wakjira, 2019). The study further contributes to optimized cash flow for Ethiopia's pharmaceutical sector by indicating where inefficiencies occur in the EPSS, thereby minimizing unnecessary practices such as emergency procurement that place pressure on the public pharmaceutical budget (FMoH, 2018; EPSS, 2020). Lastly, the data inform evidence-based policy and process recommendations for the MOH, EPSS, and other stakeholders, working from central systemic leverage points to maximize positive effects throughout the national pharmaceutical supply chain and support a patient-centred, resilient system (FMoH, 2018; Adinew et al., 2025).

1.2 Statement of the Problem

Access to essential medicines is recognized by the World Health Organization (WHO) as a core component of the right to health, requiring that medicines be available at all times in adequate quantities, in appropriate dosage forms, and at prices individuals and communities can afford (WHO, n.d.). In Ethiopia, this principle is embedded in the Health Sector Transformation Plan II (HSTP II, 2015/16–2019/20) and the Pharmaceutical Supply Transformation Plan II (PSTP II, 2020/21–2024/25), which explicitly identify improving access to pharmaceuticals and their rational use as one of the key strategic directions (Federal Ministry of Health [FMoH], 2015; FMoH, 2020).

In addition, Ethiopian Pharmaceutical Supply Service (EPSS), the primary public sector distributor and procurer, supports the Pharmaceutical Sector Development and Investment Plan (PSDIP), which aims to guarantee that essential medicines reach health facilities in a timely and dependable manner (FMoH, 2015; World Bank, 2020). Empirical data indicates that there are still gaps in the supply of medications at public health institutions notwithstanding these policy and programmatic initiatives. These results are in line with evaluations of Ethiopia's primary

healthcare system, which found that a significant bottleneck that frequently caused shortages at medical facilities was the insufficient supply of medications from EPSS (Wallace et al., 2025).

In this larger framework, EPSS functions under a sophisticated and centralised procurement system that primarily consists of three directorates: demand management, procurement management, and contract management. Together, these directorates cover the entire cycle, from the initiation of purchase requests to port clearance and warehouse stocking. The average lead time for pharmaceutical product procurement has remained high, and availability trends over time have not consistently reached predetermined goals, according to internal performance statistics and operational experience (EPSS, 2017; Tadesse et al., 2022). In practice, the EPSS head office faces recurring challenges that appear to stem directly from specific pharmaceutical procurement practices. These include delays in the Demand Management directorate's preparation and consolidation of facility-level demand lists, the Procurement Management directorate's lengthy tender evaluation, tender endorsement, and contract signing procedures, and the Contract Management directorate's sluggish follow-up on performance bond collection, letter-of-credit (L.C.) opening, shipment tracking, and customs clearance (FMoH, 2020; Assefa et al., 2024). Extended procurement lead times, late medicine arrivals at EPSS central warehouses, delayed supplier deliveries, and frequent L.C. expiries are all common outcomes of these back-and-forth activities and procedural rigidities, all of which contribute to preventable medicine shortages at public health facilities (Tadesse et al., 2022; Wallace et al., 2025).

Although Ethiopia has introduced reforms such as the committed demand and supply system (CDSS) and other supply-chain modernization initiatives. The lack of a targeted, quantitative evaluation that clearly connects particular pharmaceutical procurement practice at the EPSS head office level to medication availability results, including stock-out rates, lead times, and on-time delivery, represents a research gap. In order to close this gap, this study, "The Effect of Pharmaceutical Procurement Practice on Medicine Availability: The Case of Ethiopian Pharmaceutical Supply Service (EPSS) Head Office," looks at how current procurement procedures affects the availability of medicine at EPSS central warehouses. In accordance with WHO recommendations and national health and pharmaceutical supply chain policies, closing this gap is vital for guiding focused operational improvements, cutting down on needless delays and expenses, and ultimately improving access to necessary medications (WHO, n.d.; FMoH, 2015, 2020).

1.3 Research Question

Based on the above problems, the study wants to ask the following major research questions and answered at the end of the study.

1.1. What is the effect of accurate demand forecasting in pharmaceutical procurement and medicine availability and their corelation at the EPSS Head Office?

1.2. How does the duration and variability of procurement lead time components influence the timely availability of essential medicines and their corelation at the EPSS Head Office?

1.3. To what extent do EPSS's supplier selection and contract management practices affect the continuous supply of essential medicines and their corelation at the EPSS Head Office?

1.4. What are the major operational and structural efficiency in pharmaceutical procurement practices affecting medicine availability and their corelation at the EPSS Head Office?

In order to fill the above gaps and to answer the above research questions by suggesting possible scientific solutions, the effect of EPSS procurement practice on availability of essential medicine was studied and also the study asks the above research questions that are going to be answered at the end of the study. In this study the possible independent variables are demand forecasting, procurement lead time, Supplier selection and contract management practices and operational and structural challenges. The dependent variable is medicine availability.

1.4 Research Objectives

1.4.1 General Objective:

To analyse the effect and corelation of pharmaceutical procurement practices on medicine availability at Ethiopian Pharmaceutical Supply Service (EPSS) Head Office.

1.4.2 Specific Objectives:

1. To evaluate the effect and corelation of demand forecasting on the availability of essential medicines.
2. To analyze the effect and corelation of procurement lead time variability on the availability of essential medicines.
3. To examine how supplier reliability and contract fulfilment rates influence the continuous availability of essential medicine and their corelation.
4. To identify the major operational and structural efficiency of procurement practice on medicine availability and their corelation .

1.5 Significance of the Study

The findings of this study was expected to bring significant benefits for MOH,EPSS, academic community and essential medicine end users. The study provided meaningful insight to demand , procurement and contract management directorates in EPSS to make data driven decision making to meet operational targets and also helps to remove those unnecessary non value adding procurement practices that are highly affecting to avail pharmaceutical medicines on time, in affordable price and in a sufficient quantity.

In the year 2018 EBY Ethiopia has started the implementation of new pharmaceutical supply supply chain system known as committed demand and supply system (CDSS) which strongly support the policy in availing essential medicines. This system is primarily initiated by MOH & EPSS and all regional health bureaus are involved in the implementation. It is believed that one of the core issues to secure the smooth implementation of CDSS at national level is efficient procurement practice at EPSS. So that it is significant to evaluate and analyze the current procurement practice of EPSS and provide appropriate scientific solution in order to sustainably implement the current new system.

By offering actual data on the effectiveness of a centralised procurement organization in a low-resource environment, this study adds to the body of knowledge on public pharmaceutical supply chain management. In particular, it examines how the EPSS Head Office's procurement procedures affect the availability of medications, providing practical advice for improving stock dependability and procurement efficiency.

1.6 Scope of the Study

The study was confined to the EPSS Revolving drug fund (RDF) Pharmaceutical Procurement Practices only. The study was conducted at the EPSS Head Office in Addis Ababa because the head office which is the sole responsible body for procurement at the national level, tender processes and final contract awards. The study assessed the EPSS's Pharmaceutical Procurement cycle/ Practices focused on particular independent variables like demand forecasting, procurement Lead Time, Suppliers selection, and Contract Management and the operational and structural problems and their effects on the availability of essential medicine. To make sure the study is current and applicable, purchase request, procurement and contract Management data's for a recent period of time would be assessed. The most recent three Ethiopian fiscal years (2015-2017 E.C) seem appropriate.

1.7 Operational Definitions

Pharmaceutical Procurement Practice: The systematic set of processes, policies, and actions undertaken by EPSS to source, purchase, and contract for essential medicines (Management Sciences for Health, 2012).

Forecast Accuracy: The effective demand forecasting process, measured quantitatively as the average deviation of the forecast from actual consumption (Holloway et al., 2021).

Procurement Lead Time: The total number of days taken from the official start of the procurement cycle to the physical arrival of medicine at the EPSS central warehouse (World Health Organization, 1999).

Essential Medicines: Products listed on the Ethiopian National Essential Medicines List or pharmaceutical procurement list (PPL) that are strategically prioritized for procurement by EPSS (Management Sciences for Health, 2012).

Medicine Availability: The continuous presence of selected essential medicines at EPSS's central warehouses (World Health Organization & Management Sciences for Health, 2012).

1.8 Limitation of the Study

This study primarily focused on effect on medicine availability using evidence from the Ethiopian pharmaceutical supply service (EPSS), considering specific variables, time, available resources, and comprehensive data. Initially, the study's focus was confined to the EPSS, and this limited perspective might hinder a comprehensive grasp of the challenges throughout the pharmaceutical procurement systems. Secondly, the research utilized a cross-sectional approach and recorded medicine availability issues at one specific moment rather than across a long duration, which constrains understanding of long-term trends, policy effects, and changing organizational procurement related reforms. Third, limitations on resources such as financial constraints, time hindered.

1.9 Organization of the Study

Five sequential chapters were arranged to present this study in a very clear narrative structure. In Chapter One, the background, problem statement, research objectives, questions, significance, scope, and limitations are introduced. It has been observed that Chapter Two provides a broad

literature review which covers theoretical foundations, empirical studies about pharmaceutical procurement practices, and their clear effect on medicine availability, while focusing on centralized supply systems like EPSS. The research methodology is explained in Chapter Three, which includes the case study approach, the collection of data from by semi structured questionnaire and verification from EPSS digital systems and manual records (procurement logs, inventory data), quantitative analysis techniques (regression for lead time/forecast effects), and also ethical considerations. Chapter Four successfully reveals the findings and analysis by linking procurement practice variables (demand forecasting accuracy, lead time variability) directly to medicine availability metrics at EPSS Head Office. Chapter Five offer summary of findings, conclusions and recommendations for EPSS operational improvements, and directions for future research on integrated pharmaceutical supply chain enhancements.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the relevant literature on pharmaceutical procurement and supplies and the availability of Essential Medicines. The rationale behind doing a literature review is to provide a theoretical basis and empirical background for this study, identify any gaps or inconsistencies in current knowledge and give a justification for the indicators or variables of this study. The literature review discusses the major monitoring areas of demand forecasting, procurement lead times, supplier performance and contract compliance, and operational and structural factors of procurement systems. Continuous availability of Essential Medicines is one of the fundamental goals of public pharmaceutical supply systems, especially in low- and middle-income countries, where problems of supply and distribution often lead to stock-outs and disruption of health services. Provision of the right medicine, at the right place, at the right level of the system, in the right amount, at a reasonable cost, through a system that is effective and efficient, has been demonstrated to depend largely upon procurement practices. Poor planning, over-reliance on inaccurate forecasts, long procurement cycles, non-performance by suppliers and administrative inefficiencies have been identified to be the key reasons for medicine shortages. The Ethiopian Pharmaceutical Supply Service (EPSS) is the sole public procurement and distribution organization within the country's health supply system responsible for the provision of Essential Medicines to public health facilities.

This chapter is subdivided into three sections. The first section discusses about the major theoretical reviews that support the procurement. The second section discusses the findings from empirical research into pharmaceutical procurement practices and medicine availability. This section also describes findings from empirical research into procurement determinants including forecasting accuracy, procurement lead time, supplier reliability, and operational barriers to medicine procurement. The third section describes the conceptual framework for the research and relations between procurement practices and medicine availability.

2.2 Theoretical Review

The theoretical review outlines the conceptual and analytical framework through which the effect of pharmaceutical procurement practices on medicine availability can be analysed in the Ethiopian public health supply system. As a general rule, procurement is known to be one of the most important causes of supply performance, as procurement decisions influence the structure of the supply chain as well as everything related to supplier management (delivery, inventory

management, etc.) and product performance (quality, service level, etc.) (Vian et al., 2017). Especially under centralized procurement mechanisms, 'how a procurement process is conducted is highly influential in how much medicine arrived to the patient in a timely manner, i.e., whether procurement was a strategic function of a health service or not' (Sanderson et al., 2015: 2). In the Ethiopian public health supply system, the role of procurement practices has to be realized within the national health policy, financial resource base and the essentially global pharmaceutical market when striving for medicines availability (Boche et al., 2022). The framework for the theoretical review in this study is developed according to the framework of the specific research questions; demand forecasting, variability of procurement lead time, supplier punctuality and contract fulfilment and operational and structural constraints. The study of pharmaceutical procurement and its effect on medicine availability is supported by several organizational and supply chain management theories that explain how resources, relationships, and transaction structures influence performance.

2.2.1 Agency Theory

Agency Theory applies to situations where one party (the principal) delegate's responsibility for the execution of activities to another party (the agent). In pharmaceutical procurement, this relationship is multifaceted. At one level, the Ethiopian Ministry of Health (principal) delegates the responsibility of securing national medicine supplies to EPSS (agent) (Boche,2022). In order to provide quality-assured products, EPSS (principal) also works with local manufacturers (agents) and outside foreign suppliers (Sanderson, 2022). The main problem with these interactions is the possibility of opportunistic behaviour on the part of the agent, who might operate more in their own self-interest than the principal's (e.g., maximising profit at the expense of quality or delivery time) (Sanderson, 2022). EPSS employs contractual procedures, incentive structures, and monitoring regimes such as formal supplier qualification and performance audits to manage these behavioural hazards and guarantee adherence to quality and delivery requirements (Sanderson, 2022). Agency Theory directly applies to the principal-agent relationships inherent in Ethiopia's pharmaceutical procurement system. At the macro level, the Ethiopian Ministry of Health (principal) delegates medicine procurement authority to EPSS (agent). At the micro level, EPSS (principal) contracts with international and local suppliers (agents) to deliver quality-assured medicines. This theory is most relevant because the central problem that was investigated medicine unavailability due to procurement failures was explained by agency problems: suppliers know their true production capacity; EPSS does not, suppliers prioritize profit; EPSS prioritizes availability, and suppliers may cut corners after contract award.

As Sanderson et al. (2015) argue, procurement performance depends on how well contracts align agent incentives with principal objectives. Agency Theory guides the examination of Supplier reliability: are contracts designed with adequate monitoring and penalty clauses to reject opportunistic supplier behaviour? Contract management practices: Does EPSS effectively monitor and enforce supplier compliance? Operational efficiency: Does the organizational structure clarify roles and reduce agency costs? Agency Theory suggests that the effectiveness of pharmaceutical procurement depends on the principal's ability to design contracts that align the agent's incentives with the principal's goals of timely, quality-assured delivery at reasonable cost (Sanderson et al., 2015, p. 45).

2.2.2 Resource-Based View (RBV)

According to experts, the Resource-Based View (RBV) explains how an organization's unique assets and skills which are valuable, scarce, impossible to replicate, and irreplaceable (VRIN) create its long-term market domination and superior execution (komache, 2025). When examining EPSS, the Resource-Based View (RBV) shows that the institution's internal strategic tools determine how well pharmaceutical procurement operates. A highly qualified staff (pharmacists and supply chain specialists), cutting-edge technology (SAP and eGP systems), and the exclusive legal authority granted to EPSS as the exclusive central buyer for the state division are specific components of these resources (EPSS, 2026).The Resource-Based View (RBV) focuses on internal skills rather than external market conditions, meaning that drug accessibility is primarily caused by how EPSS manages and makes use of its own internal resources, such as information evaluation for prediction and its transport web (komache, 2025). In terms of EPSS, gaining a stronger market position entails being able to provide better support and a steady supply of commodities at a lower total cost compared to other procurement frameworks (Zhou, 2025).

RBV helps explain why some procurement organizations do better than others. It's about the unique things they can do and the resources they have. This approach looks at what's inside the organization, rather than just the contracts they have with others. For EPSS, these internal assets include having specialists like pharmacists and supply chain experts, using technology like SAP and eGP systems, and having the legal authority to procure for the public sector in Ethiopia, as noted by Komakecha et al. in 2025. How well EPSS uses these assets affects how well they can get medicines to people. So, can they forecast demand accurately? Do they have the right people and systems to do that? Are staff trained well enough? Is technology being used effectively? And can they get things done quickly, without a lot of delays?

2.2.3 Transaction Cost Economics (TCE)

TCE suggests that an organization chose the procurement method that minimizes these total lifecycle expenses. For EPSS, the decision to use open tendering versus direct procurement involves a balance between the lower unit prices of competitive bidding and the lower administrative and time costs of direct sourcing in emergency situations (Negera,2021). The theory also highlights how uncertainty and the frequency of transactions influence whether a function should be managed in-house or outsourced. For example, the high costs of cold chain logistics in pharmaceuticals demand significant capital, making the acquisition cost often less than 60% of the total lifecycle expense (ABDRHMAN,2020).

TCE looks at how much it really costs to do a transaction, including all the hidden costs like checking out vendors, negotiating, and making sure everything goes right. This matters for EPSS because they have to decide whether to do things in-house or contract them out. Should they centralize procurement or spread it out? Should framework agreements replace open tendering? And must balance efficiency against transaction costs. ABDRHMAN (2020) notes that in pharmaceutical procurement, acquisition costs often represent less than 60% of total lifecycle expenses when transaction costs are properly accounted for. TCE guides the examination of Procurement lead time: Does the current tendering process minimize total transaction costs, or do bureaucratic delays represent hidden costs? Supplier management: Are framework agreements and long-term relationships used to reduce transaction costs and ensure availability?

This study integrates the above three theories by placing that medicine availability at EPSS is determined by: how well contracts align supplier incentives (Agency Theory),the organization's internal forecasting and procurement capabilities (RBV), and the efficiency of procurement methods in minimizing total transaction costs (TCE). Generally the above three theories was used for the future study titled as the effect of pharmaceutical procurement practice on medicine availability: the case of ethiopian pharmaceutical supply service (EPSS): Head Office. But from those three theories Agency theory was Primary theory that the study used, both Resource-Based View (RBV) and Transaction Cost Economics (TCE) was Supporting theories.

2.3 Conceptualization of Study Variables

This study comprises of four independent variables and one dependent variable, derived from the research objectives and conceptual framework.

Demand Forecasting Accuracy Refers to the degree of precision with which the Ethiopian Pharmaceutical Supply Service (EPSS) predicts future medicine requirements based on historical consumption data, disease burden trends, population dynamics, and service delivery plans (Komakecha et al., 2025). Accurate forecasting helps get the right amount of stuff. You don't run out and you don't overbuy. Procurement lead time is basically how long it takes to get medicines from when you first ask for them to when they show up at the warehouse. This includes a lot of steps like getting bids, picking a supplier, making the supplier make the stuff, shipping it, getting it through customs, and finally getting it. Supplier reliability is key. It means the supplier can deliver what you need when you need it. They have to follow the specs, send the right amount, and meet the deadlines. It's about being consistent, not just getting it right once. Sanderson and others talked about this back in 2015.

Contract fulfilment represents the extent to which suppliers meet contractual obligations including delivery schedules, quality standards, and quantity requirements (ABDRHMAN, 2020). Operational and Structural Efficiency: Encompasses the organizational processes, role clarity, coordination mechanisms between directorates (demand management, procurement management, and contract management), staff capacity, and bureaucratic procedures that influence procurement performance (Negera et al., 2021; Boche et al., 2022).

Medicine Availability: Defined as the continuous presence of essential medicines at EPSS central warehouses and service delivery points when required by healthcare providers or consumers (Ahmed et al., 2024). For this study, medicine availability is measured using three indicators: line-item fill rate, stock-out frequency, and continuous supply of selected essential medicines.

2.4 Pharmaceutical Procurement Practice and Medicine Availability

Pharmaceutical procurement practice can be defined as the well-established process of purchasing medicines from manufactures or other suppliers, through systematic planning, sourcing, contracting and checking mechanisms (Vian et al., 2017). There are varied though interconnected activities performed under procurement (Sanderson et al., 2015), including product selection, needs assessment, tender preparation, sourcing negotiation, contract execution and supplier performance monitoring. The focus of the modern procurement mechanisms is to attain the “six rights”, ensuring the best fit to supply chain in terms of right product, right quantity, right circumstances, right place, right time and right cost, by effective coordination in

procurement planning, finance, stakeholders' management and logistics operation (Vian et al., 2017; Negera et al., 2021).

Availability of medicines is defined as the presence of an essential medicine in health facilities stock or distribution points when required by health care providers or consumers (Ahmed et al. 2024). Availability is usually determined by using index indicators such as line item fill rate, order fulfilment rate and rate of stock-out (Ahmed et al. 2024). According to literature, availability of medicines has been shown to be directly related to the performance of procurement as this determined availability of supplies, delivery time and supplier reliability (ABDRHMAN, 2020).In centralized pharmaceutical supply agencies like Ethiopian Pharmaceutical Supply Service, the procurement practices equally determine the availability of medicine by linking country needs with demands of global pharmaceutical markets (EPSS, 2026). Poor procurement system may lead to delays, failure of suppliers or mis procurements leading to stock-outs, thereby interrupting service delivery (Boche et al., 2022).

This study focused on four dimensions of Pharmaceutical Procurement Practices namely Demand Forecasting, Procurement Lead Time, Supplier Selection & Contract Management and Operational & Structural Efficiency. Demand forecasting estimates future pharmaceutical needs using consumption data, morbidity rates, and guidelines to guide accurate quantification. EPSS uses national protocols, but data inaccuracies are a problem (Biru et al., 2022). Procurement lead time is critical for availability, as it is the period from order initiation to goods receipt. EPSS targets under 90 days, but it often exceeds due to regulatory delays. Shorter times reduce shortages in pharmaceutical supply chain systems (Amero, n.d.). Supplier selection evaluates vendors on quality, price, and GMP compliance using multi-criteria methods, with contracts ensuring ongoing performance (Abolghasemi et al., 2018). This optimizes pharmaceutical supply reliability. Operational and structural efficiency involves processes, ICT, staff skills, and infrastructure for effective procurement execution, which is essential for successful procurement. In EPSS, it addresses logistics and SOPs to enhance medicine availability (MTaPS Program, 2023).

Medicine availability is commonly measured using several indicators in public health supply chain research (Ahmed et al., 2024). This study employed three complementary measures of medicine availability. The first one is Line-item fill rate (Primary Measure): This study used line-item fill rate as the primary measure because it captures procurement performance at the central warehouse level before distribution to health facilities. According to Vledder et al. (2019), line-item fill rate directly reflects procurement effectiveness, as it measures what proportion of

requested medicines were actually procured and received. For EPSS, a lower line-item fill rate indicates procurement failures in quantification, supplier selection, or contract management. Line-item fill rate Captures procurement completeness; directly links to forecasting accuracy and supplier performance. The second one is Stock-out frequency (Secondary Measure): Stock-out frequency was measured as the number of days selected essential medicines were unavailable at EPSS central warehouses during the study period (2015-2017 E.C.). This measure is critical because, as ABDRHMAN (2020) notes, stock-out frequency at central warehouses cascades downstream, causing facility-level shortages.Stock-out frequency : Reflects procurement lead time effectiveness; short-term stock-outs indicate logistics failures. Lastly Continuous availability of selected essential medicines (Tertiary Measure): Following WHO (2019) guidelines, this study tracked whether a tracer list of 10-15 essential medicines (from the National Pharmaceutical Procurement List) remains continuously available over three fiscal years. This measure addresses the sustainability dimension of availability (Ahmed et al., 2024). Continuous availability Measures system resilience; addresses the consistent access goal of EPSS mandate. These three measures collectively address the research objectives. Line-item fill rate was used to test the effect of demand forecasting and supplier reliability. Stock-out frequency assessed procurement lead time variability. Continuous availability evaluated operational efficiency.

Theoretical and empirical literature establishes a direct causal pathway between forecasting accuracy and medicine availability measures. Komakecha et al. (2025) demonstrated that a 10% improvement in forecast accuracy reduces stock-out frequency by approximately 8% in centralized pharmaceutical supply systems. Forecasting accuracy pretty is key. It ensures that what's ordered matches what's needed, making it more likely that items are fully supplied. Under-forecasting leads to not enough stock, which increases stock-out days.

Procurement lead time also matters. The longer it takes to get stuff, the more safety stock is needed. But if lead times are longer than planned, stock-outs are pretty much guaranteed. Longer lead times mean a bigger gap between ordering and getting new stock, so existing inventory might run out before new stock arrives. And that makes it hard to keep medicines available all the time. Suppliers play a big role too. If they don't deliver on time or as promised, it can cause stock-outs. Vian et al. found that supplier issues account for 30-45% of stock-out events. Reliable suppliers, on the other hand, deliver complete orders, which improves fill rates. And when contracts are fulfilled consistently, it supports sustained availability. Internal processes are important as well. Facilities with clear roles and streamlined approval processes have fewer stock-outs. Operational efficiency affects all availability measures. Poor coordination between

different parts of the process can lead to stock-outs. For example, Negera et al. found that facilities with better coordination had 40% fewer stock-outs. Forecasting accuracy affects line-item fill rate and stock-out frequency. Lead time affects stock-out frequency and continuous availability. Supplier reliability affects line-item fill rate and continuous availability.These factors all contribute to whether medicines are available when they're needed. Poor coordination between demand management, procurement management, and contract management directorates created delays that negatively affect fill rates, increase stock-out frequency, and disrupt continuous supply (Desalegn, 2023).

2.4.1 Demand Forecasting and Availability of Essential Medicines

Demand forecasting is a key part of pharmaceutical procurement. It's really important to get this right. This is due to the fact that procurement decisions are extremely reliant on the most reliable assessment of the needs for the medicines for use in the future (Vian et al., 2017). Demand forecasting entails the projection of future requirements for essential medicines based on historical usage data, disease trends, population dynamics, as well as service delivery plans (Sanderson et al., 2015).

The theoretical literature acknowledged that "the greater the accuracy of the forecast, the more it offset the uncertainty of supply chains and the lower the effective procurement cost was by maintaining the optimum balance of supply and demand" (Komakecha et al., 2025). Better demand forecasting could provide procurement organizations with the benefit of planning procurement cycles, negotiating procurement contracts with the suppliers, and establishing order quantity for keeping the proper stock levels (Negera et al., 2021). Improved demand forecasting can allow procurement organizations to plan procurement cycles, negotiate procurement contracts with suppliers, and determine order quantities for the maintenance of appropriate stock levels accordingly (Negera et al., 2021). Conversely, poor demand forecasting is commonly cited as one of the reasons for stock-outs, with inaccurate forecasts being attributable to unreliable planning data, a lack of integrated information systems, limited information systems capacity, as well as fluctuating disease patterns (Boche et al., 2022).

Demand underestimation often lead to under-procurement whilst over estimation can lead to wastage of stock through expiry and overstocking (ABDRHMAN, 2020).. Pharmaceutical procurement nowadays is frequently aided by computerized forecasting and other decision support systems within health information systems (Komakecha et al., 2025). Digital procurement systems enable the exchange of information between facilities and procurement agencies in real-time, which improves planning for supplies (Sanderson et al., 2015).

2.4.2 Procurement Lead Time Variability and Medicine Availability

Procurement lead time is defined as the duration between the beginning of a procurement action and the delivery of the item into stock (ABDRHMAN, 2020). The variability in procurement lead time becomes a significant source of concern for supply chain performance since the unpredictability in the time inherent to procurement results in uncertainty in inventory management and escalates risk associated with stock-outs (Negera et al., 2021). Theory-based literature shows that longer or more variable lead times compel businesses to stock up on safety inventory, thereby incurring higher inventory costs and operational management burdens (Sanderson et al., 2015). The causes of variability in procurement lead times include length of tendering procedures, delays in the production cycle of suppliers, transportation complications, customs requirements and similar expenses in terms of wordwide financial approvals (Boche et al., 2022).

In a public pharmaceutical supply system, long procurement lead times are common as they are a consequence of numerous regulations and practices that uphold a transparent system of accountability (Negera et al. 2021). Although a transparent system of governance may strengthen accountability mechanisms, it is a double-edged sword as it may slow down procurement processes, suggesting a balance between efficiency and accountability to be achieved (ABDRHMAN, 2020).

A critical conceptual clarification is required regarding procurement lead time's role in this study. In the pharmaceutical procurement literature, procurement lead time occupies a dual position: As a Procurement Practice (Input/Process Variable): Lead time is managed through specific practices including tender preparation timelines, bid evaluation protocols, contract approval procedures, and customs clearance coordination (ABDRHMAN, 2020). Organizations actively design lead time management practices to achieve efficient procurement. For EPSS, these practices are documented in the Procurement Lead-Time Standardization Protocol (EPSS, 2022).

As an Outcome Variable (Output/Performance Measure): Lead time variability (the degree to which actual lead times deviate from planned lead times) is an outcome of how well procurement practices are executed. Factors such as supplier performance, customs delays, and internal coordination failures produce lead time variability (Sanderson et al., 2015). Procurement lead time is be conceptualized as both a practice and an outcome, depending on the level of analysis:

but for this study's objectives: Lead time is treated as an independent variable when examining its effect on medicine availability as stated on Objective 2 , effect of procurement lead time variability on availability. However, lead time variability itself is acknowledged as being influenced by underlying procurement practices like forecasting accuracy and supplier selection.

2.4.3 Supplier Reliability, Contract Fulfilment, and Medicine Availability

Supplier reliability refers to supplier ability to deliver goods according to specifications, in precise quantities and timeline (Sanderson et al., 2015). Contract fulfilment rates refers to the extent of suppliers fulfil contractual commitments such as delivery schedule, quality and quantity of the items purchased (ABDRHMAN, 2020). Literature indicates that the success of procurement system largely depends on supplier performance, as performance shortfalls and unreliability would lead to delays in delivery, partial deliveries and quality problems leading to interruptions in supplies of medicines (Negera et al., 2021). Reliable supplier management such as prequalification, monitoring and review and long-term relationships is crucial to ensure supply security (Boche et al., 2022).

Contract management mechanisms are essential for aligning supplier incentives through setting expectations and accountability (Sanderson et al., 2015). An adequate instrument for monitoring of contract performance provides assurance that medicine deliveries are made in compliance with prescribed quality assurance standards, on-time, and can help to avoid supply shortages (ABDRHMAN, 2020).

2.4.4 Operational and Structural Efficiency in Procurement Management

Most systems experience operational and organizational challenges that affect procurement performance and medicine availability (Boche et al., 2022). The typical operational challenges encountered are inadequate funding, foreign exchange shortages, lack of technical capacity, bureaucratic procurement process, and disjointed coordination among organizational departments (Negera et al., 2021).Sanother organizational aspect that affects procurement performance is organization structure, as coordination between units responsible for

procurement management and contract management is vital for monitoring supplier performance, and adhering to procurement deadlines (Sanderson et al., 2015). Communication problems or task ambiguity may result in delays and lessen accountability. (ABDRHMAN, 2020).

External market conditions, including supplier market concentration, trading partners' prices, international prices, and transportation interruptions, can also shape procurement performance and drug availability (Komakecha et al., 2025). To addresses these limitations, institutional capacity strengthening, enhanced digital platform and strategic procurement planning should be performed as per country's priorities (Boche et al., 2022).

Overall, the theoretical review has indicated that procurement practices are at the heart of pharmaceutical supply in the procurement supply system of the publicly financed health system. The forecast precision and the related planning of procurement, procurement lead time variation, reliability of suppliers and contracted delivery, and the operational issues of procurement are exactly the interrelated factors that influence the availability of essential medicines for the population through the central pharmaceutical supply organization.

2.5 Empirical Literature Review

Empirical data on health systems around the world shows that one of the most important factors affecting medicine availability in a public-sector supply chain is how the medicines are procured. Studies that have been undertaken to identify the determinants of procurement performance find that demand forecasting, managing procurement lead time, supplier reliability, contract performance, and coordination of the organization all effect on the sustained availability of these medicines at the point of use (Vian et al., 2017).

The availability of medicines has been a common measure of performance for pharmaceutical supply chains as it captures the performance of the upstream procurement activities in addition to the downstream logistics network. Empirical studies have shown that procurement inefficiencies are a major cause of medicine stock-outs, long delivery times and service failures in both developed and developing healthcare systems (Sanderson et al., 2015). The effect of procurement performance is even more obvious in the context of middle- and low-income countries, where a central procurement body often acts as the key stakeholder in the national

supply network for medicines and hence procurement performance is a key factor in the overall health system reliability (Boche et al., 2022).

The Ethiopian Pharmaceutical Supply Service is a centralized procurement and distribution management that assures medicine availability through pooled procurement and integrated supply chain management. Reported8 evidence from Ethiopia's public health system suggests central procurement has resulted in cost saving and better supply chain co-ordination, but motivation remains a concern due to several operational difficulties including demand forecasting and supplier performance which might affect medicine availability (Negera et al., 2021).

2.6.1 Demand Forecasting and Medicine Availability

Demand forecasting has captured the attention of empirical studies as an important factor affecting procurement performance, with evidence from different public systems of pharmaceutical supply in various countries suggesting that a high degree of accuracy in forecasts minimizes stock-outs as a result of placing appropriate quantities of medication orders based on the demand (Komakecha et al., 2025). However, the empirical literature suggest that the error in forecasting is one of the leading causes of medicine stock-outs, with studies emerging from African health public systems based on consumption data alone, failing to consider the factors of epidemiological transition or scale-up that result in an account of met need. Forecasting problems arise due to poor data collection systems, limited reporting rates, and technical capacity to analyze data (Negera et al., 2021).

Field surveys undertaken in Ethiopian public sector health facilities demonstrate that inconsistent usage of facility information for reimbursement and planning causes suboptimal quantities of supply (excess and stock-out) (Boche et al., 2022). Field studies also show that digital information sharing such as Health Commodity Management Information Systems (HCMIS) enhance accuracy of consumption forecasts and improves the ability of monitoring consumption trend (Komakecha et al., 2025). Additionally, literature underscores the significance of shared forecasting processes between various agents. Empirical work identifies that procurement agencies derive significantly improved forecasting performance when health facilities are actively involved in quantification processes and data validation (Sanderson et al., 2015). Shared forecasting is a potent means of reducing informational divergence between procurement agencies and service delivery points to achieve efficient procurement planning and desirable medicine availability outcomes.

Other researchers have shown that forecasting problems such as those experienced by CHEST and FGL can be caused by outside influences, such as disease outbreaks, changes in policy or the transition of donor programs. For example, epidemics can cause sharp increases in demand that can break down existing models with relative accuracy (Vian et al., 2017). It has been argued that models including scenario planning and buffer stocks make forecasts more robust.

H01: There is no significant effect of accuracy of demand forecasting on medicine availability at the EPSS Head Office.

Ha1: There is a significant effect of accuracy of demand forecasting on medicine availability at the EPSS Head Office.

2.6.2 Procurement Lead Time and Medicine Availability

Procurement lead time has been well-studied as a key operational determinant of medicine availability. Empirical research shows that long or variable procurement lead times are strongly associated with increased risk of stock-outs because they break inventory replenishment cycles (ABDRHMAN, 2020).49 Research into public sector pharmaceutical supply chains reveals that procurement lead time covers multiple process steps such as tender preparation, bid review, contract award, supplier manufacturing, international shipping, customs management, and internal distribution (Sanderson et al., 2015).

Empirical evidence from the Ethiopian health system showed that bureaucratic procurement procedures, unavailability of foreign currency and restrictions in obtaining approval, have been identified as major factors leading to long lead time in the procurement process (Negera et al., 2021). Long lead times reduces the responsiveness of procurement agencies to changes in demand and compel procurement agencies to depend on emergency procurement procedures, which is more costly and less efficient. (Boche et al., 2022).

Empirical studies in the Sub-Saharan Africa has indicated that long procurement lead time variability is often caused by manufacturing delay, delays in procurement of raw materials and transportation interruption on the supply side (Komakecha et al., 2025). Empirical case studies reveals that using diversified suppliers and framework agreement is likely to reduce lead time

variability as suppliers was available on a frame work agreement when the primary supplier performs poorly.

Another byproduct of efficiency is that increased coordination between procurement management and logistics units has the potential to increase efficiency by reducing lead time through smoother approval processes and ease of communication between involved stakeholders (Sanderson et al., 2015). Electronic procurement has also been found to minimize administrative delays by increasing transparency.

H02: Procurement lead time variability does not significantly affect the timely availability of essential medicines at the EPSS Head Office.

Ha2: Increased procurement lead time variability significantly decreases the timely availability of essential medicines at the EPSS Head Office.

2.6.3 Supplier Reliability and Contract Fulfilment

Supplier reliability has been established as a major factor determining procurement performance in empirical literature. Empirical findings suggest that the lack of reliable suppliers results in late deliveries, partial shipments and quality problems that affect medicine availability (ABDRHMAN, 2020). In terms of public sector pharmaceutical procurement, the evidence points to the role of supplier prequalification and supplier performance monitoring to contribute to reliable supply. Empirical evidence indicates that procurement agencies that sustain high levels of supplier evaluation achieve better contract compliance rates and supply continuity. (Sanderson et al., 2015).

In Ethiopia for example, initial findings from the Ethiopian health systems suggest that supplier related performance problems include delayed production schedules; limited production capacity and foreign currency problem faced by foreign suppliers (Boche et al., 2022). Another study shows that supplier incentives such as payment, penalty, performance based payment and supplier score-card are successful in make suppliers adhere to schedules (Negera et al., 2021).

Long term relationship with suppliers is also associated to better performance of the procurement function. According to some empirical evidence, collaborating with suppliers could contribute

to improving communication, minimizing uncertainty and increasing service levels (Komakecha et al., 2025). Nevertheless, excessive dependence on few suppliers also makes the company more susceptible to risks of disruptions.

H03: Supplier reliability and contract fulfillment rates do not have a significant influence on the continuous supply of essential medicines at the EPSS Head Office.

Ha3: Supplier reliability and contract fulfillment rates have a significant positive influence on the continuous supply of essential medicines at the EPSS Head Office.

2.6.4 Operational and Structural Procurement Efficiency

Operational and institutional barriers to procurement performance are well established in empirical literature. Researchers point to financial resource constraints, institutional capacity constraints, crowding of the institutional coordination framework, and particularities of the regulatory environment as inhibiting procurement performance (Boche et al., 2022). Empirical evidence suggests that procurement agencies with constrained human resources capacity has an impact on forecasting, monitoring supplier performance, and handling complex tenders (Negera et al., 2021). Research suggests that capacity building through training programs contributes to improved procurement performance by boosting technical skills and analytical capacity (Sanderson et al., 2015).

Financial management problems, such as delays in the approval of budgets or allocation of foreign exchange, also lead to delays in procurement and a less than adequate availability of medicines (ABDRHMAN, 2020). A number of studies stress that integrated financial planning and procurement coordination promotes procurement efficiency and alleviates bottlenecks.

The structure of the organization significantly affects procurement performance. Empirical studies show that the ambiguity of roles and responsibility between procurement management and contract management units may lead to redundancy and duplication of tasks, delay decision-making and lack of accountability (Boche et al., 2022). The enhancement of institutional coordination mechanisms and responsibility clarification can effectively improve procurement efficiency and supply ability.

Much of the available empirical literature (national, international) suggests the operational, structural and systemic aspects influencing pharmaceutical procurement and medicine availability. Much of section 1 addressed aspects such as demand forecasting, procurement lead times and supplier reliability; whereas section 2 is mostly a synthesis of the literature on the institutional, managerial and structural factors, and approaches to improve issues.

The management fails in procurement and supplies operations is well documented with many evidence-based studies reporting its impact on stocks. For instance, Boche et al. (2022) conducted a mixed-methods study in Ethiopia with procurement staffs, and results identified that with organizational inefficiencies like long bureaucratic procedures, capacity constraints and weak coordination between procurement and contract management directorates, there was a significant association with delays in delivery and stock-outs. Likewise, Negera et al. (2021) revealed that health staff participants reported procurement system effectiveness as being limited by the organization structure and workflow deficiencies in response to needs at the facility.

Similar conclusions are also identified in the comparative studies conducted worldwide. Vian et al. (2017) summarized that weak procurement process standardization and monitoring mechanisms and poor integration of procurement data in public pharmaceutical supply systems of LMICs contribute to delays in procurement decisions. Sanderson et al. (2015) highlighted that only when organizations know their roles and avoid duplication of responsibilities between departments can procurement inefficiency be reduced and accountability be further increased. These evidences imply that operational and managerial problems are encountered throughout the nations and greatly influence the medicine availability.

H04: Operational and structural efficiency challenges do not significantly affect medicine availability at the EPSS Head Office.

Ha4: Operational and structural efficiency challenges significantly decrease medicine availability at the EPSS Head Office.

2.6 Research Gaps Identified in Empirical Studies

Lack of analytical studies with a longitudinal time series data for procurement performance, which limits the understanding of long-term effects of the procurement decision on medicine

availability (Negera et al., 2021); Limited understanding of the interaction of operational, financial and human resource factors in low-resource setting like Ethiopia (Boche et al., 2022). ew studies analysing the output and outcome of digital systems including integrated procurement system especially the effect on stock out reduction and lead time variation (Komakecha et al., 2025); Deception among the quantifiable indicator of procurement performance and medicine availability, for example the effect of supplier contract fulfilment on the availability of medicines at the service delivery points (ABDRHMAN, 2020). Filling these knowledge gaps is imperative for informed decision making and improvement of the procurement process, reduction of medicines stock out and strengthening of overall results of the centralized pharmaceutical supply systems.

Table 1*:* Summary of Emprical evidence

S.N	Study	Context	Focus Area	Key Findings	Implications for EPSS
1	Boche et al., 2022	Ethiopia	Procurement challenges	Bureaucratic delays, limited technical capacity, fragmented coordination	Need for operational reforms and staff capacity building
2	Negera et al., 2021	Southwestern Ethiopia	Procurement performance	Structural inefficiencies, weak forecasting	Strengthen organizational structure and integrated forecasting
3	ABDRHMAN, 2020	Global LMICs	Procurement practices	Lead time variability, supplier reliability	Implement supplier monitoring, contract management, and risk mitigation
4	Komakecha et al., 2025	Global supply chains	Human resources & digital tools	Skilled staff and digital integration improve procurement outcomes	Enhance training programs and adopt digital tracking systems
5	Vian et al., 2017	Low-and middle-income countries	Procurement systems	Integrated systems reduce stock-outs and improve accountability	Adopt e-procurement and real-time data systems
6	Sanderson et al., 2015	Global	Organizational and regulatory factors	Bureaucracy and unclear roles reduce efficiency	Clarify roles, streamline processes, and balance regulation with efficiency

Summary of Empirical Evidence

2.7 Conceptual Framework

A conceptual framework visually and theoretically depicts how the variables under investigation relate to each other (Sanderson et al., 2015). For this study, it describes the connection between pharmaceutical procurement practices and medicines' availability at the Ethiopian Pharmaceutical Supply Service. It is based on the research aims and empirical studies, which suggest that demand forecasting; procurement period; supplier performance and operational

efficiency are important predictors of medicines' availability. Procurement practices refers to the processes and approaches used to purchase medicines in a way that is both cost effective and reliable. For the purposes of this study procurement practices were defined as demand Forecasting Precision which means accurate estimation of required medicines by analysing data on consumption trend, burden of disease & service utilization (Komakecha et al., 2025). Secondly effective management of procurement processing time which also means minimizing and standardizing the period between procurement initiation and delivery of medicines (ABDRHMAN, 2020). Thirdly delivery performance means delivery of medicines according to contract and in the right quantity, time & quality (Boche et al., 2022). Finally efficiency measures coordination with other departments, processing time & policy compliance at the procurement and contract management units (Negera et al., 2021).

Availability of medicines refers to storage or service delivery points having essential medicines available when needed. Availability can be assessed by line-item fill rate which is the percentage of medicines ordered that are successfully supplied (Ahmed et al., 2024). Stock-out rate whereby the frequency of days without essential medicines is monitored (Vian et al., 2017); and continuous availability of high use or lifesaving medicines (ABDRHMAN, 2020). The theory of the conceptual framework is that every component of pharmaceutical procurement practice directly affects medicine availability namely demand forecasting artifact led to medicine availability, the comprehensive demand forecasting is crucial to procure the accurate amount of medicines in order to avoid stock-outs (Komakecha et al., 2025). Lead time management of procurement led to medicine availability described as shorter and predictable procurement lead time facilitated to replenish medicine stocks and to avoid supply disruptions (ABDRHMAN, 2020). Supplier Reliability and Contract implementation led to medicine availability which also described as equiprobable provider reliability and efficient contract implementation facilitated to deliver medicines based on predetermined specification (Boche et al., 2022). Operations and Structural efficiency led to medicine availability which means synchronized procurement activities and clear organizational structure prevented procurement delays and make sure a steady medicine supply (Negera et al., 2021).

In this framework, all various components of pharmaceutical procurement practice are predicted to have direct and positive effect on medicine availability without any moderating relationship.

Independent Variables Dependent Variable

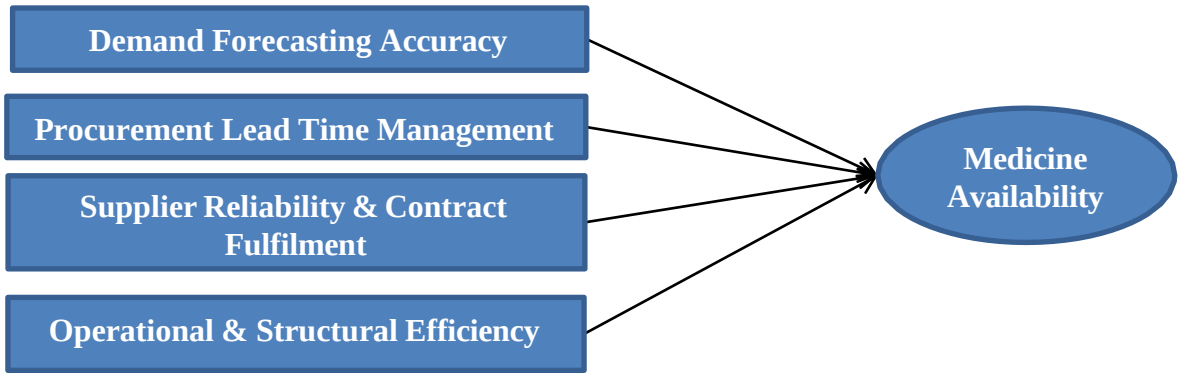


Figure1**:**Conceptual framework showing the direct relationship between pharmaceutical procurement practices and medicine availability (developed by resercher 2026).

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

This research was conducted in the Ethiopian Pharmaceutical Supply Service (EPSS) Head Office which is found at AddisKetam Sub-city of Addis Ababa City, the capital of Ethiopia (EPSS, 2026). EPSS is a semi-autonomous government agency established in 2017 E.C. by Proclamation No. 1354/2017, which legally formulated their Mandate and Authority to operate (FDRE, 2017). The geographic coordinates of the EPSS are 9°02'44" N and 38°43'38" E (Google Map, 2026). The organization has various sizes of cold chain warehouse, a large warehouse, a small warehouse and organized town according to the city plan that has modern infrastructures for the best flow of goods from head office to the regional warehouses. (EPSS, 2026).

Average daily temperature in this study location is 15–25°C, characteristic of the substropical highland climate prevailing in Addis Ababa (National Meteorology Agency of Ethiopia, 2025). Such climates are suitable for storage of pharmaceuticals when appropriate cold-chain and warehouse temperature control systems are in place (EPSS, 2026). The EPSS Head Office is a strategic public body established with the functions of procuring, storing and distribution of quality pharmaceuticals and medical supplies at affordable cost to all public health facilities in the country (EPSS, 2026). It is subdivided into two core operational units for procurement and supply of pharmaceutical products: the inbound section and the outbound section(EPSS, 2026).

The inbound wing has three directorates named as Procurement Management, Contract Management, and Marketing and Customer Experience Directorate, which are responsible for supplier selection, tender management, contract management, and customer liaison (EPSS, 2026). The outbound wing has three directorates named as Demand Management, Warehouse Operations, and Pharmaceutical distribution Management Directorates, which are responsible for facility demand aggregation (collaborative forcasting), pharmaceuticals storage, and distribution planning and execution (EPSS, 2026).the study site selected was the Head Office because it is the national central coordinating body for medicines procurement and supply chain management. It facilitates medicines demand pooling from public health facilities through nineteen hubs and Regional State Health Bureaus, plans and executes public sector medicine procurement through national and international Competitive Bidding, administers the contract, receive medicines, and monitors financial administration (EPSS, 2026; FDRE, 2017).

3.2 Research Approach

The research employed a mixed methods approach, integrating both qualitative and quantitative methods to provide a comprehensive analysis of pharmaceutical procurement practices at EPSS. Researchers used quantitative methods to look at relationships between things like how well they could forecast demand and how much medicine was available. This was based on a sample of 143 people. They also did interviews with key people to get a better understanding of what was causing problems with getting medicine. This mixed approach makes sense because it helps explain what's going on and why it's happening. It's a good way to study complex systems like pharmaceutical supply chains, as Creswell and Creswell suggested in 2018. By using both numbers and interviews, they could verify their findings and make sure they were accurate.

3.2 Research Design

This study adopted a convergent parallel mixed methods design, combining descriptive cross-sectional survey data with explanatory elements. The descriptive component profiles current procurement practices across EPSS directorates using frequencies and means from Likert-scale responses. The explanatory component tested causal relationships via multiple linear regression, assessing how independent variables affects medicine availability. This design is justified for several reasons: (1) Descriptive surveys suit population-based profiling in organizational studies (Saunders et al., 2019); (2) Regression enables causal inference from cross-sectional data, common in supply chain research where experiments are infeasible (Hair et al., 2019); (3) The convergent parallel structure allows simultaneous data collection and integration during analysis, maximizing efficiency for time-bound thesis. It fits the EPSS context, where quantitative metrics from SAP/eGP systems complement qualitative insights from directorate staff.

3.3 Population and Sample

Employees working in the EPSS Head Offices demand management, procurement management, contract management,marketing and customer experience and warehouse operation was the major target Populations and employees from cross functional directorates was incluided. Purposive sampling was the method of sampling that is employed for key informants. The total population of the study is 795 (EPSS head office Hr. Data). For this case major leads or directors and coordinators from demand management, Procurement management, contract management, marketing and customers experience directorates, pharmaceutical distribution directorate and warehouse operation Directorate was used and also other key informants necessary for the study was used to acquire their professional knowledge in specific procurement practices. Stratified

random sampling is used to guarantee representation from a variety of operation departments. Stratified random sampling ensures proportional representation from key strata (Demand Management, Procurement Management, Contract Management, RDF finance directorate, Warehouse Operations and others necessary departments, preventing underrepresentation of smaller but critical groups like Contract Management staff. This technique reduces sampling error in heterogeneous populations like varying expertise levels across directorates and enhances generalizability to the 221 employees working on end-to end pharmaceutical procurement, as recommended for organizational surveys (Saunders et al., 2019). Purposive sampling supplements for 12 key informants that are involved in the EPSS procurent practice to capture insights on structural and other independent variable challenges.

To ensure statistical significance the survey portions sample size was calculated using Yamane's formula (1967) for both as a sample size and the explanatory followed 10:1 Rule (Jr., 2005). The target population comprises employees at the EPSS Head Office, specifically those in Demand Management, Procurement Management, Contract Management, Marketing and customer experience and Warehouse Operations directorates, plus cross-functional staff involved in end-to-end procurement. This finite population size justifies Yamane's (1967) formula for sample size determination, yielding n=221 at 5% margin of error (95% confidence).

Yamane's formula

$n=N/1+N\ (e)^{2}$

Where n is the required sample size, N is total population size, e is margin of error (expressed as decimal)

Given

Target Population (N): 221 (All employees - both pharmacy and non- pharmacy professional operating in end-to end pharmaceutical procurement).

Margin of Error (e): 0.05 with 95% confidence level

$$n=N/1+N\ (e)^{2}$$

$$n= 221/1+221(0.05)^{2}$$

$$n= 221/1+221*0.0025$$

$$= 143$$

Therefore : Based on the above Yamane's formula (1967) the study used a sample size of 143 from the target population of 221.

3.4 Data Sources and Types

The study used structured questionnaires for data collection as primary data source which was given to employees. Additionally, SAP, eGP, NPPL (national pharmaceutical procurement list or CDSS committed demand and supply system) Medicine list, different demand documents, procurement and contract documents, different EPSS performance reports and other organizational documents approved by executive committee are the sources of secondary data.

3.5 Data Collection Procedures

The study were followed three steps in the data collection process. As preparatory a formal letter was reccived as sopport support to conduct the research from Addis Ababa University College of business and economics school of commerce and received approval from EPSS head office was the first step. Secondly electronic paper (questionnaire) was distributed and finally virtual interviews was done as data collection procedures. Verification of the consistency of survey answers by comparing them to any kind of secondary data was done as data validation mechanism.

3.6 Ethical Consideration

The study were followed the following ethical standards of the research in order to securely fulfil the scientific research standards. The informed Consent was done by pre-notification of the goal of the research to all participants; the data did not be associated with any personally detectable information in order to keep the confidentiality and respondents are free to leave at any stage as participation is entirely voluntary in order to keep right to withdraw.

3.7 Data Processing and Analysis

3.7.1 Data Processing

After the data was obtained, the questionnaires were checked for completeness, inconsistency and accuracy. Any incomplete, inconsistent response were left out of the analysis. Data from questionnaires was analyzed using SPSS (Version 26). The following processes were carried

out: the negative items were reverse coded, and the individual mean of each of the variables were computed taking the mean of the associated Likert scaled items for the analysis. The responses to all individual five-point of Likert scale (1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree) were considered as continuous variables.

3.7.2 Descriptive Analysis

Descriptive statistical techniques were employed to provide descriptions of the demographical information of the respondents and of the main study variables. Frequencies and percentages was used for all the categorical variables; gender, educational background, years of work experience and job position. The mean and standard deviations of the main study variables; demand forecasting, procurement lead time variability, supplier reliability and contract fulfillment, operational and structural problems, and availability of medicines were calculated.

3.7.3 Correlation Analysis

The Product-Moment Correlation was used to evaluate the strength and the direction of the association between the independent variables (demand forecast, procurement lead time variation, reliability of the supplier, and operational practices) and the dependent variable (medicine availability) (Pearson, K. (1895). The correlation coefficient (r) for the correlation was interpreted thus: $r > 0$ positive relation; $r < 0$ negative relation; $r = 0$ no relation. The 5% significance level was used ($p < 0.05$).

3.7.4 Multiple Linear Regression Analysis

Multiple linear regression (MLR) analysis was used to determine the relationship of pharmaceutical procurement to medicine availability. This analysis is useful when dependent variable is continuous and to look at the effects of several independent variables on that one dependent variable. In this study a composite mean score of several items measured on a Likert-scale was used as a continuous variable. These composite scores are often used as an interval variable in management and public health studies of several Likert items.The primary goal was to understand how each predictor variable

contributes to effective medicine availability while controlling for the influence of the other variables.

The regression equation in this study be:

$$MA=\beta_0+\beta_1 DF+\beta_2 PLT+\beta_3 SR+\beta_4 OC+\varepsilon$$

Where:

- **MA** = Medicine Availability (Dependent Variable)
- **DF** = Demand Forecasting
- **PLT** = Procurement Lead Time Variability
- **SR** = Supplier Reliability and Contract Fulfillment
- **OC** = Operational and Structural Challenges
- **β_0** = Intercept
- **β_1–β_4** = Regression coefficients
- **ε** = Error term

The regression coefficients (β) show the level of effect and the association between the independent variables and medicine availability while other variables are equal to each other. A positive β coefficient indicates that increasing the independent variable would bring about an increase in medicine availability, and vice versa, for a negative β coefficient. The model fitness was assessed by: R- squared (R2): estimate the percentage variance of medicine availability, which is shown by independent variables. Adjusted R-squared: adjusted for the number of predictors. F- statistic: test the whole significance of the model. p value (α =0.05): establish the significance.

3.7.5 Diagnostic Tests for Regression Assumptions

The following assumptions were tested to ensure the validity of the regression analysis:

Linearity - Scatter plots were looked at to determine whether or not there were linear relationships between the IV and the DV

Normality - Normal probability plots (P-P plots) and histograms of residuals were seen.

Homoscedasticity - Scatter plots of standardized residuals versus the predicted values were looked at.

Multicollinearity - Variance Inflation Factor (VIF) and Tolerance values were calculated. [VIF< 10, Tolerance> 0.1 = no collinearity].

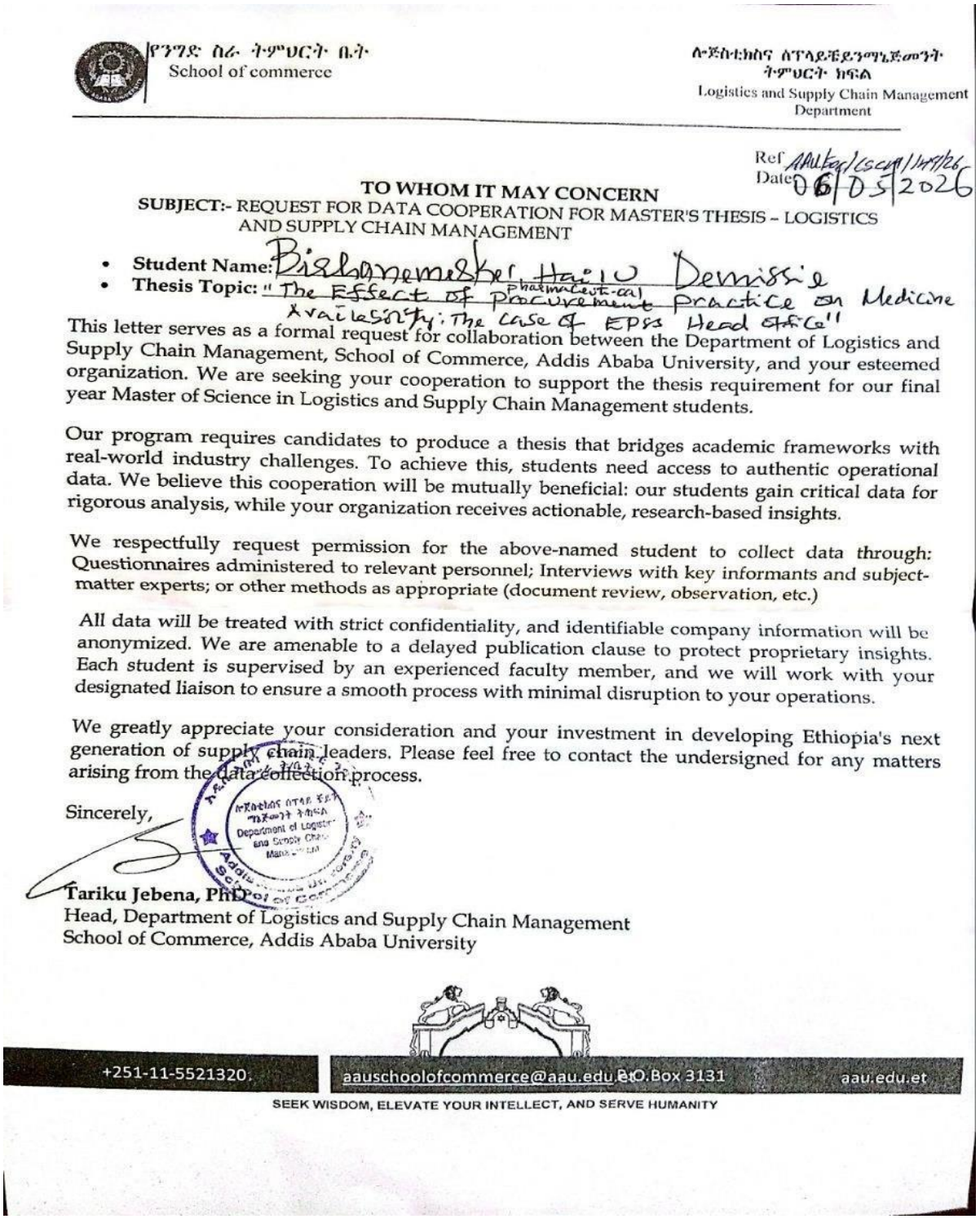
3.7.6 Reliability Test

Reliability relates to the extent to which the measurement of a phenomenon yields stable and consistent results (Carmines, 1979). It is also related to repeatability. Reliability testing is important because it concerns the consistency of all parts of the instrument (Huck, 2007). Items on a scale are said to be related and have high internal consistency if they measure the same structure. The most used internal measure of consistency is the Cronbach alpha coefficient. This is the most appropriate measure of reliability when using the Likert scale. There are no absolute rules for internal consistency, but most agree on a minimum internal consistency factor of 0.70 (Robinson, 2009). George and Mallery (2003) present interpretative guidelines: $\alpha \geq 0.90$ (Excellent), $0.80 \leq \alpha < 0.90$ (Good), $0.70 \leq \alpha < 0.80$ (Acceptable), $0.60 \leq \alpha < 0.70$ (Questionable), $0.50 \leq \alpha < 0.60$ (Poor), and $\alpha < 0.50$ (Unacceptable). Overall, the outcome of this coefficient, which falls between 0 and 1, reflects the reliability of the scale, with values exceeding 0.70 usually deemed acceptable for internal consistency, confirming that the tool is internally consistent and not excessively variable. Additionally, upholding a 5% margin of error is essential for guaranteeing statistical accuracy and applicability.

3.7.7 Validity Test

Instrument validity was ensured through multiple procedures. Content validity was established via expert review by the thesis advisor and two EPSS procurement experts, verifying that questionnaire items align with the study objectives and that Likert-scale items correspond to literature-derived constructs (Hair et al., 2019). A pilot study was conducted with 14 participants (approximately 10% of the main sample) to ensure the reliability and validity of the instrument. This size is consistent with the recommendations of Connelly (2008) for providing sufficient statistical power to identify ambiguities in the survey tool. All unclear or misfit items identified

during the pilot was revised and removed to improve both face and content validity (Altman et al., 2006).



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School of commerce

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Logistics and Supply Chain Management Department

Ref AAU/Log/CSCM/1447/26
Date 06/05/2026

TO WHOM IT MAY CONCERN

SUBJECT:- REQUEST FOR DATA COOPERATION FOR MASTER'S THESIS – LOGISTICS AND SUPPLY CHAIN MANAGEMENT

- **Student Name:** Bisrat Nemeskel Haile Dermissie
- **Thesis Topic:** "The Effect of Pharmaceutical Procurement practice on Medicine Availability: The case of EPSS Head Office"

This letter serves as a formal request for collaboration between the Department of Logistics and Supply Chain Management, School of Commerce, Addis Ababa University, and your esteemed organization. We are seeking your cooperation to support the thesis requirement for our final year Master of Science in Logistics and Supply Chain Management students.

Our program requires candidates to produce a thesis that bridges academic frameworks with real-world industry challenges. To achieve this, students need access to authentic operational data. We believe this cooperation will be mutually beneficial: our students gain critical data for rigorous analysis, while your organization receives actionable, research-based insights.

We respectfully request permission for the above-named student to collect data through: Questionnaires administered to relevant personnel; Interviews with key informants and subject-matter experts; or other methods as appropriate (document review, observation, etc.)

All data will be treated with strict confidentiality, and identifiable company information will be anonymized. We are amenable to a delayed publication clause to protect proprietary insights. Each student is supervised by an experienced faculty member, and we will work with your designated liaison to ensure a smooth process with minimal disruption to your operations.

We greatly appreciate your consideration and your investment in developing Ethiopia's next generation of supply chain leaders. Please feel free to contact the undersigned for any matters arising from the data collection process.

Sincerely,

Department of Logistics and Supply Chain Management

Tariku Jebena, PhD
Head, Department of Logistics and Supply Chain Management
School of Commerce, Addis Ababa University

+251-11-5521320 aauschoolofcommerce@aau.edu.et P.O.Box 3131 aau.edu.et

SEEK WISDOM, ELEVATE YOUR INTELLECT, AND SERVE HUMANITY

Ethiopian Pharmaceutical Supply Service

Ref.No: EPSS/11·3/1552/81
Date: 19 MAY 2026

To Addis Ababa University (School of Commerce)

Addis Ababa

Subject: Acceptance Of Request For Data Cooperation For Master's Thesis

We are writing in response to your formal request dated 06/05/2026 (Ref No: AAU/SoC/LSCM/149/26), regarding data cooperation for your final-year Master of art in Logistics and Supply Chain Management student.

We are pleased to inform you that EPSS Head Office has approved the request for the requested student to conduct his research data collection within our organization.

Student Name:Birhanemeskel Hailu Demissie: Thesis Topic: "The Effect of Pharmaceutical Procurement Practice on Medicine Availability: The Case of EPSS Head Office" As requested, the student is granted permission to administer questionnaires, conduct interviews with relevant personnel and subject-matter experts, and review necessary documents appropriate to his study. We appreciate your department's commitment to ensuring strict confidentiality and data anonymization. To facilitate a smooth and structured data collection process with minimal disruption to our operations,

We are glad to support Addis Ababa University in developing Ethiopia's next generation of supply chain leaders and look forward to the mutually beneficial insights this research will yield.

Sincerely,

Daniel Tesfaye
Chief of Staff

ETHIOPIAN PHARMACEUTICAL SUPPLY SERVICE

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CHAPTER FOUR

4. DATA PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter is essential to a study because it turns unprocessed data into insightful knowledge that directly relates to the goals of the investigation. Using tables, figures, descriptive and inferential data analysis, interpretation and explanation of significant findings, finding patterns and connecting them to theoretical frameworks or existing literature to contextualise the results, comparing them with prior studies, and addressing any unexpected outcomes of medicine availability and pharmaceutical procurement, the analysed data were presented beginning with the response rate and background information of the respondents.

4.2 Response Rate of the Respondents

The response rate is summarized in Table 4.1. Out of 143 questionnaires distributed, 124 were completed and returned with resulting in a high response rate of 87% which exceed from the recommended 70% threshold and also the response rate in this study by Babbie (2010) as being adequate for analysis and report the findings indicate strong engagement of respondents and reliability of the results. From the total distibuted data collection tools 19 questionnaires (13%) were not returned.

Table 2: **Response Rate**

S.N	Rating	Frequency	Response
1	Responded	124	87
2	Non-responded	19	13
Total		143	100

Source: *Own Survey, 2026*

4.3 Background Information Analysis

Demgraphic data allows for more clear and precise segmentation and comparative analysis, which improves the validity, depth, and applicability of the research findings from a variety of angles that offer insight into the workforce's makeup and assist in evaluating how these factors might affect procurement practices in the case of Ethiopian pharmaceutical supply services (EPSS). To ensure the validity and applicability of the study data and to identify patterns or

relationships influenced by professional and demographic characteristics such as age,gender, educational background, year of work experience, and job position, it is very iportant to analyze the background information provided by respondents.

4.3.1 Gender and Age of the Respondents

In most public organizations in Ethiopia like EPSS these age range includes the most professionally active and institutionally engaged segment of the population directly involved in procureent practices. These classifications are significant for examining respondents' participation in studies on pharmaceutical procurement systems and medicine availability. These classification are critically important in procurement practices incluide Demand forecasting, procurement lead time management, supplier reliability and contract fulfilment, operational and structural efficiency.

Table 3 : **Gender and Age**

S.N	Characteristics	Classification	Number	Percentage
1	Gender	Male	96	77
2	Age (in years)	Female	28	23
		20-30	38	31
		30-39	58	46
		40-49	27	22
		50-50	1	1
		Above 60	0	0
Total			**124**	**100**

Source: *Own Survey, 2026.*

As shown in the above table 4, from the total respondents 23% (n = 28) were female and 77% (n = 96) were male respondents. The dominance in nuber of male responders suggests that there is a gender imbalance, this provide that are not fully generalisable across genders. The age

distribution of the study, which includes Young Adults (20–29 years) 31% , Early Middle-Aged Adults (30–39 years) 46% , Middle-Aged Adults (40–49 years) 22% , Late Middle-Aged Adults (50–59 years) 1%, and fro the total respons there is no respondents over 60years of age, which has a substantial impact on the validity and applicability of the findings.

The engagement of middle-aged and late-middle-aged individuals adds even more value and facilitate procurement activities due to their extensive knowledge, strong dedication to involve in activities even after work (at home). Their important role in the execution of pharmaceutical procurement, this is especially pertinent to the analysis of medication availability.

4.3.2 Job Position/Designation of the Respondent

Table 4**: Position of Respondents**

S.N	Job Position / Designation	Frequency (n)	Percentage (%)	Cumulative Percentage
1	Procurement Officer	16	12	12
2	Technical Advisor	12	9	21
3	Demand management Officer	17	14	35
4	Contract Management Officer	18	15	50
5	Procurement Coordinator	4	3	53
6	Demand management Coordinator	5	4	57
7	Warehouse Officer	6	5	62
8	Contract Management Coordinator	5	4	66
9	Finance Coordinator	3	2	68
10	Warehouse Coordinator	3	2	70
11	Director	4	3	73
12	Finance Officer	10	8	81
13	Marketing and Customer Experience Coordinator	2	2	83
14	Marketing and Customer Experience Officer	2	2	85
15	Pharmaceutical distribution Officer	5	5	90
16	Pharmaceutical distribution Coordinator	3	3	93
17	Other	9	7	100
Total		124	100	100

Source: Own Survey, 2026.

As shown in the above table, the Job Positions demographic data, a substantial component of the incredibly diverse and relevant mix of responders are core operational workers in procurement,

contract management, and logistics. The dominant nuber of respondents are Contract Management Officers (15%, n = 18), Demand Management Officers (14%, n = 17), and Procurement Officers (12%, n = 16). These employees are directly responsible for executing pharmaceutical procurement processes on a regular basis, which makes them ideal for the study. Added with their coordinator equivalents, these very important roles make up over half of the sample size. For effectivel representation of the study dependent variable, medicine availability the inclusion of warehouse officers (5%, n = 6), warehouse coordinators (2%, n = 3), and pharmaceutical distribution officers/coordinators (8% combined, n = 8) is necessary. For actual stock levels are impacted by procurement successes or bottlenecks, these respondents are able to provide detailed information. Additionally Strategic and financial angles are also provided by Technical Advisors (9%, n = 12), Directors (3%, n = 4), and Finance Officers/Coordinators (10% combined, n = 13) their participation strengthens institutional memory regarding strategy and oversight. According to the demographic distribution 70% and greater nuber of the participants are directly active in the procurement, contract administration, logistics, and demand forecasting directorates at EPSS's head office.

4.3.3 Educational Qualificationof the Respondents

Table 5**: Educational Qualification**

S.N	Educational Qualification	Frequency (n)	Percentage (%)	Cumulative Percentage
1	Master's Degree	71	57	57
2	Bachelor's Degree	52	42	99
3	PhD	1	1	100
Total		124	100	100

Source: *Own Survey, 2026.*

Because pharmaceutical procurement and supply chain management need a high level of technical expertise, data forecasting, and strategic decision-making, the respondents' educational background is an important predictor of the reliability of the data. The above table shows educational backgrounds of the respondents were analysed in order to assess the EPSS workforce's professional competence that are participanting in the procurement processes. Out of the respondents, 57% (n = 71) hold a master's degree. EPSS procurement techniques requires a deep understanding of global tendering practices, legal frameworks, and complex supply chain

components, the large percentage of postgraduate holders demonstrates the sophisticated, specialised knowledge of the staff supervising and advising on on the operation .

Strong Undergraduate Foundation: Of the respondents, 42% (n = 52) had a bachelor's degree, which is indicative of the fundamental professional workforce carrying out daily contract administration, procurement, and warehousing tasks.1% (n = 1) of the population has a PhD, indicating the institution's highest level of technical or advisory knowledge.Combined Academic Competence: Interestingly, every member of the sampled workforce has at least an undergraduate degree from a university. The absence of responders with diplomas or certificates in this sample suggests that a highly skilled professional body is in charge of the strategic and operational aspects of EPSS procurement to unsure medicine availability.

4.3.4 Year of work Experience in EPSS of the Respondents

Table 6**: Work Experience of Respondents in year**

S.N	Year of Work Experience	Frequency (n)	Percentage (%)	Cumulative Percentage
1	7–10 years	44	35	35
2	More than 10 years	34	27	62
3	4–6 years	22	18	80
4	1–3 years	18	15	95
5	Less than 1 year	6	5	100
Total		124	100	100

***Source**: Own Survey, 2026.*

In order to assess the respondents' institutional familiarity and practical exposure to the procurement workflows at the EPSS Head Office, their length of employment within the company was examined. In public supply chain research, work experience plays a critical role in determining the quality of data since those with longer tenure have a better grasp of institutional bottlenecks, changes in procurement policies, and long-term patterns in the availability of medications.Those with seven to ten years of experience make up the single largest category of respondents, making up 35% (n = 44) of the sample. Employees who have served for more than ten years, who make up 27% (n = 34) of the participants, come in second these two categories ake the majority of the saple 62%. From four to six years of experience are 18% (n = 22) of the sample which represents mid-level professionals who are actively operating

the procurement system Electronic Government Procurement (eGP) and other framework. Employees that have one to three years of experience are 15% (n = 18), for current baseline challenges, operational pressures,fresh perspectives and recent onboarding less than a year are only 5% (n = 6) which are the smaller segment of sample.

4.4 Descriptive Data Analysis of the Study Variables

Apilot study was done using SPSS (version 23) to check validity and reliability of the data collection to tool of by calculating Cronbach's Alpha to measure or test different variables using a sample of 14 respondents as proposed and accepted in the early phase of the research. The results showed that the items under each category are conceptually aligned, with values ranging from 0.7 to 0.9 and average Cronbach's Alpha values of 0.788 for all 30 items of 14 pilot study participants. In order to better understand the degree of agreement or disagreement with each statement, the study used mean scores to summarise the data based on cut-off points from the literature and presented an analysis of respondents' strengths of agreements or perceptions regarding the effect of pharmaceutical procurement practice on medicine availability.

Table 7: **Crombach's Alpha Test Results**

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.788	.792	30

***Source**: Own Survey, 2026.*

In order to provide a more comprehensive understanding of the degree of agreement or disagreement with each statement, the analysis is carried out using mean scores.

Table 8**: Interpretation of the Mean Score**

S.N	Mean Score	Interpretation
1	4.21 – 5.00	Very High
2	3.41 – 4.20	High
3	2.61 – 3.40	Moderate
4	1.81 – 2.60	Low
5	1.00 – 1.80	Very Low

***Source**: Kothari,(2004)*

In order to guarantee clarity and comparability throughout this specific study, this method provides a standardised framework for evaluating respondents' attitudes or perceptions in social science and procurement. In order to interpret the mean score values in relation to medicine availability in the various EPSS operational units, this study used the above cut-off points as a reference.

4.4.1 Descriptive Statistics of Demand Forecasting Accuracy

The study examined various data to assess the case organization's procurement management. For the accuracy of demand forecasts, we computed frequencies, percentages, mean scores, and standard deviations. This was based on a survey of 124 respondents, none of whom left any response blank. On a scale of 1 (strongly disagree) to 5 (strongly agree), they were asked to indicate whether they agreed or disagreed with six statements. People often agree with the statement if the average score is higher than 3. Additionally, they all essentially agree if the standard deviation is less than or equal to 1. The study's primary goal was to assess the connection between demand forecasts and the accessibility of necessary medications.

Table 9: The Respondents‘ Perception about demand forecasting and the availability of essential medicines.

S. N	Variable	Item Code	Items Description	N	Values	Agreement Level					M	SD
						Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
1	Demand Forecasting Accuracy	DFACC1	The damand/forcasting unit accurately predicts medicine demand based on historical consumption data.	124	F	4	13	32	67	8	3.5	0.9
					%	3.2	10.5	25.8	54	6.5		
		DFACC2	Forecasts are regularly updated to reflect changes in disease patterns and service utilization.	124	F	6	17	24	67	10	3.5	0.9
					%	4.8	13.7	19.4	54	8.1		
		DFACC3	EPSS uses reliable data from health facilities to prepare/ verify forecasts.	124	F	7	24	33	56	4	3.2	0.9
					%	5.6	19.4	26.6	45.2	3.2		
		DFACC4	Forecasting practices minimize the occurrence of medicine stock-outs.	124	F	6	9	23	49	37	3.8	1
					%	4.8	7.3	18.5	39.5	29.9		
		DFACC5	Staffs are adequately trained to analyze and interpret consumption data for forecasting/Aggregation.	124	F	6	13	26	63	16	3.5	1
					%	4.8	10.5	21	50.8	12.9		
		DFACC6	The organization’s demamnd management/ forcasting aggregation system effectively informs procurement decisions.	124	F	4	12	23	69	16	3.6	0.9
					%	3.2	9.7	18.5	55.7	12.9		
2	**Demand Forecasting Accuracy (Overall Average)**			**124**	**F**	**5.5**	**14.7**	**26.8**	**61.8**	**15.2**	**3.5**	**0.9**
					%	**4**	**12**	**22**	**50**	**12**		
3	**Valid N (listwise)**			**124**								
4	**Missing**			**0**								

Source: *Own Survey, 2026*

The averages out to 3.50, indicating that although past data is helpful, many people are still uncertain about its accuracy. As shown in the above table the majority of participants (54%) responded that the demand forecasting team uses previous data to accurately predict pharmaceutical demand. 25.8% were neutral, 13.7% disagreed, and another 6.5% strongly agreed. The third item examined whether forecasts are updated in response to changes in service demand and disease patterns. 8.1% strongly agreed and 44% agreed. 3.46 was the average score. On the other hand, 19.4% were neutral and 18.5% disagreed. This indicates that while updates are occurring, they may not be keeping pace with shifts in epidemiological patterns. At 3.20, the third item had the lowest score.

Concerning item four, Converselye make the highest average score (3.80). This item examined if stock-outs are decreased by forecasting techniques. 39.5% of individuals agreed, and 29.9% strongly agreed. This indicates that the present forecasting approach is thought to be successful in maintaining a supply of basic medications. Item five examined whether staff members had received adequate training to assess and analyse consumption data.

With 50.8% agreeing and 12.9% strongly agreeing, the average score was 3.50. The final item, examined whether procurement decisions are influenced by the demand management and forecasting system. With 55.7% agreeing and 12.9% strongly agreeing, the average score was 3.60. This demonstrates how procurement operations heavily rely on the forecasting system's output. Demand Forecasting Accuracy received a total score of 3.51. This is regarded as moderate-to-high favourable agreement. It indicates that although the demand forecasting structure is well-configured and functional, it has several operational issues, particularly with regard to data integrity and update intervals. In the case organization's supply chain, demand forecasting accuracy varies. They receive an average score of 3.80 for preventing stock-outs and 3.60 for using the system to guide buying decisions. However, there is a significant disclaimer with a score of 3.20, the data from nearby medical institutions is just unreliable.

To maintain inventory, the company most likely uses urgent purchases or safety stock estimations. It's not sustainable, even though it works for the time being. Forecasts that are overestimated may result in budgetary problems, fictitious distribution bottlenecks, and premature product expiration. A warning sign is the poor data reliability score for health facilities. Health facilities and the central procurement agency are frequently at odds in public pharmaceutical supply chains.

4.4.2 Descriptive Statistics of Procurement Lead Time Management

Six individila Likert-scale items were used for this, there were 124 participants, and the data was complete. Frequencies, percentages, mean values, and standard deviations are displayed in the results. A 5-point Likert scale was used, with 1 denoting strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. They employed descriptive statistical analysis to systematically evaluate the operational efficiency in order to have a better understanding of the situation. The

Second objective of the study was designed to analyze the effect of procurement lead time variability on the availability of essential medicines.

Table 10 : The Respondents‘ Perception about procurement lead time variability and the availability of essential medicines.

S.N	Variable	Item Code	Items Description	N	Values	Agreement Level					M	SD
						Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
1	Procurement Lead Time Management	PLTM1	Procurement processes are completed within planned timelines without unnecessary delays.	124	F	14	46	28	23	13	2.7	1
					%	11.3	37.1	22.6	18.5	10.5		
		PLTM2	Lead times for ordering and receiving medicines are predictable and consistent.	124	F	11	57	21	29	6	2.6	1
					%	8.9	46.0	16.9	23.4	4.8		
		PLTM3	Delays in procurement processes are minimized through effective planning and monitoring.	124	F	4	13	17	61	29	3.7	1
					%	3.2	10.5	13.7	49.2	23.4		
		PLTM4	The organization has strategies to reduce procurement lead times for essential medicines.	124	F	3	12	10	83	16	3.7	0.8
					%	2.4	9.7	8.1	66.9	12.9		
		PLTM5	Emergency procurement procedures are effective in addressing delays.	124	F	4	26	18	68	8	3.4	0.9
					%	3.2	21.0	14.5	54.8	6.5		
		PLTM6	Procurement staff regularly review lead time performance to identify areas for improvement.	124	F	4	23	29	55	13	3.4	1
					%	3.2	18.5	23.4	44.4	10.5		
2	Procurement Lead Time Management (Overall Average)			124	F	7	30.0	21.0	53.0	14.0	3.25	0.95
					%	5	24	17	43	11		
3	Valid N (listwise)			124								
4	Missing			0								

Source: *Own Survey, 2026*

In the first item the average score was only 2.70 and delays appear to be a major issue. It asks about timely completion of procurement procedures, most employees didn't believe that, which is 37.1% didn't agree 11.3% strongly disagreed, that represents 48.4% of those who believe that activities are not going well. Just 10.5% strongly agreed and 18.5% agreed, 22.6% of respondents were neutral. The lead times for ordering and receiving pharmaceuticals were the subject of item two. With a mean score of 2.60, this one received the lowest rating in which 54.9% of respondents disagreed. The lead times were become unreliable by employees, merely 28.2% responded as predictable this indicates that EPSS order-to-receipt procedure isn't operating efficiently.

The third item enquired as to whether monitoring and planning aid in delay reduction, 72.6% of respondents agreed, giving it a high average score of 3.70, the employees responded that having a plan is essentially important. Just 13.7% didn't agree. Item four enquired about the organization's methods for reducing lead times for important medication procurement, with a mean score of 3.70 and 66.9% of respondents agreeing, this one also received a good rating. The employees believe administration is attempting to expedite the procedure. Emergency procurement procedures were the subject of item five in which 54.8% of respondents agreed, with an average score of 3.40 however, 21.0% disagreed the eployees don't believe that these procedures are always effective. The final item, enquired as to whether procurement staff assess lead time efficacy in which 44.4% of respondents agreed, with an average score of 3.40 and the eployees believe that efforts are being made to make things better.

Procurement Lead Time Management received an overall average score of 3.25 this implies a moderate degree of agreement however, there is a significant disconnect between preparation and implementation while actual execution and predictability received low grades, strategic planning and monitoring received great scores. Procurement lead time management is a major issue in this EPSS supply chain environment, employees concur that the business has monitoring measures in place ,lead-time reduction techniques and all of which received average scores of 3.70.

As respondents raised complicated administrative processes, lengthy international bidding cycles, banking and currency problems, and delays in customs clearance are the primary causes of these delays and ambiguous deadlines. Employee opinions on these matters vary greatly, with standard deviations of about 1.00. This variance implies that lead time issues are not uniform. Bureaucratic delays may be more common for some product categories, such as necessary pharmaceuticals, or specific procurement techniques, such as international competitive bidding. As employees described unpredictable lead times can lead to more challenges in public pharmaceutical supply chains than long, at least predictable lead times. EPSS makes extensive use of emergency procurement techniques, which are overused. As stated by employees these emergency procureent have significant drawbacks, yet they affect standard administrative processes in order to meet urgent shortages and also lower order quantities, raise transaction costs, and increase the likelihood that quality assurance assessments would be neglected.

4.4.3 Descriptive Statistics of Supplier Reliability & Contract Fulfilment

A descriptive statistical study was carried out to analyze the case of EPSS procurement practice, particularly with relation to the third variable which is Supplier Reliability & Contract Fulfilment. Data were distributed to a sample of N = 124 respondents and with no missing for this investigation in the response. Six different Likert-scale items ,A 5-point Likert scale was used for the questions, with 1 denoting strongly disagree, 2 denoting disagree, 3 denoting neutral, 4 denoting agree, and 5 denoting strongly agree. Standard deviations at or below 1.0 showed excellent data concentration and participant agreement, whereas average scores above 3.0 suggested a positive perceptual bias. Frequencies, percentages, mean values, and standard deviations were among the computed statistical measures that offered a thorough comprehension of the data. Examining how supplier reliability and contract fulfilment rates affect the ongoing availability of medicine was the study's third objective.

Table 11: The Respondents‘ Perception about supplier reliability and contract fulfilment and continuous availability of essential medicine.

S.N	Variable	Item Code	Items Description	N	Values	Agreement Level					M	SD
						Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
1	Supplier Reliability & Contract Fulfilment	SRCF1	Suppliers consistently deliver medicines according to contract terms and conditions.	124	F	7	34	24	53	6	3.1	1
					%	5.6	27.4	19.4	42.7	4.8		
		SRCF2	Supplier performance is regularly monitored and evaluated.	124	F	6	20	31	51	16	3.4	1
					%	4.8	16.1	25.0	41.1	12.9		
		SRCF3	The procurement units maintains reliable relationships with suppliers to ensure continuous supply.	124	F	4	21	35	58	6	3.3	0.9
					%	3.2	16.9	28.2	46.8	4.8		
		SRCF4	Contracts include clear terms regarding delivery schedules and product quality.	124	F	5	12	17	60	30	3.7	1
					%	4.0	9.7	13.7	48.4	24.2		
		SRCF5	Supplier non-compliance is effectively managed through penalties or corrective actions.	124	F	6	18	33	60	7	3.3	0.9
					%	4.8	14.5	26.6	48.4	5.6		
		SRCF6	The organization is able to meet procurement needs due to reliable supplier performance.	124	F	4	25	31	46	18	3.3	1
					%	3.2	20.2	25.0	37.1	14.5		
2	Supplier Reliability & Contract Fulfilment (Overall Average)			124	F	5	22.0	29.0	55.0	14.0	3.35	0.9
					%	4	18	23	41	11		
3	Valid N (listwise)			124								
4	Missing			0								

Source: *Own Survey, 2026*

The average score of the first ite was a poor which is 3.10, it enquired as to whether suppliers fulfilled their contractual obligations to avail medications. Of those participants, 42.7% agreed and 4.8% strongly agreed, a noteworthy 33.0% of respondents disagreed, this demonstrates that there are actual problems with suppliers' timely deliveries. With 54.0% of participants stating that supplier performance is regularly checked. Item two was slightly more favourable the average score was greater than the first which is 3.40, this implies that the EPSS is utilising performance monitoring methods, which is advantageous. In order to guarantee a consistent supply, item three questioned about the procurement teams contacts with vendors. 46.8% of respondents agreed with the average score of 3.30, 28.2% of respondents were undecided.

The average score of item four was 3.70, which enquired about whether contracts contained explicit provisions regarding delivery schedules and product quality which received the highest score which is quite impressive 48.4% of individuals agreed, and 24.2% strongly agreed, Just 13.7% of respondents disagreed, which is a tiny percentage. Item five getting an average score of 3.30 which enquired as to whether providers that violate contracts be penalised or repaired. 54.0% of participants agreed, 26.6% of respondents were undecided. Based on supplier performance, item six enquired as to whether the company could meet its procurement requirements an its average score was 3.30. With 37.1% agreeing and 14.5% strongly agreeing, Once more, a considerable portion 25.0% were indifferent.

Contract fulfilment and supplier reliability are inconsistent and they have a strong legal framework in place, together with precise and comprehensive tender documents that safeguard the EPSS. EPSS has a solid contract foundation, there are some serious problems with suppliers' timely delivery of medicines. The average score for contract clarity is a respectable 3.70. However, things go down when suppliers genuinely fulfil their obligations and only 3.10 is the average score for consistent supplier compliance. Overall, 3.35 is the average score for contract fulfilment and supplier reliability, this indicates a moderate degree of agreement.

4.4.4 Descriptive Statistics of Operational & Structural Efficiency

Descriptive statistical analysis was performed on the fourth main construct, Operational & Structural Efficiency, to assess the internal systemic dynamics of the case organization.

This variable was assessed through six particular Likert-scale items given to a sample size of N = 124 participants, with no missing data. The calculated statistical measures consist of frequencies (F), percentages (%), mean values (M), and standard deviations (SD). The data was gathered utilizing a 5-point Likert scale that ranges from 1 (Strongly Disagree) to 5 (Strongly Agree)

The fourth objective of the study was designed to identify the major operational and structural challenges faced by the procurement management and contract management directorates.

Table 12: The Respondents' Perception about the major operational and structural challenges

S.N	Variable	Item Code	Items Description	N	Values	Agreement Level					M	SD
						Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
1	Operational & Structural Efficiency	OSE1	Roles and responsibilities in demand , procurement and contract management are clearly defined.	124	F	6	17	15	65	21	3.6	1
					%	4.8	13.7	12.1	52.4	16.9		
		OSE2	Communication and coordination between demand, procurement and contract management units are effective.	124	F	9	34	23	42	16	3.1	1.1
					%	7.3	27.4	18.5	33.9	12.9		
		OSE3	Organizational processes support timely and efficient procurement decisions.	124	F	5	12	23	79	5	3.4	0.8
					%	4.0	9.7	18.5	63.7	4.0		
		OSE4	Staffs are well-trained and capable of managing procurement operations effectively.	124	F	4	19	35	53	13	3.4	0.9
					%	3.2	15.3	28.2	42.7	10.5		
		OSE5	Bureaucratic delays and unnecessary procedures in procurement are minimized.	124	F	4	41	23	47	9	3.1	1
					%	3.2	33.1	18.5	37.9	7.3		
		OSE6	The organization has adequate systems in place to support procurement activities.	124	F	4	11	11	82	16	3.7	0.9
					%	3.2	8.9	8.9	66.1	12.9		
2	Operational & Structural Efficiency (Overall Average)			124	F	5	22.0	22.0	61.0	13.0	3.3	0.95
					%	4	18	18	50	11		
3	Valid N (listwise)			124								
4	Missing			0								

Source: *Own Survey, 2026*

Research investigation results show that EPSS established clear limits and duties because this research investigation highlights the functional operations of various procurement directorates that are operating separately. The primary component measured whether assigned functions and duties within the principal procurement directorates including demand, procurement, and contract management possess clear definitions. Study data shows that 52.4% of employees included in the survey responded agreement, and 16.9% of employees who took part in the

survey responded strong agreement. The score of 3.60 was obtained because these specific findings the study looked at by the evaluators. Experts claim that 34.7% of employees who took part in the survey did not agree, while 18.5% of those individuals who included in the survey were in the neutral.

Many experts claim that making various departments work as one group is a very hard job even though the organization plan is seen. Conditions appeared slightly better when procurement decisions were evaluated. Survey data indicates 63.7% of employees participating in the survey felt satisfied with the actual circumstances, while 4.0% felt the situation was excellent, in the study, the quantitative data result shows 3.40. Analysis of each item suggests that while EPSS structural definitions and macro-level systems receive positive views, daily coordination and administrative steps create significant obstacles.

Concerning the issue of how well-trained the staff get the score of 3.40, 53.2% of employees believed that they were well trained and 28.2% were simply not trained to manage the procurement processes and also one of the major challenges evaluated in the study was bureaucratic delay which gets score of 3.10. 36.3% of respondents expressed they didn't satisfy with the current state of issues. On the other hand 18.5% simply had neutral. This data result shows that that bureaucracy is still a major problem however, the majority of employees understand and believed that EPSS had effective procurement procedures in place which score was 3.70. 66.1% of respondents thought this was good and 12.9% thought it was very good. The average score was 3.30 overall, this shows that while most individuals agree that EPSS has clear directives and strong support mechanisms, but bureaucracy and departmental communication are remains the current and great challenge.

There are certain obvious strenghts in the EPSS supply chain management framework's operational and structural efficiency, Which includes efficient procurement methods and clearly defined professional positions, has established a strong basis. With scores of 3.70 and 3.60, respectively, professional responsibilities and procurement assistance systems are especially strong. However, the scores for bureaucratic simplicity and cross-departmental communication both significantly decline to 3.10, this implies a silo effect, in which several departments didn't collaborating well. Advanced systems and clearly defined roles are insufficient in EPSS pharmaceutical supply chains. Information flow breaks down if procurement planning, contract management, and demand forecasting departments didn't interact effectively.

The large standard deviation of 1.10 for departmental communication is informative, It shows the wide range of viewpoints within the EPSS. While some teams may have no official ties that facilitate communication, disconnections impede other crucial areas. The low ranking of 3.10 shows that, the administrative challenges that EPSS have. For decreasing bureaucratic delays, to maintain accountability, EPSS procurement must manage intricate legal frameworks, approval procedures, and auditing requirements. However, the flexibility of the supply chain may be hampered if these procedures become overly stringent and manual.

4.4.5 Descriptive Statistics of Medicine Availability

The above table shows data on medicine availability to assess the efficiency of the EPSS procurement system. The data were collected from 124 respondents using a survey with six distinct Likert-scale items and there is no missing data. A 5-point Likert scale was employed, with 1 denoting strongly disagreed, 2 disagreed, 3 neutral, 4 agreed, and 5 strongly agreed and also frequencies, percentages, average scores, and standard deviations were calculated and they were among the findings. A favourable trend was indicated if the average score was higher than 3.0, suggesting that employees understanding were typically favourable. However, significant data agreement across study respondents was shown by standard deviations close to or below 1.0, indicating that the response was consistent.

Table 13**:** The Respondents‘ Perception about Medicine Availability

S.N	Var iable	Item Code	Items Descr iption	N	Values	Agreement Level					M	SD
						Str ongly Disagree	Disagree	Neutr al	Agree	Str ongly Agree		
1	Medicine Availability	MA1	Essential medicines are consistently available at EPSS centeral storage.	124	F	4	18	32	61	9	3.4	0.9
					%	3.2	14.5	25.8	49.2	7.3		
		MA2	Stock-outs of critical medicines are rare or effectively managed at centeral EPSS.	124	F	6	23	38	50	7	3.2	0.9
					%	4.8	18.5	30.6	40.3	5.6		
		MA3	Request for medicines are fulfilled accurately and completely to hubs.	124	F	6	25	30	60	3	3.2	0.9
					%	4.8	20.2	24.2	48.4	2.4		
		MA4	There is minimal delay between procurement and delivery of medicines.	124	F	7	31	33	45	8	3.1	1
					%	5.6	25.0	26.6	36.3	6.5		
		MA5	Inventory levels are maintained at optimal levels to meet EPSS needs.	124	F	6	25	30	59	4	3.2	0.9
					%	4.8	20.2	24.2	47.6	3.2		
		MA6	EPSS rarely face shortages due to procurement inefficiencies.	124	F	6	42	26	39	11	3	1
					%	4.8	33.9	21.0	31.5	8.9		
2	Medicine Availability (Over all Aver age)			124	F	6	27.0	32.0	52.0	7.0	3.1	0.9
					%	4.7	22	25	45	6		
3	Valid N (listwise)			124								
4	Missing			0								

Source: *Own Survey, 2026*

The majority of employees scores are neutral, indicating that views regarding the availability of medications are quite guarded. The first questions was whether the central storage always had the appropriate medications. Of the participants, 49% agreed and 7% strongly agreed, however, 26% were totally neutral and 14% disagree and 3.40 was the average score. This implies that even while basic storage is available, not everyone believes medicines have consistent access. The following query concerned whether shortages of necessary medications are uncommon or effectively managed. At 3.20, the average score was somewhat lower, of the participants, almost 40% agreed and 6% strongly agreed, However, 31% were neutral and 23% disagreed, this indicates that there is considerable ambiguity regarding the management of stock-outs. The question of whether medication orders are accurately and fully fulfilled is a continuation of this trend. Additionally, the average score was 3.20, of the participants, 2% strongly agreed and about 48% agreed, 24% were neutral and 25% disagreed. This implies that it's not always easy to fulfil orders from EPSS central to regional hubs.

Minimising the delay between obtaining and delivering medications and whether the system seldom faces shortages as a result of procurement problems were the questions with the lowest

marks. With 31% disagreeing and 27% neutral, the first one received an average score of 3.10. For the second question 40% of participants agreed that shortages are uncommon, 21% were neutral, and about 39% disagreed, it earned a neutral average score of precisely 3.00, This demonstrates that a major contributing factor to medicine shortages is internal procurement issues. The question of whether inventory levels are optimal for fulfilling system needs was 48% of participants agreeing and 3% strongly agreeing, the average score was 3.20, however, 24% were rather indifferent.

EPSS medication availability statistics provide a crucial evaluation of its overall success. It's rather straightforward, the EPSS is performing its duties if the appropriate drugs are available when needed, however, a combined mean score of 3.10 indicates that drug availability is frequently compromised and the procurement is susceptible. Overall the average score for the availability of medications was 3.10. Out of all the supply chain variables, this one has the lowest score, it demonstrates that even though medications are somewhat more accessible than not, the system is nevertheless quite brittle and impacted by problems with procurement and logistics. This nearly neutral grade implies that the procurement is always vulnerable, with medicine availability rarely maintained and frequently interfered with.

The study finding shows that protracted procurement lead time, unpredictable delivery date, and crucial departmental communication challenges seriously impede the availability of medicine rather than being exclusively restricted by global market shortages or external funding constraints. For example, delivery schedules (mean score of 2.60) and procurement lead times (mean score of 2.70) are important elements that impact pharmaceutical availability.
The reduction in item six, with a mean score of 3.00, directly confirms the study's main claim that inefficiencies in internal procurement are the cause of medicine shortages, which are a serious concern. A basic systemic issue is shown when nearly 39% of the professional workforce says the company is unable to avert shortages due to procurement issues.

The central EPSS must distribute its limited inventory when regional hubs submit their requests, which leads to partial shipments. The stock-out problem is moved downstream by this administrative rationing, making nearby medical facilities and vulnerable patient populations susceptible to sudden drug shortages. As a result, EPSS capacity to provide people in need with necessary medications is threaten. The 1.00 standard deviation for efficiency-related shortages

and procurement delays reveals a markedly uneven operational experience across different product lines.

4.5. Analysis of Inferential Statistics Results

4.5.1 Correlation Analysis

This analysis primary objective is to evaluate the direction and strength of linear correlations between the final outcome variable and various pharmaceutical procurement practices variables: At EPSS central storage, essential medications are consistently available. In this study the degree of correlation between two variables was determind by the by Pearson's Correlation Coefficient represented by (r), which ranges from -1.00 to +1.00, in which r > 0.7 strong positive correlation, r between 0.3 and 0.7 a moderate positive correlation and r < 0.3 was a weak positive correlation.

Table 14 : Pearson‘s Correlation Matrix between pharmaceutical procurement and Medicine Availability

Pearson‘s Correlation coefficient (r)	Forecasts are regularly updated to reflect changes in disease patterns and service utilization.	The damand/forcasting unit accurately predicts medicine demand based on historical consumption data.	Procurement processes are completed within planned timelines without unnecessary delays.	Suppliers consistently deliver medicines according to contract terms and conditions.	Roles and responsibilities in demand , procurement and contract management are clearly defined.	Essential medicines are consistently available at EPSS centeral storage.
Forecasts are regularly updated to reflect changes in disease patterns and service utilization.	1					
The damand/forcasting unit accurately predicts medicine demand based on historical consumption data.	0.6	1				
Procurement processes are completed within planned timelines without unnecessary delays.	0.185	0.221	1			
Suppliers consistently deliver medicines according to contract terms and conditions.	0.374	0.378	0.472	1		
Roles and responsibilities in demand , procurement and contract management are clearly defined.	0.257	0.265	0.326	0.269	1	
Essential medicines are consistently available at EPSS centeral storage.	0.395	0.415	0.364	0.302	0.491	1

Source: *Own Survey, 2026*

In the data presented above, every measured coefficient is positive (r > 0), suggesting that enhancements in any individual forecasting, procurement, or contract management activity are linked to a respective rise in medicine availability and overall operational effectiveness. For a

concise and organized understanding, the correlation matrix is examined in terms of its key operational aspects. The matrix last part shows that how each procurement process affects the availability of medicines and it turns out that there is a close relationship between these processes. There is a close relationship between forecasting and regularly updating forecasts, at 0.600 the connection is rather significant, this indicates that historical data alone is insufficient for good forecasting real-time information of sickness trends is necessary.

There is also a relation between procurement practice and supplier performance. At 0.472, the correlation is moderate to strong, this suggests that if internal administrative delays are iproved, suppliers are more likely to meet their delivery schedules. In this study the most significant finding is that, there is the largest correlation between the availability of pharmaceuticals and well defined roles and functions (procurement practice) (0.491). Institutional problems are often more prevalent in procurement processes than technical ones. In order to reduce the shortate of medicine availability employees needs to be informed their obligations there by reducing process friction which will make the procureent practice ore transparent to and consequently decision - making , lowers response time and establish responsibility structure.

The corelation between internal and external components is also essential in supplier logistics and procurement. The relationship between internal procurement/delivery schedules and external supplier adherence is 0.472.As long as EPSS can follow and continuously monitor the internal procurement/delivery schedules, EPSS can create a reliable environment that allows suppliers to achieve their delivery obligations. Internal delays, however can reduce lead times and supplier compliance, which ultimately lowers the effect of supplier performance on drug availability (correlation of 0.302).

4.5.2 Multiple Linear Regression Analysis

4.5.2.1 Assumption of Normality

Many parametric statistical procedures, such as multiple linear regressions, need the normality assumption, which was typically evaluated using skewness and kurtosis, which estimated a distribution's asymmetry and peakedness, respectively. In social science research, values within a certain range are considered normal. For skewness, that's ±1.0, and for kurtosis, it's ±2.0. These benchmarks come from Kline, 2016, and George and Mallery, 2010.

Table 15 : Normality Test Result

Variables	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Essential medicines are consistently available at EPSS centeral storage.	124	-0.656	0.217	-0.035	0.431
Stock-outs of critical medicines are rare or effectively managed at centeral EPSS.	124	-0.434	0.217	-0.412	0.431
Request for medicines are fulfilled accurately and completely to hubs.	124	-0.653	0.217	-0.527	0.431
There is minimal delay between procurement and delivery of medicines.	124	-0.219	0.217	-0.784	0.431
Inventory levels are maintained at optimal levels to meet EPSS needs.	124	-0.612	0.217	-0.527	0.431
EPSS rarely face shortages due to procurement inefficiencies.	124	0.073	0.217	-1.042	0.431
Valid N (listwise)	124				

Source: *Own Survey, 2026*

There is a slight negative skewness number (range from -0.656 to +0.073) in five of the six items. This implies that responses are on the positive end of the spectrum and typically indicate agreement or strong agreement, Only one item is perfectly balanced. All skewness values fall between -1.0 and +1.0 so that there is no noticeable skewness and Kurtosis values is shown a variation from -0.035 to -1.042. The distributions of each item are flatter than those of a standard bell curve since they all have negative kurtosis. This suggests that answers are scattered across the scale selections. All the skewness and Kurtosis are ranges between -2.0 to +2.0 which implies the values are in the allowed range. Both have the standard error of 0.431 and 0.217 respectively and there is a consistency across all variables which demosnstrates the data is accurate. The data meets the criteria for a normal distribution for each of the six items and also tehere are 124 valid replies in the sample.

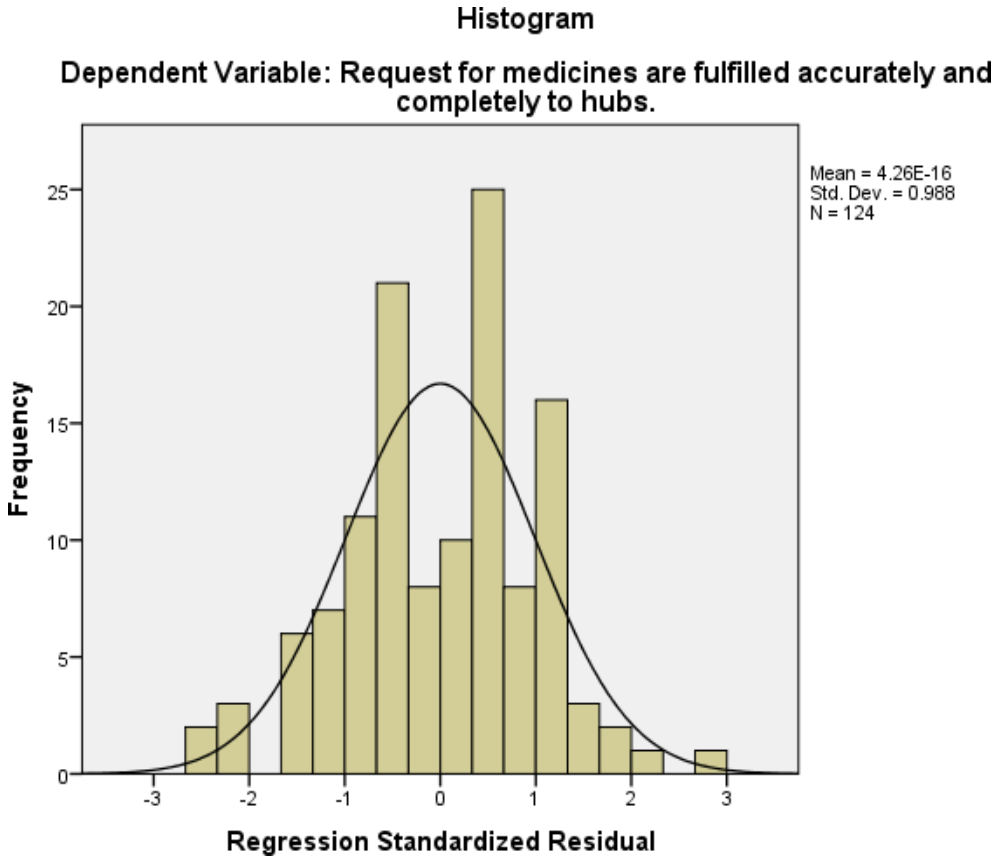


Figure 2 **: Graphical Test for Normality (*Source: Owen Survey, 2026*)**

The dependent variable standardised residuals histogram from the regression was analysed and it looks to be about normal with a mean of roughly zero (4.26 times 10^-16) and a standard deviation of 0.988, which is almost equal to 1, the distribution is symmetrical, it is evident that the residuals and the overlay normal distribution curve match. The normality assumption required to perform a reliable and credible linear regression analysis is supported by this visual evidence, which shows that the error terms follow a normal distribution. As a result, the above graph shown in the fig.2 confirmed that the normality assumption satisfies the conditions for using multiple linear regression models in this scientific investigation and enhances the validity of any interpretations and choices made regarding institutional reform in the Ethiopian Pharmaceutical Supply Service (EPSS).

4.5.2.2 Assumption of Linearity

Beside using histogram were other ways to determine whether the regression residuals followed a normal pattern or not. Using the Normal Probability-Probability plot (P-P) normality assumption for the regression residuals was evaluated. this graphical representation displayed the degree to which the observed cumulative probabilities agree with what would be predicted from a normal distribution. data points shows A successful fit by the proximity to the 45-degree diagonal reference line. Because of there are no notable fluctuations or strong tendencies, the residuals appear to be almost normally distributed. Sufficient fulfilment of the normality assumption supports the linear regression model validity and statistical reliability .

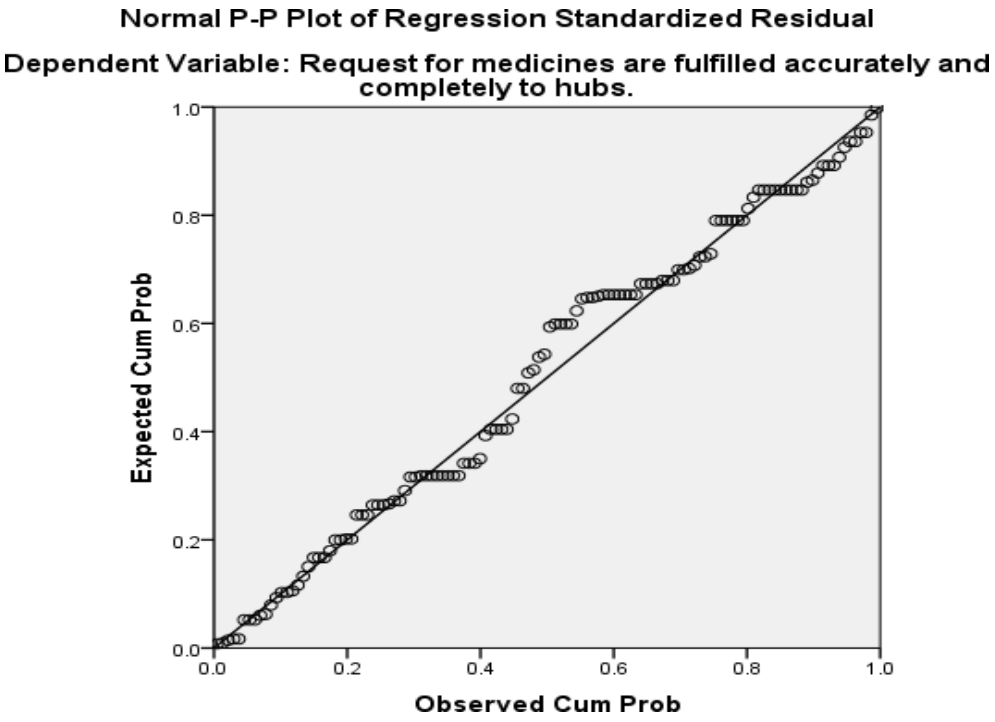


Figure 3**:** Graphical Test for Linearity by Using P-P Plot (***Source:*** *Owen Survey, 2026*)

4.5.2.3 Assumption of Homoscedasticity

The above graph shows evaluation of the regression assumptions of homoscedasticity and linearity, Which is displays scatterplot of the standardised residuals with that of the standardised projected values of the medicine availability an independent variable. As shown in the figure the

residuals are very equally and randomly distributed along a horizontal band, primarily between -2 and +2, with no discernible funnelling or geometric expansion patterns. The consistent vertical distribution throughout the projected values confirms that the variance of the residuals is constant even though the discrete nature of the Likert-scale replies leads to observable parallel diagonal arrangements of data points. As a result, the linear regression model homoscedasticity and linearity premises have been successfully verified, bolstering the analysis validity.

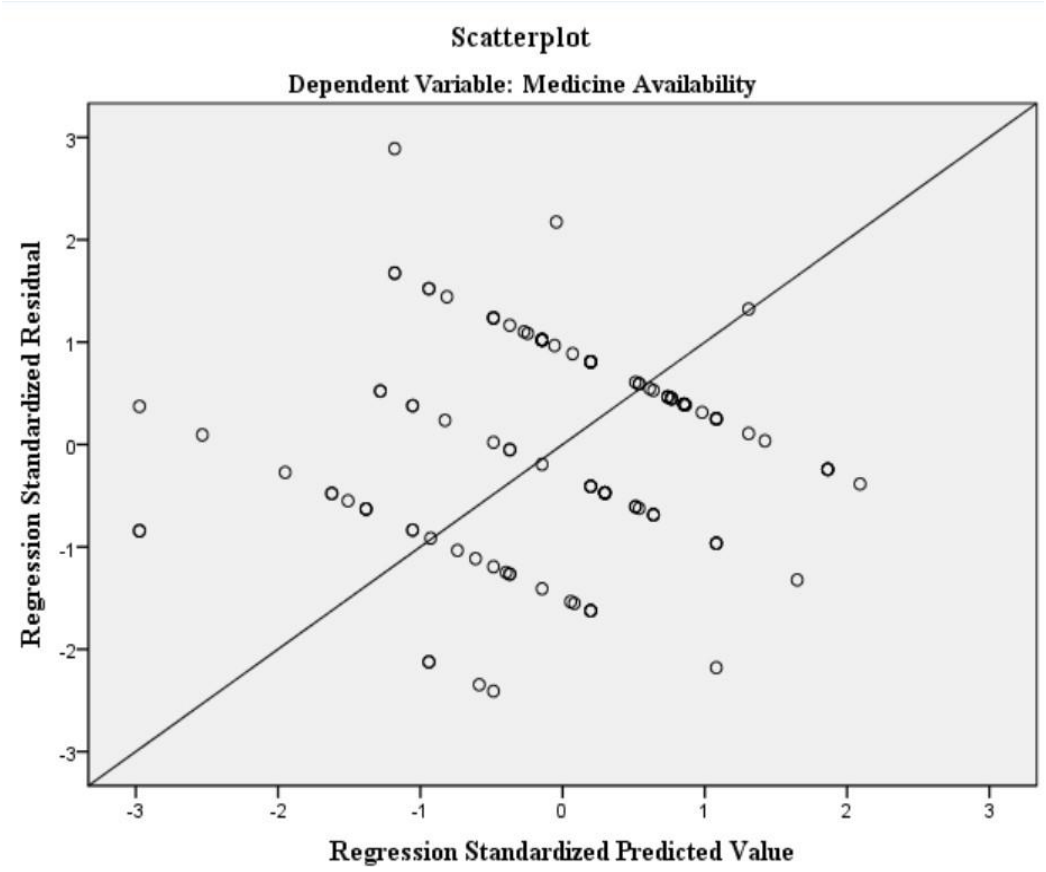


Figure 4 Graphical Test for Homoscedasticity (***Source:*** *Owen Survey, 2026*)

4.5.2.4 Assumption of Multicollinearity

To confirm the validity of the multiple linear regression models, the diagnostic assumption of multicollinearity was evaluated using Tolerance and Variance Inflation Factor (VIF) measures as shown in the below table. Per statistical norms (Hair et al., 2010), multicollinearity does not exist when Tolerance values exceed 0.10 and VIF values are under 5.0. According to the

regression coefficient table, the Tolerance values for the independent variables span from 1 to 4 significantly exceeding the 0.10 limit. Simultaneously, the VIF values vary from 1.35 to 1.74, remaining significantly under the conservative limit of 5.0. These findings indicate that there is no multicollinearity issue among the predictor variables, validating that each independent variable distinctly and consistently aids in forecasting Medicine Availability

4.5.2.5 Regression Analysis Results

A multiple linear regression analysis was performed to evaluate the combined effect of the independent variables (Demand Forecasting Accuracy, Procurement Lead Time Management, Supplier Reliability & Contract Fulfilment, and Operational & Structural Efficiency) on the dependent variable (Medicine Availability). As shown in Table below the multiple correlation coefficients (R) of 0.615 indicate a strong positive relationship between the combined pharmaceutical procurement practices and the availability of medicine at the EPSS head office. Additionally, the coefficient of determination (R^2) is 0.378. This suggests that 37.8% of the variability in Medicine Availability is specifically accounted for by the procurement practice variables present in this model.

The Adjusted R Square value of 0.346 reinforces this, indicating a strong model despite accounting for the number of predictors. External factors not included in this analysis account for the remaining 62.2% of the variation in drug availability. Significantly, the change statistics show a significance level Sig. F Change of.000 ($p < 0.001$) and a F value of 11.854. This important p shows that the regression model is a statistically valid match for the data, proving that managing these specific procurement practices has a notably beneficial impact on guaranteeing the availability of medicine .

4.5.2.6 Model Fit Results

To determine if the study multiple linear regression models were statistically significant, the study used an analysis of variance. The objective was to determine whether the availability of medicine could be predicted by a mix of criteria, such as how well EPSS forecast demand, manage procurement lead time, collaborate with suppliers, and conduct efficient operations and solve operational challenges. The F-statistic for the study regression model was 11.854, Regression has six degrees of freedom, while residuals had 117, less than 0.001, or.000, was the significance level. The study regression model appears to be a decent fit because the p-value is

far below the typical cutoff of 0.05. It is supported by the numbers. The study can be certain that the model used is effective with such a low p-value. The combination of those independent variables actually predicts the availability of medicine, so it didn't just a chance.

Table 16 : Model Fit Result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.6	0.378	0.346	0.7589	0.378	11.854	6	117	0
a. Predictors: (Constant), Demand Forcasting Accuracy, Procurement Lead time									
b. Dependent Variable: Medicine Availability									

Source: *Own Survey, 2026*

4.5.5 Regression Coefficient

Accuracy of demand forecasting is the first variable in the table below is the Unstandardised Coefficient (B = 0.089). A one-unit increase in Demand Forecasting Accuracy translates into a 0.089-unit increase in Medicine Availability, all other things being equal. The Standardised Coefficient (β = 0.086) has statistical significant even though it is the least significant of the four predictors in terms of impact magnitude. The result is statistically significant at the 5% significance level ($p = 0.030 < 0.05$). The rejection of the null hypothesis ($H_0 \beta_1 = 0$) shows that the accuracy of demand forecasting significantly improves the availability of medications. By accurate predicting demand, reducing stock outs, and using precise demand projections to match supply to actual consumption patterns, EPSS can increase the availability of pharmaceuticals. VIF = 1.353, Collinearity Tolerance = 0.739 Multicollinearity is not an issue.

Procurement Lead Time Management is the second variable in the table below is the unstandardised Coefficient (B = 0.175) Medicine availability increases by 0.175 units for every unit when Procurement Lead Time Management is improved. Coefficient of Standardisation (β = 0.180) in terms of proportional contribution, it comes in third place among predictors. Significance in Statistics ($p = 0.034 < 0.05$) at the 5% level of statistical significance. The null hypothesis is disproved. Continuous availability of medicine at the level of health facilities is directly supported by effective management of procurement lead time, which minimises delays

in pharmaceutical pipeline delay. Collinearity Tolerance = 0.699, VIF = 1.431 No multicollinearity.

Supplier Reliability and Contract Fulfilment is the third study variable which is the dominant Predictor unstandardised coefficient (B = 0.395). A one-unit increase is equivalent to a 0.395-unit increase in medicine availability, which is the biggest unstandardised effect. Coefficient of Standardisation (β = 0.365) More than four times the impact of Demand Forecasting Accuracy, the model's strongest predictor accounts for 36.5% of a standard deviation change in Medicine Availability. Significance in Statistics (p = 0.000 < 0.001) At the 0.1% level, very significant (t = 4.197). There is a substantial rejection of the null hypothesis. The most important factors influencing the availability of medicines are contractual fulfillment and supplier reliability. The supply for medicines is severely disrupted by inconsistent supplier or contract violations. VIF = 1.538, Collinearity Tolerance = 0.650 Multicollinearity is absent.

Structural and Operational efficiency is the fourth study variable which have Coefficient of Unstandardization (B = 0.182) Medicine availability increases by 0.182 units for every unit when operational and structural challenges are addressed. Coefficient of Standardisation (β = 0.185) has the second-highest relative contribution of all the predictors. Significance in Statistics (p = 0.048 < 0.05) slightly noteworthy in terms of statistics. The null hypothesis is disproved. The availability of medications is affected by operational and structural inefficiencies. Measurable benefits result from addressing these issues.Collinearity Tolerance = 0.574, VIF = 1.744 Highest VIF in the model but still well below the critical threshold of 10 no issue.

Medicine availability is significantly predicted by all four independent factors ($p < 0.05$). Supplier reliability and contract fulfilment continue to be the most significant factors ($\beta = 0.365$, $p < 0.001$) in the model's resonable and robust picture of pharmaceutical procurement determinants, emphasising that the integrity of contract inforsement and supplier relationships is the cornerstone of medicine availability. The comparable contributions of Operational and Structural Challenges ($\beta = 0.185$, $p = 0.048$) and Procurement Lead Time Management ($\beta = 0.180$, $p = 0.034$) indicate that internal operational efficiency and procurement speed are similarly important second-tier factors. Despite having the smallest effect size, Demand Forecasting Accuracy ($\beta = 0.086$, $p = 0.030$) has now been statistically confirmed, suggesting that data-driven forecasting even somewhat improves outcomes related to pharmaceutical availability.

Table 17 Regression Coefficient

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.445	.319		1.392	.166		
	Demmand Forcasting Accuracy	.089	.085	.086	1.051	.030	.739	1.353
	Procurement Lead time Management	.175	.081	.180	2.148	.034	.699	1.431
	Supplier Reliability and Contract Fullfilment	.395	.094	.365	4.197	.000	.650	1.538
	Operational and structural Efficiency	.182	.091	.185	1.995	.048	.574	1.744
a. Dependent Variable: Medicine Availability.								

Source: *Own Survey, 2026*

The four research hypotheses formulated in chapter two are empirically tested using the results obtained from both the Pearson Correlation analysis and the Multiple Linear Regression model. The decision rule is based on the significance level (alpha = 0.05). If the p -value is less than 0.05 ($p < 0.05$), the null hypothesis (H0) is rejected, and the alternative hypothesis (Ha) is accepted. The hypotheses test results of the study are summerize in the below table.

Table 18: Regression and Correlation Summary for Procurement Practices Hypotheses

S.N	Hypothesis Code	Proposed Relationship Path	Regression Weight (β)	t-value	p-value	Decision on Null Hypothesis (H0)	Empirical Outcome
1	Hypothesis 1 (H1)	Demand Forecasting Accuracy and Medicine Availability	.086	1.051	.030	Reject H01	Supported (Highly Significant)
2	Hypothesis 2 (H2)	Procurement Lead Time Predictability and Medicine	.180	2.148	.034	Reject H02	Supported (Statistically Significant)
3	Hypothesis 3 (H3)	Supplier Reliability & Fulfillment and Medicine Availability	.365	4.197	.000	Reject H03	Supported (Highly Significant)
4	Hypothesis 4 (H4)	Operational & Structural Efficiency and Medicine	.185	1.995	.048	Reject H04	Supported (Statistically Significant)

Source: *Own Survey, 2026*

The highly significant p-value of 0.030 in Hypotheses 1 highlights the fact that forecasting error is a systemic effect to pharmaceutical availability rather than a minor operational problem. Demand forecasting of pharmaceuticals is one of the weakest links in global health supply chains, according to Tegegne et al. (2024). Without precise demand projections, market viability, production capacity, and financial commitments become difficult. Demand forecasting is a fundamental pillar of medicine availability, as evidenced by the significant connection (r = 0.54) reported in Hypotheses 1. Hypotheses 2 was supported at the 5% significance level (r = 0.315, β =.180, p = 0.048), indicating a statistically significant but somewhat moderate positive association between procurement lead time predictability and medicine availability. This conclusion has direct empirical support from Gupta and Bhatt (2019), who show that lead time is one of the most important factors influencing the efficiency of the procurement practice because it controls the availability of medications at EPSS and helps determine the buffer stocks required to prevent stockouts. It also show that significant variations in lead time caused by procurement delays may result in understocking or overstocking of medicines.

With the greatest t-value (t = 4.197), the strongest regression coefficient (β =.365), and a highly significant p-value (p = 0.009), Hypotheses 3 proved to be the most significant predictor of medicine availability at EPSS in this research. This conclusion is in strong agreement with empirical data from evaluations of health facilities in sub-Saharan Africa. According to the Uganda health supply chain assessment (2022), delivery gaps and delayed deliveries, as well as discrepancies between orders and deliveries, are the primary causes of stockouts reported by health facilities. This directly links supplier contract fulfilment failures as the main cause of medicine stockouts. Hypotheses 4 was statistically significant (r = 0.413, β =.185, p = 0.029), indicating that even in cases where the external supply is sufficient, internal operational and structural efficiency significantly influences the availability of medications.These results are supported by the moderate but significant regression weight (=.185) seen in H4, which indicates that operational and structural investments in procrement practice can result in quantifiable increases in EPSS stock levels and that internal operational capacity is a significant but not the primary driver of medicine availability.

CHAPTER FIVE

5. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

5.1.1 Summary of Findings

This study looked at how the Ethiopian Pharmaceutical Supply Service (EPSS) Head Office's pharmaceutical procurement procedures impact the supply of necessary medications. The results demonstrate that while the supply chain as a whole is functional, there are obvious stress spots that lower the reliability with which medications reach storage. Although a number of respondents acknowledged the presence of technical capability, processes, and procedures, they also noted performance-impairing supplierrelated bottlenecks, persistent delays, and communication gaps. The accuracy of demand forecasting is the first significant finding. With a composite mean of 3.51, which indicates moderate agreement that the approach is helpful, respondents generally felt that forecasting favourably contributes to pharmaceutical availability. Accurate forecasting was particularly thought to be useful in lowering stock-outs and directing procurement choices. Conversely, with a mean score of 3.20, the trustworthiness of data from healthcare facilities was the least reliable aspect of this construct. This shows that even while the forecasting structure is in place, the timeliness, precision, and completeness of facility-level data which remains a major challenge are crucial to its quality.

Lead time management in procurement is the subject of a second significant discovery. Delays continue to be one of the most obvious issues in the procurement process, as seen by this variable's comparatively lower composite mean of 3.25. The respondents firmly believed that lead times are frequently uncertain and that procurement is not always finished on schedule. Ethiopian Pharmaceutical Supply Service (EPSS) struggles to translate procurement plans into reliable execution, as evidenced by the lowest scores in this category, 2.70 for timely completion and 2.60 for consistency and predictability. Respondents did, however, admit the existence of planning, monitoring, and proactive efforts to reduce lead times. This indicates that the problem is not a lack of plan but rather poor execution and the continuation of administrative and procedural delays.

The final conclusion has to do with contract fulfilment and supplier dependability. This construct yielded a modest composite mean of 3.35, indicating that although contract mechanisms are in place, supplier performance is not always consistent. According to respondents, contract

conditions are generally clear, particularly when it comes to delivery schedules and product quality, which scored the highest at 3.70. Nevertheless, providers' actual contract fulfilment had a far lower score of 3.10, indicating that written agreements do not always result in dependable delivery. This disparity implies that if EPSS wishes to guarantee a steady supply of medication, contract enforcement, supplier accountability, and relationship management must be strengthened.

Operational structural efficiency is the subject of the fourth discovery. The composite mean of 3.30 for this measure indicates that internal problems still have an impact on the organisational structure, despite its reasonable functionality. The respondents concurred that there are systems in place to support procurement work and that roles and duties are reasonably well defined. However, the elimination of bureaucratic delays and interdepartmental communication only obtained moderate grades, both at about 3.10. This suggests that although the organization may have a strong formal structure on paper, its actual efficiency is decreased by disjointed communication and multi-layered processes. In other words, even in cases when technical capacity is present, the system is being slowed down by internal coordination issues.

The availability of medications is the last and most significant result. The dependent variable had the lowest composite mean (3.10), indicating that pharmaceutical availability is still precarious and only marginally above the neutral level. While some medications are available at EPSS central storage, respondents recognised that delays, incomplete orders, and shortages still happen. With item medicine availability scoring precisely 3.00, the most alarming conclusion was that many respondents immediately connected shortages to procurement inefficiency. This indicates that internal procurement flaws, lead time delays, and coordination issues are also undermining drug availability in addition to external supply shocks.

These descriptive findings are confiremed by the inferential results. Improvements in forecasting, lead time control, supplier reliability, and organisational efficiency are linked to higher availability results, according to the correlation study that revealed all the examined procurement practices had favourable correlations with drug availability.

With R^2=0.378 and a p-value below 0.05, the regression model was statistically significant, suggesting that the independent variables together account for a considerable portion of the variation in medication availability. This demonstrates that procurement procedures are crucial

factors that determine whether necessary medications are accessible when needed rather than being incidental problems.

5.1.2 Conclusion

The results make it evident that a mix of organisational, operational, and technical factors influence the availability of necessary medications at EPSS. The study comes to the conclusion that shortcomings in forecasting, lead time management, supplier fulfilment, and internal coordination all contribute to stock instability, and that procurement performance has a direct and significant impact on medicine availability. Despite having established procedures, guidelines, and qualified staff, the company's capabilities are not yet converting into consistently dependable supply results. The study also finds that while demand forecasting is helpful, its efficacy is constrained by inconsistent updates from downstream (health facilities) and poor upstream data quality control. This indicates that in order to increase drug availability, EPSS cannot rely solely on past consumption trends. More precise reporting systems and improved facility-level data integration with central procurement planning are necessary to support forecasting.

The report also finds that lead time management for procurement is still a significant shortcoming. Although Ethiopian Pharmaceutical Supply Service (EPSS) seems to have reduction plans and planning systems, real procurement execution is hindered by delays that make supply timing unclear. Because inventory planners are unable to efficiently manage stock when order delivery dates are unpredictable, this unpredictability poses a significant risk for medicine shortages. Emergency procurement will continue to be a standard response rather than an exception as long as this issue persists.The study also finds that contract fulfilment and supplier dependability are just somewhat adequate. When supplier compliance is inconsistent, clear contracts are insufficient on their own. According to the findings, contract management should focus more on supplier growth, performance responsibility, and strict enforcement than just drafting and monitoring. The Ethiopian Pharmaceutical Supply Service (EPSS) will continue to experience delays between scheduled procurement and actual delivery in the absence of this change.

The analysis concludes that another significant hidden obstacle is operational structural inefficiencies. Weak communication and bureaucratic delays counteract the strength of having

clear roles, processes, and support systems. This indicates that the internal structure of Ethiopian Pharmaceutical Supply Service (EPSS) is not entirely in line with the speed and adaptability needed for pharmaceutical supply chain operations in general and procurement procedures in particular. Practically speaking, the study demonstrates that a series of interconnected flaws, starting with demand forecasting and continuing through procurement execution, supplier management, and internal coordination, are what lead to medicine stock-out rather than a single problem.

5.1.3 Recommendations

Several useful suggestions for enhancing medication availability at Ethiopian Pharmaceutical Supply Service (EPSS) can be made in light of the findings. Ethiopian Pharmaceutical Supply Service (EPSS) should first improve the timeliness, consistency, and quality of data it receives from healthcare facilities in order to fortify its demand planning system. When drafting procurement requests, central demand forecasting teams should incorporate both historical consumption and illness trend data, and facilities should be encouraged to provide comprehensive consumption reports on time. Demand forecasting should, whenever feasible, be reinforced and incorporated downstream by digital tools that lower manual errors and enable the company to react to shifting demand trends faster.

Second, Ethiopian Pharmaceutical Supply Service (EPSS) ought to make significant efforts to lower the unpredictability of procurement lead times. This can be achieved by streamlining approval procedures, reducing the time it takes to evaluate tenders, and enhancing communication between the finance, logistics, and procurement departments. In order to minimise needless (non-value adding) activities, Ethiopian Pharmaceutical Supply Service (EPSS) should reduce and digitise some of the manual processing of the procurement processes. Additionally, strengthening additional framework contracts and pre-approved supplier arrangements can help reduce delays and make procurement more predictable for critical medicines. Additionally, Ethiopian Pharmaceutical Supply Service (EPSS) should examine persistent reasons for delays, including as banking processes, administrative bottlenecks, and customs-related problems, and solve them with focused process improvement.

Third, EPSS has to strengthen contract enforcement and supplier dependability. This is more than just creating an the correct contract; it also means ensuring that supplier performance is

routinely tracked and dealt with when non-compliance occurs. EPSS should use performance scorecards, enhance supplier prequalification, and consistently carry out remedial actions when suppliers fail to meet expectations. In order to prevent responsibility from undermining long-term cooperation, supplier relationships should be strategically managed.

Fourth, Ethiopian Pharmaceutical Supply Service (EPSS) needs to increase structural effectiveness and internal coordination. Smoother communication channels are necessary for demand, procurement, contract, finance, warehouse, and logistics units in order to detect and promptly handle issues. According to the report, approval chains and repetitious paperwork should be minimised whenever feasible because bureaucratic delays are a significant obstacle. Reducing the silos that currently impede operations and facilitating faster information sharing between departments could be achieved by implementing more integrated digital procurement systems.

Fifth,EPSS should make investments in ongoing employee training and performance evaluations. The results demonstrate that there are still performance differences in actual execution even though the respondents were generally well educated and technically competent. Staff members would be better able to use their expertise if they received regular training in forecasting, contract management and procurement compliance. Regular internal assessments should also be utilised to digitally track if advancements are genuinely lowering delays and increasing the availability of medications.

Finally, rather than treating pharmaceutical availability as a specific supply problem, EPSS should view it as a system-wide performance outcome. The results demonstrate that shortages are not just caused by external supply issues, but also by a combination of internal and upstream limitations. Reforms in forecasting, procurement lead time, supplier management, and organisational coordination should thus be addressed collectively as part of an integrated response. Ethiopian Pharmaceutical Supply Service (EPSS) can transition from a volatile, reactive supply environment to a more stable and reliable drug supply and guarantee the smooth and long-lasting implementation of the committed demand and supply (CDSS) system if these measures are regularly monitored.

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Appendices

Section A: Demographic Information

S.No.	Variable	Category/Response Options
1	**Gender**	☐ Male ☐ Female
2	**Age (in years)**	☐ 20–29 ☐ 30–39 ☐ 40–49 ☐ 50–59 ☐ 60 and above
3	**Educational Qualification**	☐ Diploma ☐ Bachelor's Degree ☐ Master's Degree ☐ PhD
4	**Job Position/ Designation**	☐Director General ☐ Deputy Director general ☐ Director ☐ Demand management Officer ☐ Demand management coordinator ☐ Procurement Officer ☐ Procurement coordinator ☐ Marketing and Customer Experience Officer ☐ Marketing and Customer Experience coordinator ☐ Contract Management officer ☐Contract Management coordinator ☐Finance coordinator ☐Finance officer ☐ Warehouse Officer ☐Warehouse coordinator☐ Pharmaceutical distribution Coordinator ☐ Pharmaceutical distribution officer ☐ Technical Advisor ☐ Other
5	**Year of work Experience in EPSS**	☐ Less than 1 year ☐ 1–3 years ☐ 4–6 years ☐ 7–10 years ☐ More than 10 years
6	**Directorate**	☐Demand Management Directorate ☐ Procurement Management Directorate ☐Contract Management Directorate ☐Warhouse & Shipping Management Directorate ☐ Marketing and Customer Experience Directorate☐ Pharmaceutical Distribution Management Directorate ☐RDF Finance ☐ Other

Section B: Research Variables

Please read each statement carefully and indicate your level of agreement using the following scale:

1= Strongly disagree, 2= Disagree, 3=Neutral, 4= Agree, 5=Strongly agree

Section A: Items Related to Demand Forecasting Accuracy						
S.No.	**Statement**	1	2	3	4	5
1	The damand/forcasting unit accurately predicts medicine demand based on historical consumption data.	☐	☐	☐	☐	☐
2	Forecasts are regularly updated to reflect changes in disease patterns and service utilization.	☐	☐	☐	☐	☐
3	EPSS uses reliable data from health facilities to prepare/ verify forecasts.	☐	☐	☐	☐	☐
4	Forecasting practices minimize the occurrence of medicine stock-outs.	☐	☐	☐	☐	☐
5	Staffs are adequately trained to analyze and interpret consumption data for forecasting/Aggregation.	☐	☐	☐	☐	☐
6	The organization's demamnd management/ forcasting aggregation system effectively informs procurement decisions.	☐	☐	☐	☐	☐
Section B: Items Related to Procurement Lead Time Management						
S.No.	**Statement**	1	2	3	4	5
7	Procurement processes are completed within planned timelines without unnecessary delays.	☐	☐	☐	☐	☐
8	Lead times for ordering and receiving medicines are predictable and consistent.	☐	☐	☐	☐	☐
9	Delays in procurement processes are minimized through effective planning and monitoring.	☐	☐	☐	☐	☐

10	The organization has strategies to reduce procurement lead times for essential medicines.	☐	☐	☐	☐	☐
11	Emergency procurement procedures are effective in addressing delays.	☐	☐	☐	☐	☐
12	Procurement staff regularly review lead time performance to identify areas for improvement.	☐	☐	☐	☐	☐
Section C: Items Related to Supplier Reliability & Contract Fulfilment						
S.No.	**Statement**	1	2	3	4	5
13	Suppliers consistently deliver medicines according to contract terms and conditions.	☐	☐	☐	☐	☐
14	Supplier performance is regularly monitored and evaluated.	☐	☐	☐	☐	☐
15	The procurement units maintains reliable relationships with suppliers to ensure continuous supply.	☐	☐	☐	☐	☐
16	Contracts include clear terms regarding delivery schedules and product quality.	☐	☐	☐	☐	☐
17	Supplier non-compliance is effectively managed through penalties or corrective actions.	☐	☐	☐	☐	☐
18	The organization is able to meet procurement needs due to reliable supplier performance.	☐	☐	☐	☐	☐

Section D: Items Related to Operational & Structural Efficiency						
S.No.	**Statement**	1	2	3	4	5
19	Roles and responsibilities in demand , procurement and contract management are clearly defined.	☐	☐	☐	☐	☐
20	Communication and coordination between demand, procurement and contract management units are effective.	☐	☐	☐	☐	☐
21	Organizational processes support timely and efficient procurement decisions.	☐	☐	☐	☐	☐
22	Staffs are well-trained and capable of managing procurement operations effectively.	☐	☐	☐	☐	☐
23	Bureaucratic delays and unnecessary procedures in procurement are minimized.	☐	☐	☐	☐	☐
24	The organization has adequate systems in place to support procurement activities.	☐	☐	☐	☐	☐
Section E: Items Related to Medicine Availability						
S.No.	**Statement**	1	2	3	4	5
25	Essential medicines are consistently available at EPSS centeral storage.	☐	☐	☐	☐	☐
26	Stock-outs of critical medicines are rare or effectively managed at centeral EPSS.	☐	☐	☐	☐	☐
27	Request for medicines are fulfilled accurately and completely to hubs.	☐	☐	☐	☐	☐
28	There is minimal delay between procurement and delivery of medicines.	☐	☐	☐	☐	☐
29	Inventory levels are maintained at optimal levels to meet EPSS needs.	☐	☐	☐	☐	☐
30	EPSS rarely face shortages due to procurement inefficiencies.	☐	☐	☐	☐	☐