



**Practice and Challenges of Global Medical Equipment Supply  
Chain Management: The Case of EZM Trade and Investment, Addis  
Ababa, Ethiopia.**

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This is to certify that the thesis is prepared by Zewdalem Melesse, entitled Challenges of Global Medical Equipment Supply Chain Management: The Case of EZM Trade and Investment, Addis Ababa, in partial fulfilment of the requirements for masters of Arts in Logistics and supply chain management with the regulation of the University.

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## DECLARATION

I, Zewdalem Melesse, hereby declare that this research paper entitled **Challenges of Global Medical Equipment Supply Chain Management: The Case of EZM Trade and Investment, Addis Ababa, Ethiopia** in partial fulfillment of the requirements for masters of Arts in Logistics and Supply Chain Management with the regulation of the University is my original work and has not been used by others for any other requirements in any other university and all sources of information in the study have been appropriately acknowledged.

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## ABSTRACT

*Medical equipment is crucial for the functioning of a healthcare system, playing a vital role in the prevention, diagnosis, treatment, and rehabilitation of patients. This study aims to examine the challenges faced in managing the global supply chain of medical equipment, focusing on EZM Trade and Investment in Addis Ababa, Ethiopia. The research employs both quantitative and qualitative methods within an explanatory and descriptive research framework, with a sample size of 62 out of a population of 92. Data was collected through simple random and purposive sampling methods for quantitative and qualitative data respectively, using structured questionnaires and open-ended interviews. Analysis of the data involved descriptive and inferential statistical techniques, including mean, frequency, standard deviation, correlations, and regression analysis. Statistical Package for Social Science version 20 was utilized for data interpretation and analysis.*

*The majority of participants (62.9%) in the study indicated that fluctuations in currency exchange rates significantly impacted the global supply chain management practices of the company. Additionally, responses from 53.2% of participants highlighted procurement issues with medical equipment, leading to instability in relationships with suppliers. Furthermore, 78.9% of respondents acknowledged facing minor challenges in logistics (transportation and warehouse) during global sourcing activities within their company. The study revealed that 88.8% of the variation in the efficiency of the medical equipment supply chain could be explained by the variance in explanatory variables, with the remaining 17.2% attributed to other factors not included in the model. Consequently, it is recommended that the Federal Ministry of Health take steps to enhance global medical equipment supply chain management practices by updating national and facility-specific medical equipment lists and developing a health commodities procurement policy.*

*Overall, the findings suggest that global medical supply chain management in this context faces a range of complex challenges.*

**Keywords:** Medical Equipment, Health service, Global Supply Chain Management, Efficiency

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## **ABBREVIATIONS AND ACRONYMS**

**EFDA:** Ethiopian Food and Drug Authority

**EFSS:** Ethiopian Pharmaceuticals Supply Service

**EZM:** Esmelalem Zewde Mergia

**GSCM:** Global Supply Chain Management

**MDE:** Medical devices and equipment

**MOH:** Ministry of Health

**SCM:** Supply Chain Management

**WHO:** World Health Organization

# CHAPTER ONE

## 1. INTRODUCTION

This research is focused on investigating the challenges faced by a private medical equipment supply company (EZM Trade and Investment) in Addis Ababa, Ethiopia, within the global medical equipment supply chain management. It consists of five Chapters. Chapter 1 Introduction contains the Background of the study, statement of the problem, Objective, Research question, Scope of the study, Operational definitions, Significance of the study and organization of the study.

### 1.1 Background of the Study

Medical equipment is necessary for the health system to function effectively. Primarily in the areas of patient rehabilitation and illness and injury management, diagnosis, and treatment, medical equipment is essential. Supply chain management is an integrated approach beginning with planning and control of materials, logistics, services, and information stream from suppliers to manufacturers or service providers to the end client; it represents the most important change in business management practices (Fantazy et al., 2010). The management of the supply chain for medical equipment is a complicated process that involves the involvement of several parties, including clients, information service providers, device producers, wholesalers, and distributors (Mohammadian et al., 2021).

Under the goals of a health system, its appropriate implementation guarantees the availability of medical equipment in the appropriate number, with acceptable quality, to the appropriate consumers and locations, at the appropriate time, and at the lowest possible cost (Yue & Fu, 2020). There are scenarios where trading abroad can have direct health and safety impacts on people with limited resources (Lee et al., 2022). Most significantly, importing medical supplies is typically necessary to improve the health results for the low-income. essentially, Ethiopia is too extremely small a developing nation to manufacture all of the medical supplies and advanced medical equipment (Bahadori et al., 2020). Manufacturers internationalize the upstream portion of their supply chain in order to get access to more affordable, higher-quality, and global technologies, as well as to increase dependability and timely delivery. In addition, companies expand their downstream activities internationally to offer their products in new geographic areas (Laganà &

Colapinto, 2022). However, the global aspect has also increased the supply chain's complexity and risks, especially in Africa (Karakozova et al., 2020).

Managing a global supply chain presents greater difficulties than managing a domestic one because of factors including fluctuating currency rates, the inclusion or elimination of suppliers, and changing local regulations (RDI, 2019)

Other anomalies are also challenges in the medical device supply chain. These include larger lead times, inventory, and transportation expenses (L. Tu et al., 2021). Inadequate labor skills, supplier availability, quality of suppliers, and transportation and telecommunications infrastructure can all be considered shortcomings in developing countries (Thies et al., 2021). However, there are specific risks associated with global supply chain management (GSCM), including fluctuations and unpredictability in currency exchange rates, political and economic unrest, and modifications to the regulatory landscape (Gurtu & Johny, 2021). Realizing the advantages of internationalization may be challenging as a result of all the aforementioned obstacles. Given that supply chains are growing increasingly global, it is critical to research obstacles and develop strategies to overcome them in this field.

There are already 135 or so registered importers of pharmaceuticals and medical supplies in Ethiopia (Yimenu et al., 2021). These importers distribute various medicinal products that come from international vendors based in various nations. 75% of the medications come from suppliers worldwide. Nevertheless, this country produces 25% of the medications. This data may prompt Ethiopian medical device supply chain management to focus on GSCM concerns. The buyer-supplier relationship is conventional and more tactical, thus there is no clear proof of how the country's medical device supply chain operates, even though the majority of device items are acquired from overseas suppliers through duplicate international competitive bids. Private pharmaceutical firms may serve as excellent case studies for GSCM as, at the very least, their buyer-supplier relationship is predicated on collaboration and mutual benefit. Consequently, it is assumed that this will enhance vertical cooperation and partnerships between suppliers and retailers. (Schultz et al., 2021)

In Ethiopia, a country-wide assessment of the pharmaceuticals supply management system was undertaken by PFSA in 2015 to document the challenges faced in the procurement, storage and distribution of pharmaceuticals and health commodities (Project et al., 2015). The assessment revealed that long procurement lead times, inadequate storage infrastructure, and unsystematic

distribution practices were major constraints to the pharmaceuticals supply management system in the country. The main causes of these problems are poor procurement planning, due to the lack of a logistics management information system (LMIS), inadequate staff capacity in the Federal Ministry of Health (FMOH) Medical device Administration and Supply Service and non-optimal administrative procedures at the federal and regional government levels.

The study collects information on SCM practice (procurement, warehouse(storage), Transportation and Currency) and, in addition on Challenges of medical equipment supply chain management in the Case of EZM Trade and Investment, Addis Ababa, Ethiopia. Considering the significance of the topic and the existence of contradictory information, little study has been done to evaluate the difficulties associated with managing the global medical device supply chain in the Ethiopian setting. Using a private Medical Equipment Supply Company as a case study, this report examined the difficulties that global medical device supply chain management encounters.

## **1.2 Problem of Statement**

EZM Trade and Investment is a medical supply & equipment and related construction & finishing materials, stationery, for hospitals, health centers, hotels, and resorts, supply company in Addis Ababa, Ethiopia faces various challenges in managing the global supply chain of medical equipment. Based on the WHO report biomedical engineers estimate that from 70% to 90% of medical equipment not in use in the developing world. This is almost due to lack of the experts needed to maintain biomedical equipment and sometimes even the capacity to use it effectively more over equipment is often donated without user or maintains manual (Compton et al., 2018). These challenges of shortage of expertise in such companies like EZM Trade and Investment may include issues related to procurement, transportation, warehousing, and distribution (Sun et al., 2022). Understanding and addressing these challenges is crucial for the company to ensure the availability and efficient delivery of medical equipment to healthcare institutions.

Medical equipment supply chain is unique from the supply chain management of other medical and non-medical goods and services in developing nations of the world. Even though over ninety five percent of medical equipment in developing world hospitals are imported and it seems appropriate to sell the same equipment used in developed nations to the developing world hospitals, WHO estimates that seventy percent of medical equipment coming from the most developed nations does not work when they reach in developing nation hospitals, 96% are not working just 5 years after and 39% never worked due to lack of training, manuals or

accessories (Marks et al., 2019) . As part of the developing world Ethiopia, particularly Addis Ababa private companies, like EZM Trade and Investment has such challenges. Developing countries have very limited resources for procurement of medical equipment because of foreign currency. Deciding which healthcare technologies to procure, and how to procure them, becomes a recurring policy dilemma in a climate of austerity. In an environment of budget constraints, innovative or high-value technologies can be marginalized (Levy, 2014). This might result in an excessive emphasis on commodity procurement, whereas the goal should be to focus on outcome-based procurement.

The storage of medical equipment should be carried out in buildings that have been built for or adapted this purpose. Buildings should be built to the standard to keep the medical safe and protected. There should be enough space and premises even if EZM Trade and Investment has challenges for medical equipment's that are heavy and larger in size. Significant numbers of medical equipment are not functional when they tested to be installed. Medical equipment is heavy and costly to transport. The loading unloading mechanism of the company sometimes make medical equipment's get damaging. In addition almost all of the medical equipment in use in Ethiopia is imported because we have no manufacturing plant for medical equipment. With medical equipment costs and device complexity rising, as a developing nation we don't have adequate and to the standard infrastructure for transportation. So, this study Investigates to provide an empirical snapshot of the current Medical Equipment supply chain situation in that private medical equipment Supplier and to provide baseline information to track changes and improvements in Medical Equipment Supply chain management over time.

Therefore, there is a need to investigate and analyze these challenges in order to provide recommendations for improving the management of the global medical equipment supply chain. Conducting a comprehensive investigation and analysis of these challenges, the study aims to provide recommendations for improving the management of the global medical equipment supply chain.

### **1.3 Research Objective**

#### **1.3.1 General Objective**

The general objective of this study is to identify and analyze the Practice and challenges in global medical equipment supply management with a particular reference to EZM Trade and Investment, Addis Ababa, Ethiopia.

### **1.3.2 Specific Objective**

The specific objectives of the study are:

1. To assess the procurement practices within the global medical equipment supply chain management of EZM Trade and Investment, Addis Ababa, Ethiopia .
2. To identify the warehouse management practices of the global medical equipment supply chain management of EZM Trade and Investment, Addis Ababa, Ethiopia
3. To describe the Transportation management Practices with the global medical equipment supply chain management of EZM Trade and Investment, Addis Ababa, Ethiopia.
4. To describe the currency management Practices with the global medical equipment supply chain management of EZM Trade and Investment, Addis Ababa, Ethiopia
5. To assess the major challenges of global medical equipment supply chain management of the EZM Trade and investments .
6. To determine the effect of supply chain related challenges on global supply chain performance of medical equipment of EZM trade and investments.

### **1.3 Research Questions**

1. What are the challenges encountered by EZM Trade and Investment related to procurement practice in Addis Ababa, Ethiopia, in managing the global supply chain of medical equipment?
2. How do transportation challenges impact the management of the global medical equipment supply chain for the EZM Trade and Investment in Addis Ababa, Ethiopia?
3. What are the warehouse management challenges faced by the company in Addis Ababa, Ethiopia, in managing the global supply chain of medical equipment?
4. What are the currency-related challenges faced by the company in Addis Ababa, Ethiopia, in managing the global supply chain of medical equipment?
5. What are the overall management challenges faced by the company in Addis Ababa, Ethiopia, in managing the global supply chain of medical equipment?

### **1.4 Scope of the Study**

The study focuses specifically on the challenges faced by a private medical equipment supply company (EZM Trade and Investment) in Addis Ababa, Ethiopia. The findings and recommendations may not be directly applicable to other regions or countries. The study examines

the challenges related to the global supply chain management of medical equipment. It does not delve into the broader healthcare industry or other specific aspects of the company's operations. The study primarily explores challenges in procurement, transportation, warehousing, and currency in the global medical equipment supply chain. It does not extensively cover topics such as inventory management, demand forecasting, or supplier relationships.

The study focuses on a private medical equipment supply company, which may have unique challenges compared to public or government-owned entities with four dimensions namely procurement, inventory, warehousing, and currency practices and their relationship with SCM operational performances. The study was conducted on EZM Trade and Investment, Addis Ababa, Ethiopia using cross sectional data (one-time data) collected from April through May 2024.

Overall, the scope of the study is limited to analyzing the challenges faced by EZM Trade and Investment in Addis Ababa, Ethiopia, in managing the global supply chain of medical equipment. The study's findings and recommendations may be beneficial for similar companies or contexts, but generalization to other regions or sectors should be approached with caution.

### **1.5 Delimitation of the Study**

The study primarily explores challenges in procurement, transportation, warehousing, and currency in the global medical equipment supply chain and does not delve into the broader healthcare industry or other specific aspects of the company's operations. The study focuses on a single or selected private medical equipment supply company (EZM Trade and Investment) in Addis Ababa, Ethiopia. The findings and conclusions may not be representative of the challenges faced by all private medical equipment supply companies in the region or globally. The specific challenges identified in this study may be influenced by the unique context and circumstances of the selected company. Therefore, caution should be exercised when applying the findings to other companies or locations. The study relies on data collected from the selected company and may be limited by the availability and accuracy of the information provided. It does not include perspectives from other stakeholders such as customers, suppliers, or industry experts, technological advancements within the supply chain management process and natural disasters

## **1.6 Limitations of the Study**

The study focuses on a single or selected private medical equipment supply company (EZM Trade and Investment) in Addis Ababa, Ethiopia. The findings may not apply to other companies, sectors, or regions, as different companies may face unique challenges based on their size, location, or organizational structure. The study may not include the perspectives of all relevant stakeholders in the medical equipment supply chain, such as customers, suppliers, or industry experts. This could result in a partial understanding of the challenges faced by the supply chain. There may be a potential bias in the study due to the respondents' relationship with the company being studied. This bias can influence the interpretation of the data and the conclusions drawn from it. The study's findings and conclusions heavily rely on the data collected from the selected company. This can limit the breadth and depth of the analysis, as the researchers may not have access to complete or comprehensive information necessary to understand all the challenges faced by the company.

## **1.7 Significance of the Study**

The study provides practical insights into the challenges faced by a private medical equipment supply company (EZM Trade and Investment) in managing the global supply chain. This can help other companies in the industry gain a better understanding of the potential hurdles they may encounter and devise strategies to overcome them. By focusing on a specific company in Addis Ababa, Ethiopia, the study contributes to the contextual understanding of supply chain management challenges in the region. This can aid policymakers, industry professionals, and researchers in developing targeted solutions and policies to address the specific needs of the local medical equipment supply chain. Although the study examines challenges at a company level, it also sheds light on broader global supply chain management issues faced by the medical equipment industry. This can facilitate discussions and collaborations between companies, industry associations, and regulatory bodies to identify common challenges and develop best practices.

The study's findings can serve as a foundation for informed decision-making by managers and executives in the medical equipment supply chain sector. Understanding the challenges can help them identify key areas of improvement, allocate resources effectively, and make strategic decisions to optimize their supply chain operations. The study highlights the need for further research in this field, as it narrows down on specific challenges faced by one company. It can act

as a catalyst for future studies that explore different aspects of global medical equipment supply chain management, uncovering more comprehensive insights and potential solutions.

The study's focus on challenges in the medical equipment supply chain can promote collaboration between companies, suppliers, and customers. Sharing knowledge and best practices can lead to the development of sustainable and resilient supply chains that enhance the overall efficiency and effectiveness of delivering medical equipment.

### **1.8 Definition of Terms/Operational Terms**

**Supply Chain:** The coordination of resources and the optimization of activities across the value chain of the company to obtain a competitive advantage.

**Supply Chain Management:** The management of upstream and downstream relationships with buyers and sellers to create value in the end.

**Global Supply Chain Management:** An international network of pharmaceutical manufacturers and distributors who operate with private medical equipment supply companies and are responsible for the successful delivery of goods/services to end customers.

**Health technology:** The application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of life.

**Medical equipment:** Medical devices requiring calibration, maintenance, repair, user training, and decommissioning activities are usually managed by clinical engineers.

### **1.9 Organization of the Study**

The first chapter deals with the introduction section, which includes a background of the research topic, States the research problem and objectives, Describes the significance, and relevance of the study and outlines the research questions or hypotheses. Chapter two focuses on the Literature Review relevant to a comprehensive review of relevant scholarly articles, books, and other sources, analyzes previous research studies related to the topic, identifies gaps in the existing literature and highlights the need for the current study and offers theoretical frameworks or models that support the research. Chapter three presents the research design and methodology approach to be used, Specifies the research methods, data collection techniques, and instruments, Discusses the sampling strategy and participant selection process, Outlines the data analysis methods and procedures and addresses any ethical considerations and limitations. The fourth chapter analyzes

and discusses the findings of the study, provides a detailed analysis of the collected data, utilizes tables, graphs, or other visual aids to present the results and relates the findings to the research questions or hypotheses. The fifth chapter interprets the results in the context of the research objectives, Compares the findings with the existing literature, Analyzes the implications and significance of the results and Identifies limitations and suggests areas for future research. The six chapter summarizes the findings of the study and presents the conclusions drawn and recommendations forwarded

## **CHAPTER TWO**

### **2. REVIEW OF RELATED LITERATURE**

In this chapter, we will present an extensive review of existing literature related to medical equipment supply chain management, spanning both theoretical and empirical works. The assessment of medical equipment supply chain management practices in private medical equipment supply companies is covered in this chapter along with a review of related literature. It thoroughly explains the definition and concept of medical equipment, the significance of supply chain management for medical equipment in private supply companies, supply chain management strategies, and the general idea of supply chain management. This chapter also covers warehouse management, medical equipment preventative procedures, utilization, and transportation and disposal systems. Lastly, the research gap and conceptual framework are presented.

#### **2.1 Theoretical Literature Review**

##### **2.1.1 Definition and Concept of Supply chain management**

The term supply chain (SC) and supply chain management (SCM) were first used in the middle of the 1980s, and they subsequently gained popularity in the 1990s. Supply chain management and the concept of supply chains are relatively new ideas in management. The network of suppliers, distributors, and customers is commonly referred to as the supply chain. It also covers the ultimate consumer's mobility as well as that of the provider, thus it is important to take into account the environmental consequences of product development, research, manufacture, storage, transit, and use, as well as the disposal of product waste (Messelbeck & Whaley, 1999). One particular form of strategic management is supply chain management. It has to take a leading role in corporate strategy. The field of supply chain management aims to ensure that customers' demands are satisfied and that your company has a viable purpose for existing. The organization's vision statement should include a comprehensive coverage of the supply chain management strategy. There are several supply chain management models (Felea & Albăstroi, 2013). Several theories exist for supply chain management, including principal-agent theory, resource-based perspective theory, and transaction cost analysis. According to the resource-based concept, firms actively trade resources throughout their operations. The theoretical framework addresses the competitive

advantages that arise from a firm's varied resources, including financial, physical, human, technical, organizational, and reputational assets (Hamel & Prahalad, 1990). In low- and middle-income nations, between forty and seventy percent of medical equipment is damaged, underutilized, or unsuited for its intended use; this reduces patient care and costs money. This problem is mostly caused by procurement procedures that lack selectivity. This problem is exacerbated by indiscriminate procurement practices, a mismatch between technological design and demand, excessive prices, and difficulties with deployment, maintenance, and human resource training. The regulatory bodies and biomedical engineering capabilities necessary to provide recommendations on whether MDEs should be used in challenging deployment environments such as buildings with high temperatures, erratic energy, or no access to clean water are especially lacking in low- and middle-income countries (LMICs) (Citron, 2007).

According to (Marks et al., 2019) The method used to buy medical equipment, which involved bidding on items and accepting low-ball offers; the staff's attitude towards equipment maintenance; the restricted ability to buy high-quality gadgets at fair prices; being reliant on donations; not having spare parts for donated medical equipment; mismatching supply and demand (staffing levels and numbers); improper or excessive use of devices; mishandling or purposefully turning off medical equipment; inadequate training while medical devices are installed; assuming responsibility for operating machines without the necessary training; not being offered on the market; power outages; a shortage of maintenance personnel; a lack of enthusiasm among specialists; a lack of standards for monitoring devices; lack of organization that makes it possible to hire biomedical engineers for district hospitals; less sense of accountability and staff work overload were among the reasons mentioned by the participants that affect availability of and proper utilization of devices

### **2.1.2 procurement practice in private companies**

The act of locating, obtaining, and purchasing products, services, or works from an outside supplier via a competitive bidding or tendering procedure is known as the procurement/ supplier selection process. The procedure compares factors including quality, quantity, time, and location to make sure the customer gets the goods, services, or labor at the best feasible price (Phindika et al., 2021). It is difficult to acquire medical equipment centrally. Hospitals' choices of medical equipment are influenced by a variety of factors, including evolving clinical practices, increased specialization,

innovation, and competing interests of clinical personnel. Longer lead times, greater consultation, and more intricate negotiation and administration are all necessary for tenders (Boulding & Hinrichs-Krapels, 2021). An effective procurement process ensures the availability of the right Medicals in the right quantities, available at the right time for the right patient and at the right prices and at recognizable standards of quality (Gunasekara et al., 2022a).

According to qualitative research on the effects of procurement methods on the quality of medical devices or services obtained across four nations, in Mexico, the cost of medical equipment is frequently the deciding factor throughout the contracting and selection stages of the selection process. According to the survey, a large number of stakeholders believed that this would negatively impact professionals, clinical practices, and results. They believed that the source of the issue stemmed from their emphasis on finding the best deal. This research also demonstrates how the Ministry of Health reorganizes buy demand at the regional and occasionally national levels in order to boost purchasing power, which adds bureaucracy to the procurement process. Conversely, hospitals handle all procurement in European nations like Switzerland (Lingg et al., 2016).

### **2.1.3 Warehouse management in the supply chain**

The Guideline for storage of essential medicines and health commodities by Deliver project in collaboration with WHO (2003), states maintaining proper storage conditions for health commodities is vital to ensure their quality and product expiration dates are also based on ideal storage conditions and protecting product quality until their expiration date is important for serving customers and conserving resources. A study done in 2016 in Malawian on pharmaceutical logistics reveals that many facilities 75% has a separate store assigned for but with inadequate space and many facilities do not adhere to the proper guidelines, many facilities (89%) do not have storage maintaining equipments like thermometer, ventilator, humidity checker even they do not have adequate shelving and storage cabinets (Kondratjev, 2015b).

Every health facility, large or small, needs to store and manage its medicine stocks, for a better outcome of the patient satisfaction. Health facilities should have a good pharmaceutical inventory management in which a system must be in place to ensure secure storage, storage in correct environmental conditions, accurate record keeping, effective recording, effective stock rotation

and expiry monitoring and effective fire and theft prevention. Good pharmaceutical inventory control makes ordering and pharmaceuticals management easier (Martha et al., 2012).

According to the WHO good storage practice guide (2009), refrigerators found in the hospital pharmacy stores are containers for some expensive and sensitive, pharmaceuticals, for this reason they require a closer follow up by the store keeper and there is a standard operating procedure to follow it. This study finds out the current performance on equipment management and storage in the EZM Trade and Investment.

#### **2.1.4 Transport Management**

This is the process of transferring products from the source of supply to the place of consumption. It is the art of getting the right amounts of commodities to the right places at the right time. It involves transportation, delivery, and receiving of commodities, proper storage, and inventory control for receipt and disbursement and information systems. Moreover, there are need to have quality monitoring activity for each activity to perform properly and ensure continuous availability of products to the customers.

Transportation is one of the key logistics functions associated with moving goods vehicle on a particular technology in the supply chain, consisting of logistics operations and functions, including forwarding, cargo handling, packaging, and transfer of ownership of the goods, risk insurance, customs procedures, and so on. From an economic point of view, transport is one of the defining elements of the production process. The production and use of goods, there are two limiting factors, the time factor and the spatial factor (Kondratjev, 2015a). The time factor is that the product produced today may only be required after a certain period. Solve this problem by storing. The content of the spatial factor is that the producers and consumers of goods are rarely found in one place, and some distance from each other. Linking production and consumer, transport allows expanding the boundaries of production. Transport itself becomes gradually because the spatial factor - the development of transport and transport technology allows you to build further away from the production sites of consumption goods. Under market conditions, transport is always profitable (Kondratjev, 2015a).

Transportation requires financial re-sources in the form of internal costs for transportation of goods own rolling stock, and external costs for this purpose commercial or public transport. Thus, function defines the main transport its goal delivery of goods to their destination as

quickly as possible, cheaper, and with the least damage to the environment. It is also necessary to minimize the loss and damage of goods transported while fulfilling customer requirements for timely delivery and to provide information about the goods in transit (Kondratjev, 2015a).

### **2.1.5 Currency fluctuation**

Currency fluctuation is the changes in the value of one currency relative to another. This fluctuation results in changes in exchange rates, which determine how much one currency can be traded for another in the global market. Currency fluctuations can pose a significant challenge for importers and exporters, as they can affect the profitability, cash flow, and competitiveness of their supply chain. Exchange rate fluctuation increases the risk of global supply chain management which involves transactions to be settled at a foreign currency between a manufacturer and a supplier

Due to globalization of the economy, many firms are engaged in transactions in foreign countries through global supply chains. These include trades of large non storable commodities, such as crude oil, natural gas, agricultural produces, etc. The prices of these commodities are, however, more volatile than those of other products. Indeed, price uncertainty of non-storable commodities, whether caused by government policy, currency rates, climatic disasters, or political/civil instability, is inherent in commodity markets(Gunasekara et al., 2022b)

### **2.1.6 Challenges of medical equipment supply chain management practices**

(Quesada et al., 2012) state that the following are the main obstacles that affect supply chain management: politics, which can be explained by the government's support for importation and the creation of various policies that encourage and support supply chain management; technology, particularly in the areas of communication and documentation, which enables suppliers, manufacturers, distributors, retailers, and customers to cut down on lead times, paperwork, and other needless activities; In addition to technology, economy (budget availability) presents challenges in the acquisition and use of materials.

Fluctuation of Currency Exchange Rate: Exchange rate fluctuations occur when foreign currencies undergo changes in value. Because each currency's value changes due to a variety of economic factors, any currency can be bought or sold for a different amount of another currency at any given time. A strong national currency would appeal to foreign visitors since it would make trips to Europe more affordable. However, there is a drawback: over time, a strong currency can significantly hinder the economy by making entire industries uncompetitive and resulting in the

loss of thousands of jobs. Although some people might choose a strong currency, there are more economic advantages to a weak currency (Hammami et al., 2014). (Beamon, 1998) defined efficiency as the degree to which the resources used are effectively utilized. It often indicates how well time, effort, or money are allocated to the desired job or goal. It is frequently employed with the express intent of communicating how a certain application of effort might successfully create a particular result with the least amount of waste, expenditure, or needless work. The effectiveness of the supply chain's resource utilization is measured by its efficiency. The most effective supply chain matches customer expectations for service quality, such as lead time and precision in delivery, while also having the lowest feasible cost (Saleheen & Habib, 2023).

## **2.2 Empirical Literature Review**

As per the (Assembly, 2014), 86% of the global population presently spends \$6 per person on medical equipment, whereas rich nations spend \$290 per person on the same item. According to (Onyango, 2023) study on medication supply logistics costs, logistics operations account for around 46% of an average hospital's operating budget. To be more specific, logistics expenses may be divided as follows: According to (Rodriguez-Chavez et al., 2023), the cost of supplies is 27%, clinical staff time spent on logistics chores is 4%, and personnel allocated to logistics functions makes up 15% of the total.

In a study on medical equipment challenges of global supply chain management, the most frequently reported issue was fifty-seven percent without replacement parts, followed by thirty-two percent wanting operating and/or repair instructions and twenty-one percent lacking or expired consumables. Not a single organization stated that they had gotten replacement components for each piece of equipment that was provided. Apart from the scarcity of replacement components, there was also a noticeable absence of instructional materials, such as guides and supplies, given by the contributing companies (Gentles et al., 2019). Medical equipment of doubtful quality and utility has been freely donated as a result of the absence of monitoring over these items. According to the same WHO survey, only 42% of countries suggested technical requirements for medical equipment to facilitate contributions or purchases. Approximately 15% of countries follow WHO criteria for contributions, 26% have created their own national guidelines, and 58% have no rules at all (Lustick & Zaman, 2011). A central procurement agency is utilized by the public hospital sector to establish contracts for the purchase of frequently used, large volume products and

services. Approximately twenty-three percent of hospital procurement is covered by these contracts. Hospitals may purchase locally for the remaining items, based on the terms of the central procurement contracts and guidelines. Every year, hospitals and health services in Victoria spend more than \$750 million on supplies, services, and equipment. More than 2,000 different sellers provide these goods, which total more than 30,000 products (Mackintosh et al., 2018).

Procurement policies and practices in the four public hospitals audited are variable, with instances of poor practice and insufficient transparency. This requires attention because hospitals self-managed procurement accounts for around 77 per cent of the \$1.6 billion spent by the sector in 2010–11. The department spent around \$145 million funding medical equipment replacement across public hospitals since 2007–08. In addition, a 2009 department review of medical equipment replacement needed in hospitals found around \$240 million of medical equipment due for replacement after 2010–11 (Clark, 2019).

### **2.3 Theoretical Framework of the Study**

The study aims to explore the challenges encountered by a private medical equipment supply company in Addis Ababa, Ethiopia, in managing the global supply chain of medical equipment.

The specific research questions guide the investigation into various aspects of the company's supply chain management. The first is to identify the specific challenges faced by the company in managing the global supply chain of medical equipment. This could include issues related to sourcing, procurement, logistics, and coordination. Secondly understanding how procurement challenges impact the management of the global medical equipment supply chain. This could involve analyzing the effects of delays, quality control issues, pricing fluctuations, and supplier relationships on the overall supply chain management. Thirdly explores the transportation-related challenges faced by the company in managing the global supply chain of medical equipment. This could involve examining issues such as transportation costs, customs regulations, shipping delays, and the reliability of transportation modes. Fourthly the warehousing and distribution challenges faced by the company. This could include analyzing issues related to inventory management, storage capacity, distribution network efficiency, and order fulfillment. fifthly identify the overall management challenges faced by the company in managing the global supply chain of medical equipment. This could encompass issues such as coordination among different departments,

information sharing, decision-making processes, and organizational structure. Finally, recommend strategies to improve the management of the global medical equipment supply chain for the company. This could involve suggesting measures to enhance procurement processes, optimize transportation logistics, improve warehousing and distribution systems, and address overall management challenges.

## 2.4 Conceptual Framework of the Study

A conceptual framework helps make the proposed relationships between the variables in the study and shows them diagrammatically (Lin, 2015). The conceptual framework of this study was based on four independent variables specifically; Procurement, Transportation, Storage and warehousing and Currency. The dependent variable in this study is efficient medical equipment supply chain management.

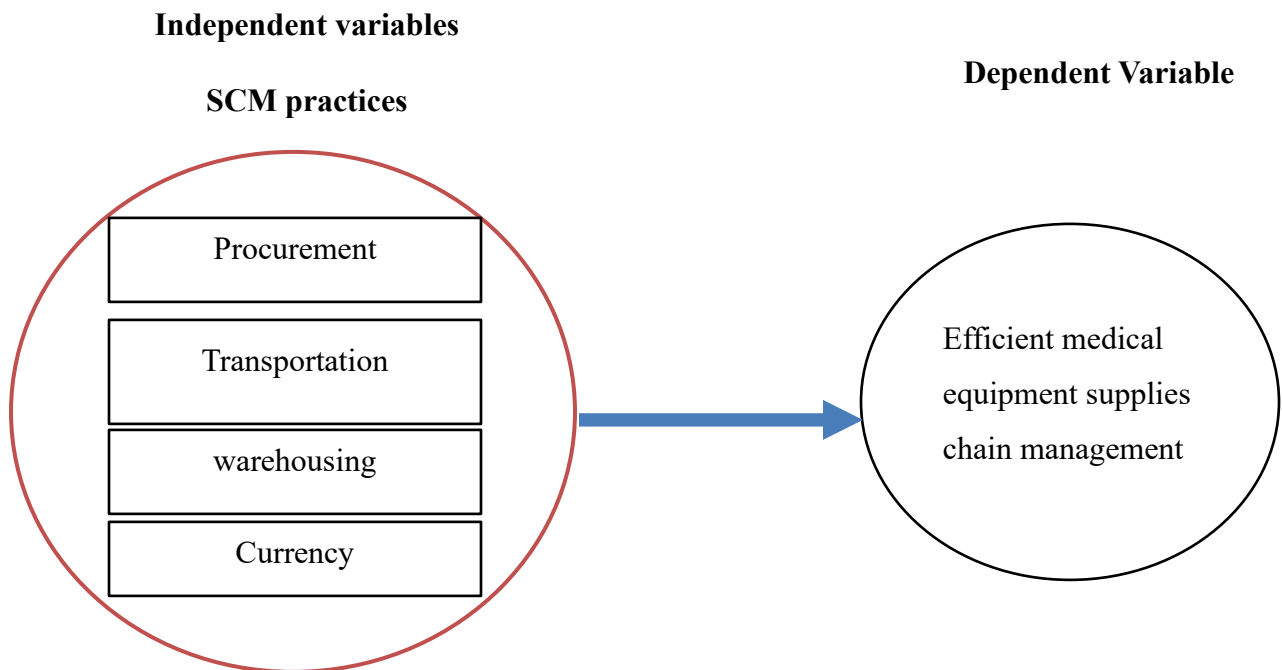


Figure 2.1: Conceptual framework (self-depicted)

## 2.5 Identified Literature Gap

Several previously reviewed research, including (Sorenson & Drummond, 2014) have not sufficiently and thoroughly demonstrated the contribution of supply chain management to the enhancement of healthcare services in Ethiopia. The manufacturer's perspective is represented in

these medical equipment studies; the difficulties with the supply chain for medical devices from the standpoint of the private medical device supplier were not examined. There isn't a published study on the supply chain management of private medical equipment supply from Ethiopia, or more especially from Addis Ababa. Poor performance in Ethiopia's health sector has been caused by the supply chain management of medical equipment. Thus, more research is needed in order to find a solution.

To the best of the researcher's knowledge, no thorough study has been conducted on the issues affecting the supply chain management of medical equipment in the health sector, particularly in Addis Ababa private medical equipment suppliers. This study aims to close this knowledge gap.

## **CHAPTER THREE**

### **3. RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter covered the kinds of data that will be utilized and the techniques that were going to be applied to evaluate the supply chain management of medical equipment at Private Medical Equipment Supply Company. The types of data used and the methods to be employed to assess Challenges Facing Global Medical Equipment Supply Chain Management: The Case of EZM Trade and Investment, Addis Ababa, Ethiopia have been dealt in this chapter. To do so issues of the research approach, research design, sampling design, source of data, methods of data interpretation and analysis and interpretation of data including validity, reliability and ethical considerations were addressed.

#### **3.2 Description of the Study Area**

The study was conducted in Addis Ababa, the capital city of Ethiopia. The study was done at the selected Private Medical Equipment Supply Company of EZM Trade and Investment. EZM Trade and Investment was established by the founder and CEO, Esmelalem Zewde Mergia under the laws of Ethiopia in the year 2016 G.C.'s head office is located in Addis Ababa, Ethiopia. They are experts in sourcing, promoting, innovations, and supply. They have been serving companies in Ethiopia and the neighboring countries for the past years and they provide customers with an unparalleled level of services, reactivity, and competitiveness in the areas of supplying medical Supply & equipment, stationery construction & finishing Materials, Wide-ranging solutions for hospitals, health centers, hotels, and other enormous projects and consulting for global sourcing & Export services. The company is selected purposively, because of its long experience, engagement of various multinational suppliers, product variability, and volume as well as market shares in the country.

### **3.3 Research Approach and Design**

#### **3.3.1 Research Approach**

A research approach is a general plan for conducting research. It includes the researcher's overall strategy for collecting and analyzing data, as well as the specific methods that will be used. There are three main types of research approaches: Qualitative research involves collecting and analyzing non-numerical data, such as interviews, observations, and documents. Qualitative research is often used to explore a topic in depth and to gain a better understanding of the experiences and perspectives of the people involved: Quantitative research involves collecting and analyzing numerical data, such as surveys and experiments. Quantitative research is often used to test hypotheses and to generalize the findings to a larger population and Mixed research involves collecting and analyzing both qualitative and quantitative data. Mixed research is often used to gain a more comprehensive understanding of a topic than either qualitative or quantitative research alone can provide.

The Researcher employed Mixed research study approaches to analyze medical equipment supply chain management in a Private Medical Equipment Supply Company under Addis Ababa city administration. The combination of this approach had more effect in holistically addressing the data and information, whereas the qualitative approach supported the results obtained quantitatively. The research approach refers to the plan or strategy adopted by the researcher to address the research questions or objectives. It determines the overall direction and methodology that will guide the data collection, analysis, and interpretation processes. Different research approaches offer varying perspectives and methods of investigating a research problem. Qualitative Research Approach: Focuses on understanding human behavior, perceptions, and experiences. It involves methods such as interviews, observations, and case studies. Quantitative Research Approach: Involves the collection and analysis of numerical data to identify patterns, relationships, or trends. It typically uses surveys, experiments, and statistical analysis techniques and the Mixed Research Approach: Combines elements of both qualitative and quantitative research to provide a comprehensive understanding of a research problem.

A mixed Research Approach was used in this Research. A mixed research approach involves integrating both qualitative and quantitative methods to offer a holistic perspective on the research problem. By combining the strengths of both approaches, researchers can gain a deeper

understanding of the complexities and nuances of the topic under investigation. The decision to opt for a mixed research approach is based on the need to gather rich qualitative insights while also quantifying data for a comprehensive analysis. This approach allows for triangulation of data, validation of findings, and a more robust interpretation of results.

The mixed research approach enabled the exploration of challenges in the global medical equipment supply chain management at EZM Trade and Investment. Qualitative methods can help uncover underlying issues, while quantitative data can provide statistical evidence and trends. By employing this approach, a more nuanced understanding of the challenges can be achieved, leading to more informed recommendations and solutions.

### **3.3.2 Research Design**

The mixed research approach was selected for this thesis research because it will allow the researcher to gain a more comprehensive understanding of the challenges of global medical devices supply chain management and explore the experiences and perspectives of the people involved in global medical devices supply chain management.

The mixed research approach helped to address the research objectives by providing a more comprehensive understanding of the challenges of global medical device supply chain management. The qualitative data provided insights into the experiences and perspectives of the people involved in global medical devices supply chain management, while the quantitative data will allow the researcher to test hypotheses and generalize the findings to a larger population.

Likewise, as the empirical studies reviewed in chapter two of this work (M. Tu, 2018),(Li et al., 2023), (Trunfio et al., 2021) and (Zomboko et al., 2012) have deployed a Mixed research approach in their endeavor of assessing the challenges of medical device supply chain management systems in different African countries. Both explanatory and descriptive research designs were employed to identify any causal links between variables and to assess different practices of medical equipment supply chain management respectively. Regarding the time dimension, it was cross-sectional (a point in time) data was collected, and the data collected was cross-sectional, focusing on a specific point in time. In-depth interviews were conducted with key individuals involved in the medical supply management system for the qualitative aspect of the study.

### **3.4 Population and Sample Design**

#### **3.4.1 Population of the Study**

The study population for the research was a single company, EZM Trade and Investment, with a total of 92 employees (Human Resource Management of the Company). The target population taken to this assessment is employees of EZM Trade and Investment. The study takes into account the whole population in the study site because it is a small and finite population. However, purposeful sampling was used to choose the respondents who speak for the company. Including store managers, biomedical engineers, supervisors, and specialists from relevant departments participating in the procurement, transportation, warehouse management and currency exchange of medical equipment in EZM Trade and Investment.

#### **3.4.2 Sampling Design**

The target population's respondents were chosen randomly using the purposeful sampling approach. The researcher tried to use a basic purposive sampling methodology to get samples from each group. This approach is crucial because it ensures that every member of the population has an appropriate chance of being included in the sample that is chosen. It is also simple to apply and devoid of subjectivity or human mistakes.

#### **3.4.3 Sample size**

Sampling is a process of selecting several study units from a defined study population. In this study, the sample was selected by purposive sampling procedure. For the purposive (non-probability sampling), respondents were chosen based on the researcher's judgment that they have desirable job characteristics and could provide the required information from each department. All 92 employees were targeted, but only 62 were selected for the study using purposive sampling from each department. The number of respondents in each department was determined randomly (probability sampling).

#### **3.4.4 Sampling Technique**

To conduct this research, the researcher employed both probability and non-probability sampling techniques. The decision to use both types of sampling was based on the characteristics of the respondents in the study. Probability sampling was used to randomly select respondents from the target population. Specifically, simple random sampling (lottery method) was utilized. This

technique ensures that each member of the population has an equal chance of being included in the sample. Simple random sampling is easy to implement and minimizes the risk of bias or personal error.

### **3.5 Data Source and Type**

Both primary and secondary sources of data have been used to meet the objectives of this research. Primary data were collected using closed ended questionnaires and through open ended interview guidelines. Secondary data were gathered from books, proclamations, research works, reports, manuals, journal articles and the internets.

### **3.6 Data Collection Procedure**

Both primary and secondary data collecting mechanisms were employed by the researcher. While secondary data were gathered from a variety of sources, including books, journals, files, and other written reports, primary were gathered through surveys, interviews, and in-person observations. The questionnaire items were measured on a five-point Likert scale that ranges from strongly disagree to strongly agree and Interviews with open-ended questioners were adapted to capture both the dimensions of independence (Procurement practice, warehouse storage practice, Transportation practice and currency exchange fluctuation rate) and dependent variables namely GSCM performance based on an extensive review of the existing literature. Structured questionnaires were administered for all of the participants namely Procurement regulatory affairs Suppliers' representative, Business development & marketing management and others. Whereas, Open ended interview questionnaires were administered to the chief executive officer (CEO) & general manager in addition to structured questionnaires to cover areas that may not be mentioned in questionnaires. chief executive officer (CEO) & general manager were selected for the in-depth interview because they are expected to be in charge of the overall activities of medical device logistics and hence able to provide the needed information.

### **3.7 Model Specifications, and Method of Data Analysis Used**

The completeness of the quantitative data collected is verified. Before analysis, it is manually coded, entered, and cleaned in statistical programmers for social sciences (SPSS) software. Quantitative results are triangulated using qualitative data. Univariate analysis was conducted using descriptive statistics. Tables and charts are used to display the results as frequency, percentage, and mean. To determine whether there is a significant relationship between the

determinant factors constructed as the independent variable and the efficiency of the medical equipment supply chain management constructed as the outcome variable, inferential statistics such as correlations and regressions, both simple and multiple, will be employed. According to Zaidaton and Bagheri (2009), the mean score below 3.39 is considered as low; the mean score from 3.4 up to 3.79 is considered as moderate and the mean score above 3.8 is considered high. While, inferential statistics such as correlations, and regressions (simple and multiple), were used to find out if there exists a significant effect between the determinant factors constructed as the independent variable with efficiency of medical equipment supply chain management constructed as the outcome variable.

### **3.8 Research Variables, Measurement Design, and Validity and Reliability**

#### **3.8.1 Validity**

Validity refers to the extent to which an instrument can measure what it ought to measure (Siriviriyakul, 2021). Research instrument validity is the quality attributed to a proposition or a measure of the degree to which it conforms to established knowledge or truth. Here, the research instruments have been used by other researchers for comparable investigations, and those researchers have determined that they are legitimate instruments. Five people from each department participated in pilot research to assess the validity of the questionnaire. The questionnaire is presented to the five people, and the researcher is on hand to help. In addition, the researcher was conferring with friends and colleagues to solicit feedback on the design and phrasing of the survey.

#### **3.8.2 Reliability**

The Cronbach's Alpha Coefficient was used in the reliability analysis of the scales. According to (Rajalahti & Kvalheim, 2011) above, 0.7 level of Alpha value considered the scale has overall stability and consistency.

Table 3. 1 Cronbach's alpha

No	Variable	No of Items	Cronbach's Alpha
1	Procurement Practices	5	0.787
2	Warehouse/storage Practices	4	0.716

3	Transportation	4	0.610
4	Currency Exchange Rate Fluctuations	3	0.829
5	Global Supply Chain Efficiency of Medical Lab Equipment	5	0.840

### 3.8.3 Variables and Measurement

The four independent variables used to measure the construct of supply chain practices are procurement practice, Warehouse storage practice, Transportation practices and currency fluctuation rate while the dependent variable was Efficient medical equipment supplies chain management which is operational performance.

Number of Items allocated to measure the independent variables was: five for procurement practice, five for Warehouse storage practice, four for Transportation practices and three for currency fluctuation rate. one for each part. For the dependent variable, five separate items were allotted for the measurement of the dependent variable, i.e. GSCM operational performance of EZM Trade and Investment.

Procurement practice refers to the processes and methods used by organizations to acquire goods and services from external suppliers. It involves identifying and selecting suppliers, negotiating contracts, and managing the delivery of goods and services.

Warehouse storage practice refers to the processes and methods used by organizations to store and manage inventory in warehouses. It involves receiving, storing, and issuing inventory, as well as managing warehouse space and equipment. Transportation practices refer to the processes and methods used by organizations to transport goods and materials from one location to another. It involves selecting and managing transportation carriers, optimizing routes, and ensuring the timely and cost-effective delivery of goods. Currency fluctuation rate refers to the change in the value of one currency relative to another over time. It is influenced by various factors, such as economic conditions, political events, and central bank policies. Efficient medical equipment supplies chain management refers to the processes and methods used by healthcare organizations to manage the

flow of medical equipment and supplies from suppliers to patients. It involves planning, procuring, storing, distributing, and tracking medical equipment and supplies to ensure that they are available when and where they are needed, while minimizing costs and waste.

Table 3. 2 Variables and measurement items

Variable/Factor	Measurement Items	Adopted From
Procurement practice	Items are Procured and delivered timely, purchase is based on procurement plan, follow up system for forecasted quantity, good ethical Purchasing practice which contributes for the availabilities of items, rely on small number of high-quality suppliers, maintaining good relationship with suppliers for the timely delivery of items, supplier performance level	(Chatfield et al., 2004); (Avery et al., 2014); (Harter et al., 1998)
Warehouse storage practice	Special storage area for cold chain items; Enough Storage space is Enough to store items; functionalities of Storage equipment; Storage equipment are regularly checked for compliance; Measures in place to ensure pharmaceuticals don't wasted and expired; Existing SOPs that are followed to ensure proper storage.	(Macharia, 2018a); (Taremwa et al., 2017) (Ellram & Golicic, 2015a) (Chatfield et al., 2004)
Transportation practice	Availability of Special Vehicles for transportation of cold chain items: Transport vehicles are fitted with functional temperature and humidity monitoring devices; availability of enough vehicles to meet demand for delivery of procured goods; delivery is done within recommended timelines; level of transport and distribution practices.	(Taremwa et al., 2017);  (Ellram & Golicic, 2015a); (Ellram & Golicic, 2015b)
Currency fluctuating rate	currency is a system of money in common use within a specific environment over time. An exchange rate is a relative price of one currency expressed in terms of another currency (or group of currencies). The exchange rate between two currencies is commonly determined by the economic activity, market interest rates, gross domestic product, and unemployment rate in each of the countries.	(Macharia, 2018b);  (Bejol & Livingstone, 2018);  (Worzala, 1995)

<b>Efficient medical equipment supplies chain management</b>	Minimum cost of purchased materials; assuring quality of purchased materials; on-time delivery of ordered materials; to meet customer satisfaction; Volume and mix flexibility	(Mathur et al., 2018);  (Sugawara & Nikaido, 2014);  (Alem Sebsbie, 2021)
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**3.8.4 measurement design**

The measurement design of the research on the impact of procurement practices, warehouse storage practices, transportation practices, and currency fluctuation rates on efficient medical equipment supply chain management is the Independent variables: Procurement practices, Warehouse storage practices, Transportation practices and Currency fluctuation rate while the Dependent variable is Efficient medical equipment supply chain management.

The independent variables were measured using a survey questionnaire. The questionnaire included questions about the organization's procurement practices, warehouse storage practices, transportation practices, and currency fluctuation rates. Example: Medical equipment is requested and delivered timely, Storage equipment are regularly checked for compliance, Delivery is done within the recommended timeline and There is a supply delay due to lack of foreign exchange permit.

The dependent variable was measured using a composite index of efficient medical equipment supply chain management. The index was developed based on a literature review of the key dimensions of efficient medical equipment supply chain management.

The data were collected from a sample of healthcare organizations using a survey questionnaire. The questionnaire was administered to supply chain managers, logistics managers, and other relevant personnel within the healthcare organizations.

The data were analyzed using a variety of statistical techniques, including descriptive statistics, regression analysis, and structural equation modeling. The analysis was used to test the hypotheses of the study and to determine the impact of the independent variables on the dependent variable.

The validity and reliability of the measurement instruments were assessed using a variety of methods, including content validity, construct validity, and internal consistency reliability. The results of the validity and reliability assessment indicated that the measurement instruments were valid and reliable for the study.

### **3.9 Ethical Considerations**

In this study the researcher was ethical enough. The researcher spoke about the rationale and goals of performing this study with the participants. The responders were aware of this and are certain that nothing will jeopardize their safety or rights. The completed questionnaires have never been shared by me with anybody within or outside the organization. Confidentiality and anonymity are reinforced by the fact that the results are always presented whether in this thesis or when discussing them with anybody else in a collective manner.

## **CHAPTER FOUR**

### **4. RESULT, DISCUSSION AND INTERPRETATION**

#### **4.1 Introduction**

This chapter presents the data analysis, results, and discussion of the study on challenges facing global medical equipment supply chain management in the case of EZM Trade and Investment in Addis Ababa, Ethiopia. The chapter begins by presenting the characteristics of the study sample and their responses to the survey using descriptive statistics. This provides readers with an understanding of the background of the respondents. The chapter then presents the results of the inferential statistical analysis, including correlations and multiple regressions. The formulated hypotheses of the study are tested using these statistical techniques. The results are presented in statistical tables and figures.

#### **4.2 Response Rate**

Here, the primary data were in the form of a structured Likert scale, and collected through a self-administered questionnaire. The questionnaire was self-administered to 65 respondents, of which 62 answered all questions as required. Therefore, the response rate is 95 % percent. Moreover, one employee from each department were interviewed.

#### **4.2 Demographic Characteristics of Respondents**

Demographic information shows the characteristics of the units in the sample. The researcher used to establish general information of respondents, which forms the basis under the interpretation are made. This part includes the analysis of general background information of respondents based on gender, age, educational level, and professional level of respondents.

Table 4. 1 Profile information of respondents

		Frequency	Percent
Sex	male	34	54.8
	Female	28	45.2
	Total	62	100.0
Age	18-25	11	17.7
	26-30	20	32.3
	31-35	26	41.9
	36-45	5	8.1
	Total	62	100.0
Education level	Diploma	8	12.9
	BSc/BA	38	61.3
	MSc and above	16	25.8
	Total	62	100
	<i>Total</i>	<i>62</i>	<i>100</i>
Work experience	less than 3 years	13	21
	4 to 6 years	25	40.3
	7 to 9 years	16	25.8
	10 years and more	8	12.9
	<i>Total</i>	<i>62</i>	<i>100</i>
	less than 3 years	13	21
Job title	Procurement regulatory affairs	16	25.8
	Suppliers' representative	13	21
	Business development & marketing mgt	22	35.5
	Others	11	17.7
	<i>Total</i>	<i>62</i>	<i>100</i>
	Procurement regulatory affairs	16	25.8

*Source: survey, 2024*

The age distribution of the respondents Table 4.1, which reveals the age range of the participants. This information is vital for determining if the individuals are part of the younger or older age categories. The investigation exposed that a substantial number of the individuals were in the 20-30 age bracket, with 138 persons (45.2%) falling within the 31-40 age group. Interestingly, the findings also indicated that 15 respondents were above 40 years old.

The statistics provided in Table 4.1 imply that a substantial number of the survey participants, 25 individuals (40.3%), had 4-6 years of work experience, with 16 respondents (25.8%) holding their positions for 7-9 years. Besides, 13 participants (21%) had below 3 years of experience, and 8 individuals (12.97%) had above 10 years of experience. The researcher believes that this diverse mix of respondents was instrumental in obtaining authentic insights, as the medical equipment supply chain management involved individuals with varying levels of expertise, allowing for a rich perspective on the subject.

This section examines the respondents' educational backgrounds, as depicted in Table 4.1. A majority of 61.3% of the respondents held a bachelor's degree, with 25.8% possessing a Master's degree, and 12.9% having a diploma. These statistics indicate that the respondents were well-equipped to effectively comprehend and respond to the study's inquiries.

The specifics in Table 4.1 expose that 35.5% of the survey participants were associated with the Business Development and Marketing Management department, 25.8% were engaged in Procurement Regulatory Affairs, 21% performed as Suppliers' Representatives, and the remaining 17.7% were located in other departments within the organization. This distribution suggests that professionals from diverse backgrounds within the company actively participated in the survey, showcasing a robust understanding of the survey's subject matter across various roles and departments.

### 4.3 Procurement Practices of Medical Equipment

Table 4. 2 : Summary of responses on Procurement of medical equipment

	<b>Procurement of Medical Equipment</b>		<b>1(SD)</b>	<b>2(D)</b>	<b>3(N)</b>	<b>4(A)</b>	<b>5(SA)</b>	<b>Mean</b>	<b>SDV</b>
<b>1</b>	Medical equipment requested and delivered timely	Frequency	0	33	0	29	0	3.06	<b>1.006</b>
		%		53.2		46.8	0		
<b>2</b>	The facility has good working relation with suppliers	Frequency	40	12	10	0	0	3.45	<b>0.803</b>
		%	64.5	19.4	16.1	0	0		
<b>3</b>	There is classification of medical equipment for procurement and budget allocation	Frequency	0	0	5	37	20	4.24	<b>0.529</b>
		%	0	0	8.1	59.7	32.3		

4	Procurement is being processed based on procurement plan	Frequency	9	23	8	22	0	2.69	1.11
		%	14.5	37.1	12.9	35.5	0		
5	There is appropriate forecasting & follow up to procure efficiently and Effectively	Frequency	16	19	0	24	3	2.61	1.31
		%	25.8	30.6	0	38.7	4.8		
<b>Total Composite mean</b>							<b>3.21</b>	<b>0.95</b>	

*Source: researcher's own compilation of survey data 2024*

1 = strongly disagree (SD); 2 = disagree(D); 3 = Neutral(N); 4 = agree(A); and 5 = strongly agree (SA).

As shown in above table 4.2, respondents were asked whether medical equipment was requested and delivered timely or not. In this regard, more than half 33 (53.2%) respondents assured that there was no timely request and delivery of medical equipment in their respective organization. Respondents were also asked to give their opinion on whether the facility has good working relations with suppliers or not. In this regard, 52 (83.5%) of respondents strongly disagreed about the existence of good working relations with suppliers, while 10 (16.1%) respondents replied neutrally. Respondents in the interview assured that their main supplier of medical equipment is foreign suppliers, but 99.4 % disagreed with having a good relationship with the agency.

Having a good Supplier-buyer relationship emphasizes that suppliers have an important impact on the overall performance and/or competitiveness of organizations, not only through minimizing costs but also through joint product, service and process development, as well as continuously improving quality across all supply chain levels (Montes & Irving, 2008). By concentrating on establishing and developing long-term relationships the costs of initial setup for large contracts with deals taking many months to complete can be offset, with both parties actively looking to avoid any unnecessary costs that may arise from retendering, negotiating, or being forced to exit an existing contract early.

An important phenomenon related to buyer-supplier relationships is that many buyers are developing single-source suppliers because of the pressure to increase quality, reduce inventory, develop just-in-time systems, and decrease time to market. The ultimate goal in developing these

capabilities is to reduce costs. Though it is a good idea to establish a single source supplier, it has also bad consequences if the supplier is not potentially fit.

The company does not have good relationships with its main supplier and also with other suppliers. This will contribute to having low quality and high cost medical equipment. Due to lose of buyer-supplier relationships minor impairments will also be difficult to fix (due to lack of adequate training by professionals, and lack of experts ) and contribute to service interruptions and financial expenses to fix or buy new medical types of equipment. About existence of classification of medical equipment for procurement and budget allocation, the majority of respondents 57 (92%) replied that, there was the classification of medical equipment for procurement and budget allocation. Moreover; respondents were asked whether local suppliers' services are satisfactory to the facility in their respective organizations. In this case, almost all respondents 59(97.1%) assured that local supplier' services were not satisfactory to the facility.

The respondents were asked about the existence of procurement plan and is being processed based on procurement plan. Almost all 40 (64.5%) of respondents strongly disagreed about the issue, whereas 22 (35.5%) of respondents were replied positively.

Respondents were also asked to give their opinion on whether there is appropriate forecasting & follow up to procurement efficiently and effectively. In this regard more than half 35 (56.4%) of respondents strongly disagreed and disagreed about the existence of appropriate forecasting & follow up to procurement efficiently and effectively, while 24 (38.7%) respondents agreed and 3 (4.8%) were strongly agreed about the existence of appropriate forecasting and existence of follow up to procurement efficiently and effectively.

As explained from the interviewee with the biomedical head and those assigned to follow the procurement, the major problem for not procuring quality types of equipment is the procurement policy of the government which uses price as the major criterion for procurement. This is a similar challenge with the practice in Mexico as shown below. In Mexico, the price of medical equipments is often the ultimate criteria in selection and contracting phase of procurement. The study indicates that many stakeholders thought this was detrimental to clinicians, clinical procedures and outcomes. For them, this focus on buying at the lowest price was the root of the problem (Myriam L, et al., 2016).

The interviewee raises their concern about forecasting “There is annual forecasting done based on the specification and item list of the main governmental supplier PFSA, while private companies have different international suppliers but it's only on paper, we didn't procure what we forecast and the agency also used the forecasted data as an input to procure not as a request to be procured”. This happens mainly due to the input or data used for forecasting is poor because they don't have an appropriate inventory management system that would produce data for forecasting demand, especially for private companies.

Approximately less than half of the respondents indicated that medical equipment was requested and delivered timely. A majority disagreed that the facility has a good working relationship with suppliers and that there is a classification of medical equipment for procurement and budget allocation. However, fewer respondents agreed that procurement is being processed based on the procurement plan or that there is appropriate forecasting and follow-up to procure efficiently and effectively. Overall, the data suggests a moderate level of satisfaction with the procurement process, with potential areas for improvement in adherence to procurement plans and forecasting processes.

These results indicate that while there are some positive aspects to the procurement process, such as good working relationships with suppliers and classification of equipment for procurement and budget allocation, there are also areas for improvement, particularly in terms of timely delivery and efficient forecasting and follow-up. These findings can inform strategies to enhance the procurement process for medical equipment in the healthcare facility.

A qualitative study conducted in four countries found that price is often the primary criterion used in the selection and contracting phase of medical equipment procurement in Mexico. Many stakeholders believe that this focus on low price is detrimental to clinicians, clinical procedures, and patient outcomes. They argue that it leads to the purchase of lower-quality medical devices and services. The study also found that in Mexico, the purchase demand is often regrouped at the regional or national level by the Ministry of Health to increase purchasing power. However, this can make the procurement process more bureaucratic and less responsive to the specific needs of individual hospitals and clinics. In contrast, in European countries such as Switzerland, procurement is typically left to the discretion of individual hospitals. This allows hospitals to select medical devices and services based on factors other than price, such as quality, performance, and

patient safety. The study's findings suggest that there is a need to move away from a focus on low price as the sole criterion for medical equipment procurement. Instead, policymakers should consider a more holistic approach that takes into account the quality, performance, and patient safety of medical devices and services (Myriam L, *et al.*, 2016).

#### 4.4 Warehouse management practices of Medical Equipment

Table 4. 3 summary of responses on warehouse management

	<b>Warehouse practice on Medical Equipment</b>		<b>SDA</b>	<b>DA</b>	<b>N</b>	<b>A</b>	<b>SA</b>	<b>mean</b>	<b>SDV</b>
<b>1</b>	Appropriate storage space is available within the facility	Freq.	0	4		20	38	4.48	<b>0.805</b>
		%	0	6.5		32.3	61.3		
<b>2</b>	Storage equipment is Fully functional	Freq.	0	11	13	16	22	3.79	<b>1.12</b>
		%	0	17.7	21	25.8	35.5		
<b>3</b>	Storage equipment is regularly checked for compliance	Freq.	0	12	1	37	12	3.79	<b>0.977</b>
		%	0	19.4	1.6	59.6	19.4		
<b>4</b>	Existing SOPs are followed to ensure proper storage	Freq.	0	36	10	16	0	2.68	<b>0.864</b>
		%	0	58.1	16.1	25.8	0		
	<b>Total composite mean</b>							<b>3.68</b>	<b>0.942</b>

*Source: researcher's own compilation of survey data 2024*

1 = strongly disagree (SD); 2 = disagree(D); 3 = no answer(N); 4 = agree(A); and 5 = strongly agree (SA).

A frequency of 61.3% of respondents strongly agree that appropriate storage space is available within the facility and 17.7% of the respondents disagree the storage of medical equipment is fully functional. 59.6.7% of respondents agree that storage equipment is regularly checked for compliance.58.1% of respondents disagree on the presence of SOPs to be followed to ensure proper storage.

The table presents responses from healthcare facility staff regarding warehouse practices for medical equipment. It shows that there is generally a high level of satisfaction with the availability of storage space and the effectiveness of compliance checks. However, there is room for improvement in the functionality of storage equipment and adherence to standard operating procedures (SOPs) for proper storage. Overall, the data indicates a moderate level of agreement with warehouse practices, suggesting potential for enhancement in certain areas.

In line with this study a study done in 2018 in South Sudan on pharmaceutical logistics reveals that many facilities 65% have a separate store assigned but with inadequate space and many facilities do not adhere to the proper guidelines, many facilities (74%) do not have storage maintaining equipment like a thermometer, ventilator, humidity checker even they do not have adequate shelving and storage cabinets (C. et al., 2018).

As we can see from the mean value of the respondent's response, among four warehouse management measurement items, most of the measurement items were below-disagreed points as shown in the table. This implies that warehouse management in private companies is still poor or contributes a lot to making the medical equipment supply chain management inefficient.

#### 4.5 Transportation management practices of medical equipment

Table 4. 4 summary of responses on transportation management practices of medical equipment

	Transportation practice		SD A	DA	N	A	SA	Me an	SD V
<b>1</b>	There are enough Vehicles for transportation of medical equipment	Frequ ency	18	22	0	22	0	3.58	<b>1.24 9</b>
		%	29.0	35.5	0	35. 5	0		
<b>2</b>	Delivery is done within recommended timelines	Freq u ency	21	11	15	15	0	3.74	<b>1.11 5</b>
		%	33.9	17.7	24.2	24. 2	0		
<b>3</b>	Safety of medical equipment is protected as required during	Freq u ency	12	36	1	13	0	3.76	<b>1.00 3</b>
		%	19.4	58.0	1.6	21	0		

	transportation								
4	Transportation practices of medical equipment are satisfactory	Freq		36	11	15	0	2.66	0.848
		uency %		58.1	17.7	24.2	0		
<b>Total composite mean</b>								<b>3.43</b>	<b>1.05</b>

*Source: researcher’s own compilation of survey data 2024*

1 = strongly disagree (SD); 2 = disagree(D); 3 = no answer(N); 4 = agree(A); and 5 = strongly agree (SA).

18 respondents (29%) strongly disagreed with the statement about having enough vehicles for transporting medical equipment. Additionally, 33.9% strongly disagreed with the assertion that delivery is done within recommended timelines. Furthermore, 58% of the respondents disagreed with the idea that the safety of medical equipment is protected as required during transportation. Finally, 58.1% of the respondents strongly disagreed with the statement that transportation practices of medical equipment are satisfactory. The survey asked respondents to express their views on questions regarding transportation management in their company. The survey outcome indicates that the average rating for disagreement was 1.45, suggesting that transportation management in the company is very poor as shown in Table 4.4.

Lack of private sector transport is a key barrier for medical equipment supply chain. The availability of vehicles is often limited due to a lack of budget, poor maintenance and inappropriate use. The interviewee explains that they have a shortage of vehicles even for ambulance service. They are giving solutions to their problems by negotiation with the customer and rent of car for specific transportation. Against to the findings, a study done in Kenya shows that instead of trying to own and operate a government fleet of trucks they have contracted a third-party transport providers to distribute stock from central to health facilities (their customers). Depending on the geography, overall economic situation, maturity of the transport market and structuring of the price and service level contracts, a third-party logistics provider can offer better service at rates comparable to the full-loaded cost of owning and operating a government fleet.

These results suggest that there is some positive perception of transportation practices for medical equipment, including the availability of vehicles, and the protection of equipment safety during

transportation. However, there are still some areas for improvement, particularly in timely delivery and ensuring that transportation practices are consistently satisfactory.

During an interview, the mention of significant problems related to Ethiopian port diversification strategies that impact the timely delivery of medical devices raises several important points and concerns. Port diversification strategies are crucial for countries like Ethiopia that rely on imported goods, including essential medical devices. If these strategies are not effectively implemented or managed, it can lead to logistical challenges such as delays in shipments, increased transportation costs, and potential disruptions in the supply chain. The interview response highlights the importance of having a resilient and efficient supply chain for medical devices.

A study conducted in Kenya found that contracting third-party transport providers to distribute stock from central warehouses to health facilities can be more efficient and cost-effective than owning and operating a government fleet of trucks. The decision of whether to use a third-party logistics provider depends on several factors, including the geography of the area, the overall economic situation, the maturity of the transport market, and the structure of the price and service level contracts. In some cases, third-party logistics providers can offer better service at rates comparable to the full cost of owning and operating a government fleet. This can free up government resources to focus on other priorities, such as providing healthcare services (Parashant Y. 2015).

The table illustrates the feedback provided by healthcare facility personnel regarding the transportation procedures for medical equipment. A significant number of respondents concur that the quantity of available vehicles for transportation is adequate, the delivery process is punctual, and safety protocols are implemented. Nevertheless, the general contentment level with the transportation practices appears to be inadequate, suggesting the presence of potential for enhancement in this particular domain. It may be imperative to introduce modifications to align with the expectations of the staff and enhance the conveyance of medical equipment.

## **4.6 Challenges of Global Supply Chain Management of Medical Equipment**

### **4.6.1 Currency fluctuation**

Table 4. 5 summary of responses on Currency exchange rate practice of medical equipment

<b>Currency fluctuation rate on Medical Equipment Supply Chain Management</b>			<b>SDA</b>	<b>DA</b>	<b>N</b>	<b>A</b>	<b>SA</b>	<b>mean</b>	<b>SDV</b>
<b>1</b>	There is a scarcity of foreign exchange which affects the company's Supply chain management practice.	Freq.	0	10		13	39	4.31	<b>1.09</b>
		%	0	16.1		21	62.9		
<b>2</b>	The is a replacement of supplier because of the changes in exchange rates and price fluctuation.	Freq.	0	10	17	23	12	3.5	<b>0.98</b>
		%	0	16.1	27.4	37.1	19.4		
<b>3</b>	There is supply delay due to lack of foreign exchange permit	Freq.	4	3	14	16	26	3.89	<b>1.19</b>
		%	6.5	4.8	22.6	25.8	40.3		
<b>Total composite mean</b>								<b>3.8</b>	<b>1.08</b>

*Source: researcher's own compilation of survey data 2024*

A frequency of 39 (62.9%) of the respondents strongly agree that there is a scarcity of foreign exchange which affects the company's Supply chain management practice. While 56.5% strongly agreed and agreed on the replacement of the supplier because of the changes in exchange rates and price fluctuation and similarly 66.1% agreed on the stamen of "There is supply delay due to lack of foreign exchange permit".

In this study, foreign currency shortage and fluctuation of exchange rates were found to be the major challenges for EZM Trade and Investment. Shortage of foreign currency is affecting the company's relationship with suppliers and its downstream customers according to the key informant interview. Fluctuation in exchange rate is also found to be a common problem which leads to unpredictable cost mark up on medicines. More than 66% of respondents agreed that they face supply delays due to lack of foreign exchange permits. One key informant also elaborated that supplier replacement due to exchange rate fluctuation is not common, often, as the case is severe from the company's side at home. It is reported that for companies that rely their sourcing on

foreign currency-denominated inputs or products, accompanying costs become a larger portion of a company's total costs.

A case study in Kenya by Magenda and Iravo (2014) reported that currency fluctuation rests among the top factors challenging global sourcing. A policy research paper by the World Bank has recently reported that though currency devaluation is suggested to stimulate exports, especially in low-income countries such as Ethiopia, exchange rate adjustments need to take in to account the increase in cost of capital imports and debt (World Bank, 2019).

The total composite mean for all statements was 3.8, with a standard deviation of 1.08. This suggests that, on average, respondents highly agreed with the impact of currency fluctuation on global medical equipment supply chain management. In general, the survey results indicate that a significant proportion of respondents perceive currency fluctuation as affecting various aspects of the company's supply chain management practices, including supplier replacement and supply delays due to foreign exchange issues. These findings suggest that currency fluctuation is an important consideration in the company's supply chain management and may require strategic planning and risk mitigation measures.

The table illustrates the feedback provided by personnel in healthcare facilities regarding the impact of currency fluctuation on the management of the supply chain for medical equipment. It indicates that challenges arising from currency fluctuations include a shortage of foreign exchange, the necessity to seek alternative suppliers, and delays in the supply process. In general, the data implies a major influence of currency fluctuation on the management of the supply chain for medical equipment, emphasizing the importance of implementing strategies to tackle these obstacles.

#### **4.6.2 Challenges of Medical Equipment Supply Chain Management**

The composite mean scores and standard deviations have been computed for all the dimensions of the independent and dependent variables. The rule of thumb about the intervals for breaking the range in measuring variables that are captured with a five-point scale (that ranges from strongly disagree to strongly agree) is 0.8, which is found by dividing the difference between the maximum and minimum scores to the maximum score (Kidane et al., 2014). Hence, a calculated composite mean value that ranges from 1 to 1.80 implies strong disagreement, whereas the remaining ranges of 1.81 to 2.6, 2.61 to 3.4, 3.41 to 4.2, and 4.21 to 5.00 represent

respondents' perceptions of disagreement, neutrality, agreement, and strong agreement respectively.

Table 4.6 indicates that, out of the total respondents, 22 (35.5%) strongly disagree that the absence of qualified suppliers during global sourcing has an impact on procurement, while 25 (40.3%) disagree that the absence of qualified suppliers during global sourcing has an impact on currency exchange rates. On the other hand, 28 (45.2%) dispute that qualified suppliers have a negative impact on the warehouse and that qualified suppliers have a negative impact on transportation management. A frequency of 37 respondents (59.7%) highly agree that procurement is impacted by a lack of technology, such as various SCM software. about the impact of technology on warehouse operations, 31 (50.8%) strongly disagree, while 26 (41.9%) strongly disagree about its influence on transportation management.

30 (48.4%) of the respondents strongly agree that the government's lack of updated and appropriate policies and procedures affects procurement. In contrast, 25 (40.3%) disagree that the government's lack of updated and appropriate policies and procedures affects currency fluctuation, twenty-six (41.9%) disagree that it affects storage practices, and twenty-eight (45.2%) disagree that it affects transportation management. The majority of respondents (24, or 38.7%) concur that procurement is impacted by insufficient funding. A shortage of funding has an impact on warehouse management, according to 48.4% of respondents, and it has an impact on transportation management, according to 50%. However, 41.9% of respondents do not think that currency fluctuations are caused by insufficient budget.

The mean score indicates that respondents highly agree (mean 3.63) with procurement and agree (mean 4.03) with currency fluctuation, storage, and transportation management, in relation to the low level of support from top management towards strengthening supply chain management (mean 4.21). This is consistent with Khizer et al. (2012), who provide a compelling explanation of how top management support affects the supply chain's overall efficiency through their actions and initiatives. The interviewee emphasizes that supply chain management is a large department that requires interdisciplinary team participation while discussing the difficulties in managing the supply chain for medical equipment. But in private businesses, the pharmacy department is primarily responsible for all supply chain management operations. Furthermore, that is not the case even from the pharmaceutical department, it is not a case team with coordinator and members

whose primary duty is to work on supply chain. The participation of different departments in different activities of the supply chain is too low”.

The interviewee, a biomedical engineer, explains that the global challenge in the supply chain management of medical equipment begins with procurement. Because they did not involve us in setting specifications, some medical equipment is not functional right away for a variety of reasons; others are impaired when they are used improperly because of electricity; most equipment is rendered unusable by professionals handling it carelessly, failing to perform preventive maintenance; overloading it beyond its capacity; and we engineers lack the necessary training to perform most preventive maintenance and to repair when it is impaired.

Table 4. 6 summary of global challenges on medical equipment supplies chain management

no	Challenges	Procurement practice					Warehouse and storage practice					Transportation practice					
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
1	Lack of qualified suppliers when doing global sourcing.	Feq.	22	15	9	16	0	3	28	5	25	1	6	28	13	15	0
		%	35.5	24.2	14.5	25.8		4.8	45.2	8.1	40.3	1.6	9.7	45.2	21	24.2	
		Mean	2.31					2.89					2.60				
		S.dv	1.29					1.05					0.98				
2	Lack of technologies like different SCM software's affects	Feq.	1	6	4	21	30	31	22	0	4	5	26	18	7	5	6
		%	1.6	9.7	6.5	33.9	48.4	50	35.5	0	6.5	8	41.9	29	11.3	8.1	9.7
		Mean	4.18					1.87					2.15				
		S.dv	1.03					1.22					1.32				
3	Lack of Updated and appropriate Policies and procedures	Feq.	22	15	9	16	0	3	28	5	25	1	6	28	13	15	0
		%	35.5	24.2	14.5	25.8	0	4.8	45.2	8.1	40.3	1.6	9.7	45.2	21	24.2	0
		Mean	2.31					2.89					2.6				
		S.dv	1.24					1.06					0.97				
4	Lack of enough budget	Feq.	24	21	6	7	4	1	6	4	21	30	31	22	0	4	5
		%	38.7	33.9	9.7	11.3	6.5	1.6	9.7	6.5	33.9	48.4	50	35.5	0	6.5	8.1
		Mean	2.13					4.18					1.87				
		S.dv	1.23					1.03					1.22				
5	There is little support from top management towards improving	Feq.	7	6	13	13	23	5	2	3	23	29	2	3	4	24	29
		%	11.3	9.7	21	21	37.0	8.1	3.2	4.8	37.1	46.8	3.2	4.8	6.5	38.7	46.8
		Mean	3.63					4.11					4.21				
		Sdv	1.37					1.18					0.99				

Source: survey, 2024

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

## **4.8 The effect of supply chain management challenges on the performance of global supply chain practices of Medical Equipment.**

### **4.8.1 Test of Assumptions**

Data that fulfill certain criteria are used for parametric inferential tests: the data must be normal, independent samples, and at least at the interval/continuous level. The linearity assumptions must also be satisfied, and the samples cannot be multi-collinear. Validity and reliability tests were also looked at. If these conditions are not satisfied, it is not practical to move on. Instead, it needs to be focused on looking at non-parametric statistical methods and other alternative testing mechanisms. As a result, it's critical to validate this requirement before doing these tests, and the assessed variables demonstrated that every assumption was almost satisfied.

#### **4.8.1.1 Normality Test/ Test for Normal Errors**

A method of statistical analysis called a normality test is used to determine if a dataset originates from a population that has a normal distribution. The Gaussian distribution, sometimes referred to as the normal distribution, is a symmetrical distribution with a bell-shaped form that is defined by its mean and standard deviation. It's critical to determine if the assumption that the data has a normal distribution holds true for many statistical approaches and procedures. This indicates that mistakes follow a normal distribution and that a plot of the residual values will resemble a normal curve ((Daniel, 2004)). The results demonstrate that they fitted a model after completing the model and parameters, and it is necessary to look into the bias in the model's underlying assumptions. Three approaches are utilized to achieve this: the scatter plot of  $Z_{resid}(y)$  vs.  $Z_{pred}(x)$ , the normal probability plot, and the histogram. Examining a graph and determining if the distribution significantly deviates from a bell-shaped normal distribution is the most effective method of determining how far away the utilized data are from a Gaussian (normal) distribution. The residuals are normally distributed, the histogram appears symmetric, and the normal p-p plot was mostly consistent with the line. Consequently, based on these results, the assumption was met, as seen in Figure 4.1.

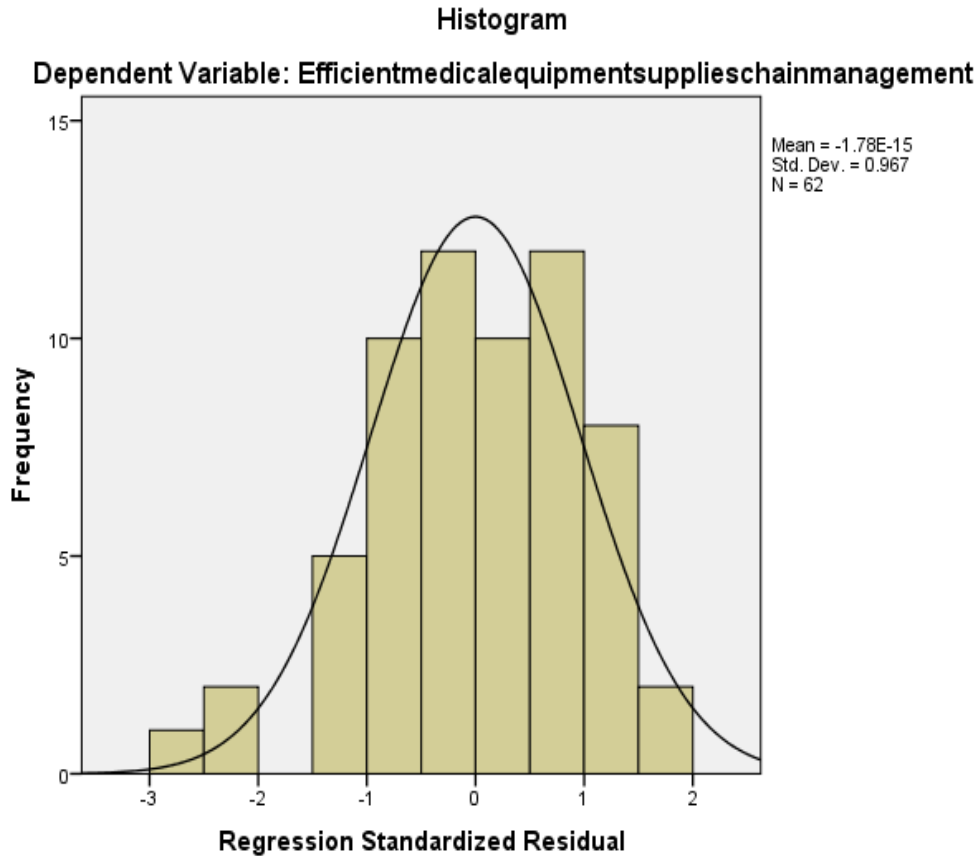


Figure 4. 1 Model Assumptions of Histograms

#### 4.8.1.2 Test of Multi-Co Linearity

Multi-co linearity means that there is a linear relationship between the explanatory variables which may cause the regression model biased (Kothari, 2014).

To examine the probable degree of multi-Co linearity among the explanatory variables, the Variance Inflation Factor (VIF) technique is also utilized to detect the issue. In theory, a VIF of more than 10 indicates that a variable may need to be removed from the model due to its multi-collinearity with other variables. However, in the case of this study, the VIF result of the SPSS output in Table 4.11, below (the section on multiple regression analysis), showed that there isn't perfect or strong co-linearity between the explanatory variables because none of the VIFs is unduly high (it falls between 1.158 and 2.079). Thus, this presumption is true.

#### **4.8.1.3 Test for Interval Level/ Continuous Scale Data**

To robustness of parametric statistical analysis, data should be measured by continuous interval level (Daniel, 2004). The researcher used a five level Likert scale to measure each variable. Then each variable consists of the sum of many items averaged to give the mean score. The data were created by calculating a composite score of mean from multiple items than a single mean for procurement, warehouse, transportation and currency. Therefore, a series of multiple items was averaged and used to test dependent, and independent, meaning, numbers can be added, subtracted, multiplied and divided. Hence these assumptions were fulfilled.

#### **4.8.1.4 Independence Observation**

Two observations are independent if the occurrence of one observation provides no information about the occurrence of the other observation. In other words, it is the correlation between errors. The independence observations are tested by Durbin-Watson coefficient (Robert B. Burns and Richard A. Burns, 2008). The test statistic coefficient should be between 1.5 and 2.5, which means residual are uncorrelated. As indicated in Table 4.9 below (multiple regression, ANOVA table), the Durbin-Watson coefficient was 2.346. Therefore, this assumption is fulfilled.

#### **4.8.1.5 Test of linearity**

Simple linear regression is based on finding the straight line on a scatter graph that fits the scatter points best, i.e. as closely as possible (Lederer et al., 2008). The distribution of points is assumed to be linear in regression techniques. Regression analysis is doubtful when the distribution around the line exhibits significant variation at different times and develops into a pattern. The result graph below shows that there is a positive link between the dependent and independent variables, with the regression line sloping from the bottom right to top left. In addition, the P-P plots have a diagonal line-like appearance, with the dots almost precisely falling on the diagonal. Consequently, this presumption is true.

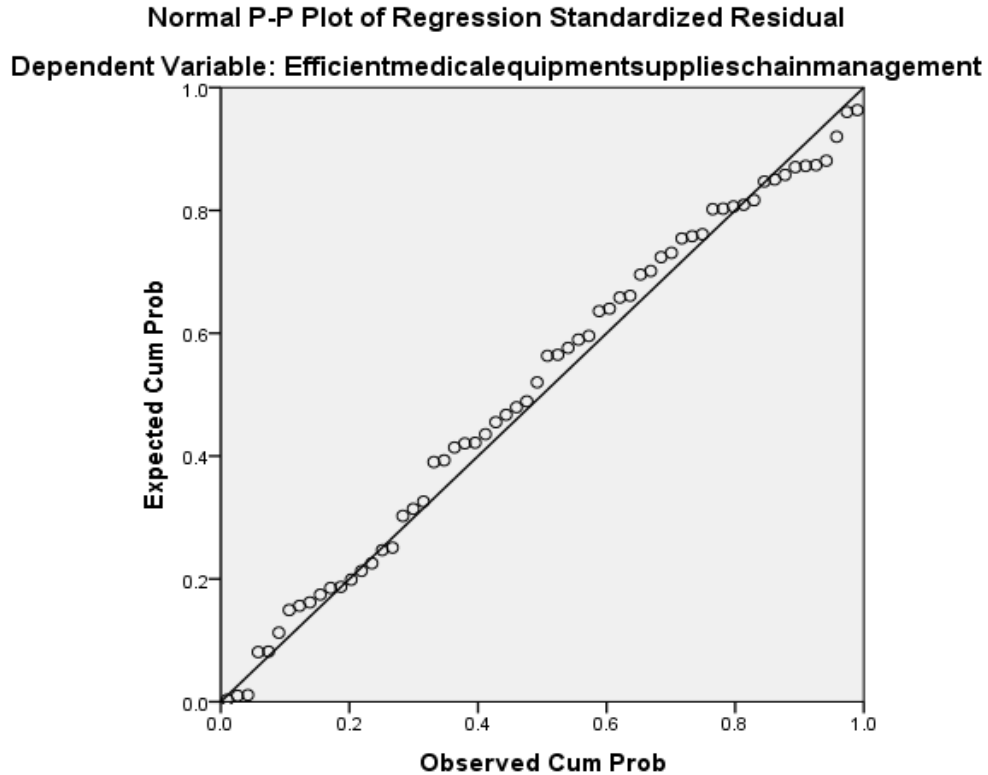


Figure 4. 2 Model Assumptions of linearity

#### 4.8.2 Correlation Analysis between Independents and dependent Variable

To gain a preliminary understanding of the symmetry and importance of the relationships between the independent variables with efficiency, correlation analysis has been performed. The linear relationship between two metric variables is measured in this study using the Pearson correlation (Robert B., Richard A.2008). With a result that can vary from -1.00 to 1.00, the test also reveals the strength of the association between the variables; 0 denotes no relationship, -1.00 denotes a negative correlation, and 1.00 denotes an ideal positive correlation (Pallant, 2010). There is a minor connection for values 0.1 to 0.29, a medium correlation for values 0.3 to 0.49, and a strong correlation for values 0.50 to 1.0 for the remaining values.

As the table below illustrates, there is a positive and strong relationship between the efficiency of medical equipment supply chain management and procurement ( $r=.757$  and  $p (.000) <0.01$ ). Similarly, there was a significant and favorable correlation ( $r=.663$  and  $p=0.01$ ) between the effectiveness of the supply chain management for medical equipment and currency fluctuations. This demonstrates how efficiency changes in tandem with currency fluctuations. Furthermore, a significant and positively associated association ( $.601$ ) exists between the effectiveness of medical

equipment supply chain management and transportation management, which is statistically significant at a p-value of (0.000). Aside from this, there was a moderately favorable connection (.347) between the medical equipment supply chain management and warehousing efficiency.

Generally, all variables were correlated positively with efficiency, even though their correlation strength varies from highly correlated (procurement) to medium correlation (warehouse) as shown in Table 4.7.

Table 4. 7 Correlation Matrix between Variables

		Procurement	Warehouse	Transportation	Currency	Efficiency
Procurement	Pearson Correlation	1	.476**	.560**	.325**	.757**
	Sig. (2-tailed)		.000	.000	.010	.000
	N	62	62	62	62	62
Warehouse	Pearson Correlation	.476**	1	.071	.094	.347**
	Sig. (2-tailed)	.000		.585	.465	.006
	N	62	62	62	62	62
Transportation	Pearson Correlation	.560**	.071	1	.326**	.601**
	Sig. (2-tailed)	.000	.585		.010	.000
	N	62	62	62	62	62
Currency	Pearson Correlation	.325**	.094	.326**	1	.663**
	Sig. (2-tailed)	.010	.465	.010		.000
	N	62	62	62	62	62
Efficiency	Pearson Correlation	.757**	.347**	.601**	.663**	1
	Sig. (2-tailed)	.000	.006	.000	.000	
	N	62	62	62	62	62

\*\* . Correlation is significant at the 0.01 level (2-tailed).

*Source: researcher's own compilation of survey data 2024*

The table shows the Pearson correlation coefficients between five variables: Procurement, Warehouse, Transportation, Currency, and Efficiency. The values range from 0.071 to 0.757, with the strongest correlations being between Procurement and Efficiency (0.757) and Currency and Efficiency (0.663).

- Procurement and Efficiency: The strong correlation between Procurement and Efficiency suggests that companies that are more efficient in their procurement processes are also more efficient overall. This is likely because efficient procurement processes can lead to lower costs, improved quality, and reduced lead times.
- Warehouse and Efficiency: The moderate correlation between Warehouse and Efficiency suggests that companies that have efficient warehouses are also more efficient overall. This is likely because efficient warehouses can lead to reduced inventory costs, improved order fulfillment rates, and reduced shipping costs.
- Transportation and Efficiency: The moderate correlation between Transportation and Efficiency suggests that companies that have efficient transportation systems are also more efficient overall. This is likely because efficient transportation systems can lead to reduced shipping costs, improved delivery times, and reduced inventory levels.
- Currency and Efficiency: The strong correlation between Currency and Efficiency suggests that companies that are able to manage their currency exposure effectively are also more efficient overall. This is likely because currency fluctuations can have a significant impact on a company's costs and profitability.
- Procurement and Warehouse: The moderate correlation between Procurement and Warehouse suggests that companies that have efficient procurement processes also have efficient warehouses. This is likely because efficient procurement processes can lead to improved inventory management, which can in turn lead to a more efficient warehouse.
- Procurement and Transportation: The moderate correlation between Procurement and Transportation suggests that companies that have efficient procurement processes also have efficient transportation systems. This is likely because efficient procurement processes can lead to reduced shipping costs, which can in turn lead to a more efficient transportation system.
- Warehouse and Transportation: The weak correlation between Warehouse and Transportation suggests that there is no strong relationship between the efficiency of a company's warehouse and the efficiency of its transportation system. This is likely because many other factors can affect the efficiency of a transportation system, such as the location of the company's suppliers and customers, the type of products being shipped, and the transportation infrastructure in the area.
- Currency and Warehouse: The weak correlation between Currency and Warehouse suggests that there is no strong relationship between a company's ability to manage its currency exposure and

the efficiency of its warehouse. This is likely because there are many other factors that can affect the efficiency of a warehouse, such as the location of the warehouse, the type of products being stored, and the warehouse management system.

- **Currency and Transportation:** The weak correlation between Currency and Transportation suggests that there is no strong relationship between a company's ability to manage its currency exposure and the efficiency of its transportation system. This is likely because there are many other factors that can affect the efficiency of a transportation system, such as the location of the company's suppliers and customers, the type of products being shipped, and the transportation infrastructure in the area.

The above correlations suggest that there are strong relationships among these five variables. It's crucial to remember that correlation does not equate to causation. For instance, even if procurement and efficiency have a strong link, this does not guarantee that streamlining the purchase process would increase total efficiency. It is plausible that an additional component is contributing to the enhancement of procurement procedures and increased productivity. Because currency and efficiency have a strong association, it stands to reason that businesses with good currency exposure management are also generally more efficient. This implies that businesses have to concentrate on creating plans to control their exposure to currency fluctuations, including hedging or using forward contracts.

Overall, the table provides evidence of strong relationships between these five variables. However, further research is needed to determine the causal relationships between these variables.

### **4.8.3 Regression Analysis**

#### **4.8.3.1 Multiple Regression Analysis of medical equipment supply chain management**

According to Cohen et al. (2011), a few presumptions must be valid for the regression model to have a strong fit. The data for this investigation, as previously said, satisfied the following assumptions: The measurements come from a probability-based sample, the data are gathered using an interval-based Likert scale, there are no extreme outliers, the dependent variable and the independent variables have an approximate linear relationship, the dependent variable is roughly normally distributed, and the data values are independent of one another; multicollinearity does not exist between the variables.

Regression analysis was conducted to know by how much the independent variable describes the dependent variable and to assess the significance of each variable. The total effectiveness of the supply chain management for medical equipment was the dependent variable, while the independent variables were currency, transportation, warehousing, and procurement. A typical multiple regression was run between these variables.

As stated clearly in the methodology part, the regression equation utilized the following form.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where,

Y = Efficiency (EFF);  $\beta_0$  = constant term;  $\beta_1, \beta_2, \beta_3, \beta_4$ , = estimated coefficients; X1 = Procurement (PRO); X2 = warehouse (WARE); X3 = Transportation (TRAN) X4= Currency (CUR)

The constant term in the model is represented by  $\beta_0$ , and the coefficients serve as an indicator for how sensitive the dependent variable (Y) is to a unit change in the predictor variables. The error term, represented by  $\varepsilon$ , incorporates the unexplained fluctuations within the model. Thus, to ascertain the distinct contribution of each dimension of the independent variable to the dependent variable in this particular study, the multiple linear regression approach was applied.

Three separate panels constitute the regression result's SPSS output. The top sub-table (Table 4.8) describes the regression model, while the center sub-table (Table 4.9), which covers ANOVA, displays the overall significance. Furthermore, Table 4.10) provides information on each regression coefficient. The results are illustrated in the following tables.

Table 4. 8 model summary: independent variables as predictors to efficiency of global medical equipment supply chain management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.888 <sup>a</sup>	.789	.774	.2719887	2.346
a. Predictors: (Constant), Currency, Warehouse, Transportation, Procurement					
b. Dependent Variable: Efficient medical equipment supplies chain management					

*Source: researcher's own compilation of survey data 2024*

Table 4. 9 ANOVA: independent variables as predictors to efficiency of medical equipment supply chain management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.768	4	3.942	53.288	.000 <sup>b</sup>
	Residual	4.217	57	.074		
	Total	19.985	61			
a. Dependent Variable: Efficient medical equipment supplies chain management						
b. Predictors: (Constant), Currency, Warehouse, Transportation, Procurement						

*Source: researcher's own compilation of survey data 2024*

As indicated above in both Tables 4.8 and 4.9 the fit of the regression model can be evaluated by two things: the Model Summary table and ANOVA table. The model summary table provides the R, R<sup>2</sup>, adjusted R<sup>2</sup>, and the standard error of the estimate, which can help in determining how successful the model is in predicting the outcome (Cohen et al., 2011). R can be considered as one measure of the accuracy of the prediction of the dependent variable relationship of the independent variables. But when applied to real-world scenarios, R square tends to overestimate the model's effectiveness. For this reason, an adjusted R square value is computed, accounting for the number of variables in the model as well as the number of observations the model is based on. The most helpful indicator of the model's performance is the adjusted R square value. The adjusted R square is high (0.774), meaning that the independent factors account for a high 77.5% of the variation in the dependent variable. As Cohen et al (2011) highlight, there is high fit for the model.

The regression model has a sum of squares of 15.768, with 4 degrees of freedom and a mean square of 3.942. The residual error has a sum of squares of 4.217, with 57 degrees of freedom and a mean square of 0.074. The F-statistic is 53.288, which is the ratio of the mean square for the regression model to the mean square for the residual error. The F-statistic has 4 and 57 degrees of freedom. The significance level for the F-statistic is 0.000, which means that the F-statistic is statistically significant at the 0.000 level.

The four independent variables account for 78.9% of the variation in the efficient medical equipment supply chain management, as indicated by the R-squared value of 0.789. The adjusted value of R-squared is 0.774, that takes into consideration the number of independent variables in the model and is a less optimistic estimate of the model's predictive power. The average difference

between the values of the Efficient medical equipment supplies chain management and the values anticipated by the model is measured by the standard error of the estimate, which is 0.2719887. The residuals' autocorrelation is measured using the Durbin-Watson statistic, which comes out at 2.346. A Durbin-Watson statistic close to 2 indicates that there is no autocorrelation in the residuals, which is an acceptable mark. Overall, the results of the regression analysis suggest that the four independent variables are good predictors of Efficient medical equipment supplies chain management. The model explains a large proportion of the variation in the dependent variable, and there is no evidence of autocorrelation in the residuals.

In line with the preceding table, the F ratio is 53.288 and the analysis of variance is highly statistically significant (0.000) at the 5% level of significance, indicating a strong link between the independent and dependent variables. To sum up and based on the previously mentioned findings, the Model Summary table and ANOVA table provide a statistically significant overall fit of the data and demonstrate how the model improves our ability to predict the dependent variable. To forecast efficient medical equipment, supply chain management, the four independent factors are jointly significant, according to the ANOVA findings. This indicates that the four independent variables help predict the dependent variable and that the model fits the data well.

Table 4. 10 Independent variables as predictors of efficiency of medical equipment supply chain management

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.040	.312		-.127	.899		
Procurement	.467	.085	.481	5.479	.000	.481	2.079
Warehouse	.073	.082	.063	.883	.381	.717	1.395
Transportation	.093	.039	.184	2.379	.021	.619	1.616
Currency	.300	.045	.441	6.738	.000	.864	1.158

a. Dependent Variable: Efficient medical equipment supplies chain management

*Source: researcher's own compilation of survey data 2024*

In a multiple regression analysis, the coefficients of the independent variables in the model of regression are represented by unstandardized coefficients, that, keeping all other independent

variables constant, show how the dependent variable changes for every unit change in the relevant independent variable. Standardized coefficients are the values of the coefficients of the independent variables in the standardized the regression model equation, in which all independent variables have a mean of 0 and a standard deviation of 1. Regardless of the units of measurement, these coefficients enable comparison of the relative importance of various independent variables. The unstandardized coefficient is divided by its standard error to get the t-statistics. A significant t-statistic ( $p$ -value  $< 0.05$ ) suggests that the independent variable has a statistically significant impact on the dependent variable, supporting the null hypothesis that the coefficient is equal to 0. Collinearity statistics quantify the strength of the relationship between independent variables. variation inflation factor (VIF) is the inverse of tolerance, which is the amount of variation in an independent variable that cannot be explained by the other independent variables. The quality and stability of the regression model may be impacted by an independent variable's high VIF, which denotes a high degree of correlation with other independent variables.

According to Table 4.10, there is a statistically significant correlation between procurement and the effectiveness of supply chain management for medical equipment ( $t = 5.479$ ,  $p = 0.000 < 0.05$ ). In SPSS, the unstandardized regression coefficient, often known as the slope ( $\beta_1$ ), is 0.481 and is shown as the second line below  $\beta$ . This shows that, whereas all other factors remain constant, the efficiency of the outcome variable increases by 0.481 units for every unit increase in procurement. In another manner, a 0.481-unit increase in the effectiveness of the supply chain management for medical equipment is linked to every unit improvement in procurement methods.

When we see the impact of currency fluctuation with the effectiveness of medical equipment supply chain management as described in the model above demonstrated the presence of a positive and significant relationship among currency fluctuation and efficiency ( $t = 6.738$ ,  $p = 0.005 < 0.05$ ). It demonstrates that the effectiveness of private enterprises' supply chains for medical equipment and currency fluctuations are statistically significantly correlated. Furthermore, the slope ( $\beta_1$ ) = 0.441 shows that the efficiency of public hospitals' medical equipment supply chain management rises by 0.441 units for every unit increase in currency fluctuation.

According to Table 4.10, there was a significant effect of the transportation system on the effectiveness of the supply chain management for medical equipment ( $t = 2.379$ ,  $p = 0.000 < 0.05$ ). Furthermore, the slope ( $\beta_1$ ) = 0.184 shows that the efficiency of a private company's supply

chain management for medical equipment rises by.184 units for every unit that transportation management increases. According to Table 4.10, there was a substantial impact of warehouse management on the effectiveness of supply chain management for medical equipment in private enterprises ( $t=0.883$ ,  $p = 0.000 > 0.05$ ).

The effectiveness of a medical equipment supply chain is impacted by four major variables: procurement, currency, transportation, and warehouse management. It is possible to improve the supply chain's overall effectiveness by improving these procedures. In another context, the supply chain as a whole will become more efficient if procurement procedures are strengthened, currency fluctuations are efficiently controlled, transportation is effective, and warehouse management is maximized. This may result in lower expenses, better quality, and more satisfied clients.

All four independent variables (Procurement, Warehouse, Transportation, and Currency) demonstrate statistically significant coefficients at the 0.05 level, as the table above demonstrates. This indicates that there is no indication of collinearity among the independent factors and that all four of the independent variables help predict the chain management of efficient medical equipment supply.

## CHAPTER FIVE

### 5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Summary of Findings

The main objective of the study was to analyze the practices and challenges of the Global medical equipment supply chain management within a private company. Structured surveys and interviews were used in an explanatory research framework that combined quantitative and qualitative methodologies. The company studied its medical equipment procurement, currency handling, transportation, and warehouse management procedures to determine how well these operations affected the effectiveness of the medical equipment supply chain management. A total of 62 participants completed and returned the survey questionnaire, resulting in a response rate of approximately 94%. Among these respondents, the majority, 34 individuals, who completed the questionnaires were male, representing 54.8%, while the remaining 28 respondents were female, accounting for 45.2%. The analysis of procurement practices revealed that a majority of the respondents expressed disagreement (composite mean 3.21) regarding the adequacy of procurement practices within their respective organizations. Subsequent analysis indicated a significant impact of procurement practices on the efficiency of medical equipment supply chain management ( $t = 5.479$ ,  $p = 0.000 < 0.05$ ).

The composite mean value for assessment queries related to transportation management and warehouse management is 3.41 and 3.71, respectively. These figures indicate that a majority of the participants express disagreement towards the quality of transportation practices and warehouse management systems. Findings derived from the correlation analysis revealed that transportation management exhibits statistical significance at a p-value of 0.000, showcasing a strong positive correlation. Furthermore, the correlation between the efficiency of medical equipment supply chain management and warehouse management is moderate and positive at 0.451. When considering the challenges faced in implementing supply chain management practices, issues such as the absence of advanced software technologies and political influences, such as outdated policies, have a significant impact. Analysis of the predictive potential of the variables towards the dependent variable indicates that procurement practices, currency management practices, and warehouse storage management practices have statistically significant beta values, implying their

individual effects on the dependent variable. Challenges like insufficient funds for purchasing medical equipment can hurt transportation, warehousing operations, and procurement. Moreover, the worldwide medical equipment supply chain management system is inefficient as a result of senior management's lack of focus on warehouse management, transportation, inventory, and procurement.

Top management gives limited attention to the areas of procurement, inventory, transportation, and warehouse management, resulting in inefficiencies in the management of the global medical equipment supply chain. The mean composite score for evaluation queries related to transportation management and warehouse management stands at 3.41 and 3.71, respectively. These outcomes suggest that a majority of participants do not endorse the effectiveness of transportation practices and warehouse management systems. Results obtained from the correlation analysis indicate that transportation management demonstrates statistical significance with a p-value of 0.000, indicating a robust positive correlation. Furthermore, a moderate positive correlation of 0.451 exists between the efficiency of medical equipment supply chain management and warehouse practices. Challenges encountered in supply chain management practices arise from various issues, including inadequate software technologies and political factors like outdated policies, both of which have notable ramifications. The evaluation of the dependent variables' predictive power indicates that the management of procurement, currency, and warehouse storage all exhibit statistically significant beta values, indicating that each dimension affects the dependent variable. Challenges including inadequate funding allotted for the purchase of medical equipment result in adverse effects for the supply chain's transportation, warehouse operations, and procurement departments. Procurement, inventory, transportation, and warehouse management components receive less attention from senior management, which worsens the inefficiencies in the global medical equipment supply chain management.

The strength of influence is highest in the case of currency management practice and procurement practices relative to the influence, transportation practices and warehouse storage management practices have on the supply chain management performance of the EZM Trade and Investment.

The results indicate that there is a high cost associated with medical equipment supply chain management, a limited variety and amount of medical equipment, and low quality medical equipment, as indicated by the composite mean value assessing the efficiency of the medical

equipment supply chain management. This suggests that there's inadequate medical equipment supply chain management, which has been brought on by improper purchasing, low currency, transportation, and medical equipment warehouse management. The comprehensive research demonstrates that every variable has a major impact on the effectiveness of the supply chain management for medical equipment.

While every issue discussed previously has an impact on whether GSCM practices perform well or not, this does not imply that every issue has an equal impact on SCM performance. A Likert question with a five-scale was used to evaluate this investigation. Ratings were therefore calculated into a mean score, from which a challenge level was determined and classified. All of the challenges for market authorization procurement, transportation, storage and warehousing, and fluctuating exchange rates were found to have scores above the mean and, depending on their mean scores, are regarded as major challenges, as detailed in the descriptive analysis section of this paper.

The results demonstrated that procurement, currency, transportation, and warehouse management methods had a significant impact on the effectiveness of medical equipment supply chain management in EZM Trade and Investment. It was constrained, still to evaluating the difficulties associated with managing the global supply chain for medical devices. Further research is necessary for further generalization because the study was only done in one of the firms participating in global medical device supply chain management practice, making it impossible for the findings to be typical of other companies.

## **5.2 Conclusions**

The medical equipment procurement practice in private companies is not based on appropriate forecasting and is not processed by procurement plan. The relationship between the dimensions of supply chain management practice and supply chain management performance has revealed that all of the dimensions of supply chain management practice have statically significant positive relationships with supply chain management performance. It has also revealed that, though all of the dimensions of supply chain management practices have a statistically significant positive relationship with global supply chain management performance,

Annual forecasting is conducted based on the specifications and item list of the primary governmental supplier PFSA, however, the procurement does not align with the forecasted items.

The agency utilizes the projected data as input for procurement rather than a formal request for procurement, resulting in delays in the request and delivery of medical equipment. Typically, procurement of medical equipment occurs either when the current equipment malfunctions or when new services are introduced. The lack of sufficient and standardized storage facilities poses a significant challenge for the management of the medical equipment supply chain within the organization. Furthermore, many respondents indicated a lack of storage maintenance equipment and irregular functionality checks, exacerbating the issue. This situation is further compounded by the absence of a standardized operating procedure for storage management.

Regarding the difficulties encountered in the supply chain management of medical equipment, almost all respondents (mean score of 4.04) agreed that poor management assistance adversely influences the acquisition, valuation, shipping, and storage of medical equipment. Procurement and currency are more severely impacted by technological deficiencies than transportation and warehouse management. Furthermore, procurement (with mean values of 4.05) is more affected by outdated government regulations than other supply chain components like currency, warehousing, and transportation.

The outcomes of medical equipment purchases made without appropriate forecasting which, in most cases, prevents service interruptions during emergencies as well as the absence of appropriate policies that integrate quality considerations. price indicating that the supply chain is wasteful due to a lack of sufficient types and quantities of equipment, despite the high total cost of the transaction. The results of the correlation study showed that all factors, along with varying degrees of correlation from highly correlated (procurement) to medium correlated (transportation), were positively connected with the effectiveness of the supply chain management for medical equipment.

Developing policies, directives, and strategies for the proper use of medical device at the national level, and strengthening private companies with an electronic-based medical device management information system, involving Biomedical Engineering professionals at all levels, including medical device planning, procurement, currency management, and usage must improve the functionality of the medical device and ultimately to improve the service delivery in health care facilities. Each private company should establish a strong planning system and sufficient budgeting for the procurement and management of the medical device.

According to the findings the overall effects of model summary about Analysis of medical equipment supply chain management showed that 88.8 % of the variance in efficiency of medical equipment supply chain was explained by the variance of explanatory variables, while the rest 17.2 % was contributed by other factors that were not included in the model.

In general, EZM Trade and Investment, as one of the distributors of the leading pharmaceutical and medical equipment in Ethiopia, faced multiple challenges when sourcing medical equipment from global suppliers. Supply uncertainty, finding qualified supplier, shortage of forex and fluctuation exchange rate, long lead-time to receive orders, pharmaceuticals regulatory laws and unstable political environment were found to be the major challenges whereas, transportation and warehouse practices were regarded as minor challenges facing this company. These challenges negatively affect its relationship with suppliers and downstream customers. Concerned government bodies including; the ministry of health, ministry of trade and finance, Ethiopian food and drug administration, the national bank of Ethiopia and Ethiopian shipping agency should play their pivotal role to sustain global medical equipment supply chain management in the country.

### **5.3 Recommendations**

The study's conclusions focus on flaws in the global supply chain management of medical equipment, which have a detrimental effect on patient satisfaction and the provision of healthcare services. The absence of an accurate list of medical equipment in the businesses under investigation is one of the main problems found. Patient treatment may be compromised as a result of variations in the kinds and caliber of medical equipment that are accessible. The report suggests working with the health ministry and EZM to create and implement a uniform national medical equipment list to address this problem. To guarantee consistency and quality in the medical equipment that private enterprises purchase, this list ought to be sent to them. Healthcare practitioners may more effectively plan and manage their equipment needs by creating a standardized medical equipment list, ensuring that patients have access to the right treatment.

The study also shows that the nation does not follow international standards when it comes to the purchase of medical equipment and other health-related goods. Private companies and the health ministry ought to collaborate together to develop a specific procurement policy for medical supplies in order to solve this. Improvements should also be made to the transportation networks, warehousing practices, currency management, and procurement rules.

To ensure compliance to legal requirements, all storage equipment must go through routine maintenance inspections and calibrations. To improve supply chain management, companies must regularly update and closely follow EFDA recommendations and Standard Operating Procedures (SOPs). EFDA should mandate private enterprises to have specialized supply chain management teams.

To handle each aspect of purchasing medical equipment, managing money, running warehouses, and shipping, companies need to form expert's divisions. Accurate forecasting and planning should serve as the foundation for procurement processes, and standard operating procedures for medical equipment acceptance should be created. Keeping a safety supply of medical supplies on hand is crucial to avoiding service interruptions brought on by malfunctioning equipment.

It is recommended that private enterprises keep an exhaustive comprehensive list of all medical equipment in their control and service regions, working along with biomedical experts to incorporate details about the equipment's state. It is essential to update this list on a frequent basis, particularly during yearly inventories. To guarantee the delivery of critical life-saving services, health facility management teams must give priority to the purchase of medical equipment, currency management, transportation, and warehousing operations.

The development of software for managing the supply chain from procurement to service delivery units is encouraged for everyone involved in the medical equipment supply chain. This program should provide typical healthcare and supply information together with characteristics that show the condition of the equipment and its expected lifespan.

The involvement of multidisciplinary teams in procurement, currency management, and other aspects of the supply chain management for medical equipment should be strengthened by private companies and relevant institutions. Private companies will collaborate with academic institutions and other partners to set up medical equipment repair training programs. The curriculum and/or quality of education provided to biomedical engineers should be revised by the Ministry of Education to incorporate more practical components than they now do. Nurses and other healthcare professionals must have sufficient training before using medical equipment.

Interviewees expressed that they believe the government's decision to exclude private companies from taxes was a good one. Nonetheless, importers have faced significant difficulties due to the

lack of foreign exchange throughout the last two years, which has resulted in shortages of vital healthcare equipment. The government is in charge of dealing with cash scarcity and giving importers of essential medical equipment priority when it comes to receiving foreign exchange. This would guarantee that there are enough of these necessary resources to suit everyone's demands. By obtaining supplies directly through their London headquarters, certain government-run health clinics in Ethiopia, including Marie Stopes International Ethiopia, have been able to lessen the effects of the money crisis. This approach has allowed them to maintain a steady supply of vital medical devices, even when local importers have faced stockouts. Other healthcare providers (Like EZM Trade and Investment) may consider adopting similar strategies to ensure the availability of essential medical supplies for their patients.

#### **5.4 Suggesting for Further Research**

This study may not capture the whole picture. While the background research acknowledges many factors affecting medical equipment supply chains, many factors affect medical equipment supply chain management. However, the current study has used only four independent variables into account. " Based on the findings, the statistical model developed in this study only explains 88.8% of the variation in efficiency, leaving 11.2% unexplained. Future research should address this limitation by considering additional factors that may affect the efficiency of medical equipment supply chain management. It is also important to replicate this study in different types of private companies to determine if the findings are consistent across different contexts. Another limitation of this study is that it does not fully explore the remaining supply chain challenges that may affect global supply chain management practices. Future studies should incorporate other internal and external factors into their analysis to gain a more comprehensive understanding of how these factors impact global supply chain management practices and operational performance.

Finally, the conceptual framework developed in this study requires further testing, as this study was limited to a single private company. Future researchers can build on this framework by conducting more rigorous research that overcomes the limitations of this study.

In addition to these limitations, the researcher also identifies several areas for further research and intervention. First, the study's findings suggest that there is a gap in the appropriate utilization of

medical equipment. Future studies should investigate the practical advantages and disadvantages of relying primarily on global suppliers for medical equipment procurement in Ethiopia.

Overall, this study provides a valuable foundation for future research on the efficiency of medical equipment supply chain management. By addressing the limitations and exploring the areas for further research and intervention identified in this study, future researchers can contribute to a more comprehensive understanding of this important topic.

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## **Annex: Respondents Survey**

### **A. Questionnaire's**

**College of Business and Economics**

**School of Commerce**

**Master of Art in Logistics and Supply Chain Management**

**Questionnaire to be filled by respondents**

**A Study of Challenges Facing Global Medical Equipment Supply Chain Management: The Case of EZM Trade and Investment, Addis Ababa, Ethiopia.**

Dear Respondent;

*Thank you for agreeing to fill out this questionnaire. The study is being conducted by a student of Addis Ababa University Zewdalem Melesse to gather information about the Challenges Facing Global Medical Equipment Supply Chain Management: The Case of EZM Trade and Investment, Addis Ababa, Ethiopia.*

The questionnaire will take 10-15 minutes of your time. Your participation is voluntary and information given will be treated with at most confidentiality and for academic research only. So, your genuine, frank, and timely response is vital for successfulness of the study. Thank you for taking the time to share the insight with me.

#### **General Instructions**

- There is no need to write your name
- Where answer options are available, please tick (✓) in the appropriate box for both part I and part II.
- For comments/questions please contact Zewdalem Melesse (0 91 246 2330), [zedamele@gmail.com](mailto:zedamele@gmail.com)

***Thank you for sacrificing your precious time in advance!***

## **PART I: Demographic Information**

### 1. Gender

Male  Female

### 2. Age

18-25  26-30  31-35  36-45  >45

### 3. Educational Qualification:

Collage diploma  First Degree  Second Degree and above

### 4. Job title

Procurement regulatory affairs  Suppliers' representative

Business development & marketing mgt  others

### 5. Experience at the organization:

Under 3 years  3-6 years  6-10 years  over 10 years

## **Part II: Instruments for supply chain management practices and supply chain performance of private medical equipment supply company (EZM Trade and Investment).**

### **A. Procurement Practice.**

#### 1. Medical equipment requested and delivered timely

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

#### 2. The company has good working relation with suppliers

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

#### 3. There is classification of medical equipment for procurement

strongly disagree  Disagree  Neutral  agree  Strongly agree

#### 4. Procurement is being processed based on procurement plan

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

#### 5. There is appropriate forecasting & follow up to procure efficiently and effectively

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

### **B. Warehouse management**

#### 1. Appropriate storage space is available within the company

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

2. Storage equipment are Fully functional.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

3. Storage equipment are regularly checked for compliance.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

4. Existing SOPs that are followed to ensure proper storage.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

### **C. Transportation management**

1. There are enough Vehicles for transportation of medical equipment

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

2. Delivery is done within recommended timeline.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

3. Safety of medical equipment is protected as required during transportation

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

4. Transportation and distribution Practices of medical equipment are satisfactory

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

### **D. Fluctuation of Currency Exchange Rate**

1. There is a scarcity of foreign exchange which affects the company's Supply chain management practice.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

2. The is a replacement of supplier because of the changes in exchange rates and price fluctuation?

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

3. There is supply delay due to lack of foreign exchange permit

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

### **E. Challenges of medical equipment supply chain management**

On a Scale of 1-5 where 5= Strongly Agree, 4 = Agree, 3 = Not Sure, 2 = Disagree and 1 = strongly Disagree, please indicate your level of agreement with the following statements relating to the challenges of implementing Effective and Efficient Medical Equipment Supply Chain Management Practice in five parameters of your company.

S.no	Challenges	Procurement practice					Warehouse and storage practice					Transportation practice				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
		S	D	N	A	S	S	D	N	A	S	S	D	N	A	S
1	Lack of qualified suppliers when doing global sourcing.															
2	Lack of technologies like different SCM software in your company.															
3	Lack of appropriate use of updated policies and Guidelines.															

4	Lack of enough budget/ funds for foreign currency in your company																		
5	There is little support from top management for improving																		

“Thank you for your cooperation”

## **B Interview**

**College of Business and Economics**

**School of Commerce**

**Master of Art in Logistics and Supply Chain Management**

**Questionnaire to be filled by respondents**

**A Study of Challenges Facing Global Medical Equipment Supply Chain Management: The Case of EZM Trade and Investment, Addis Ababa, Ethiopia.**

### **Part III: Interview**

Interview questions for company Heads and Company Administrators

1. What is the highest priority when you select a foreign supplier?
2. How do you manage the total cost of medical equipment supply chain management?
3. What type of mechanisms are you using for forecasting & follow-up in currency fluctuation?
4. What strategies should be implemented to improve supply chain management practices in the private medical equipment supply company?
5. In what other ways your company is performing to improve the SCM operation performances (Quality, delivery time, and product mix to satisfy customers' needs)?
6. Other challenges that will affect the SCM practices of medical device company?

“Thank you for your cooperation”