HEALTHCARE LOGISTICS MANAGEMENT PRACTICES AND THEIR CHALLENGES FOR NON-PROGRAM DRUGS: THE CASE OF ADDIS ABABA CITY ADMINISTRATION HEALTH BUREAU HOSPITALS

BY

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DECLARATION

I, Eden Habte, hereby declare that this study on “Healthcare logistics management practices and their challenges for non-program drugs in hospitals under Addis Ababa City Administration Health Bureau” is my original work. It has not been submitted to any other university and all sources used in the study are properly cited.

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ABSTRACT

Essential medicines should always be available in a sufficient quantity for the functioning of a healthcare system. The pharmaceutical logistics system is accepted and guaranteed if both programs and non-program drugs (NPDs) are managed accordingly. The management of all logistics practices within health facilities is necessary for NPDs to perform pharmaceutical logistics effectively. The objective of this study was to assess the healthcare logistics management practices of NPDs and to identify their main challenges. The research was carried out in hospitals under Addis Ababa City Administration Health Bureau from June 2 to July 20, 2023. A combination of qualitative and quantitative approaches were used to conduct both explanatory and descriptive cross-sectional research design. Data were gathered using structured questionnaires, in-depth interviews, and observational checklists. Analysis was performed by using SPSS version 21. The results of descriptive analysis demonstrated that the majority of the respondents disagreed for having good quantification/forecasting, procurement, LMIS, and storage condition practices, whereas the majority of the respondents agreed for having good inventory management practices; this imply that healthcare logistics management practices of NPDs is not being practiced well in the facilities . The findings of inferential analysis showed that 51.8 % variance in healthcare logistics management practices is explained by the human resource, financial resource and infrastructure and information technology challenges, while the rest 48.2% of the variance is explained by other challenges which are not covered by this study. Healthcare logistics management practice is strongly correlated with infrastructure and information technology challenges with a Pearson correlation coefficient and a significant value of (r=0.555, P=0.000) and moderately correlated with financial resource challenges (r=0.467, P=0.000) and human resource challenges (r=0.422, P=0.000). Therefore, hospitals under Addis Ababa City Administration Health Bureau should improve the healthcare logistics management practices of NPDs in order to prevent stock outs by preventing quantification/forecasting errors due to poor logistics data quality, since information is the back bone for all healthcare logistics activities and also the storage rooms of the facilities should be standardized.

Key words: Essential medicines, pharmaceuticals, non-program drugs (NPDs), Logistics management information system (LMIS), healthcare, logistics

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LIST OF ACRONYMS

AACA	Addis Ababa City Administration
AACAHB	Addis Ababa City Administration Health Bureau
AACAHBHs	Addis Ababa City Administration Health Bureau Hospitals
DACA	Drug Administration and Control Authority
DAGU	Electronic Health Commodity Management System
DTC	Drug and Therapeutics Committee
EPSA	Ethiopian Pharmaceutical Supply Agency
EPSS	Ethiopian Pharmaceuticals Supply Service
ED	Essential Drug
EDL	Essential Drug List
FDRE	Federal Democratic Republic of Ethiopia
EFY	Ethiopian Financial Year
FMHACA	Food, Medicines and Healthcare Administration and Control Authority
FMOH	Federal Ministry of Health
HCLMS	Health Care Logistics Management System
HPR	House of Peoples' Representatives
HSDP	Health Sector Development Plan
IFRR	Internal Facility Report and Resupply Form
IPLS	Integrated Pharmaceutical Logistics System
LMIS	Logistics Management Information System
MOH	Ministry of Health
NPDs	Non-Program Drugs
PFSA	Pharmaceutical Fund and Supply Agency
PLMP	Pharmaceutical Logistic Master Plan
RDF	Revolving Drug Fund
RRF	Report and Requisition Form
SOP	Standard Operating Procedure
VEN	Vital-Essential-Non-Essential
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

This chapter covered the study's background, which starts by describing healthcare logistics management, statement of the problem, research questions, general and specific study objectives, the study's significance and scope, definition of terms and general framework of the study.

1.1. Background of the study

A healthcare system is an organization of people, institutions, and resources that delivers healthcare services, prevention, diagnosis, and treatment of health-related issues or impairments in human beings by health professionals (IGI global, 2009).

In the world, there are different healthcare systems, each with a unique organizational structure and history. Despite the fact that primary healthcare and public health initiatives are common to almost all health systems, nations are implicitly required to create and develop health systems in line with their requirements and resources. The functioning of every healthcare system functioning depends on medicines (White, 2015).

Safe, effective and affordable pharmaceuticals of the necessary quality, in sufficient quantities, and at an acceptable price must always be available to deliver comprehensive health care (PFSA, 2017). That is why, within a decade of the first modern medications became accessible, efforts have been made to ensure the availability of medicines (MSH, 2011). Without the availability of essential medications, modern healthcare is impossible. Essential medicines not only save lives and promote health, they also help in stopping outbreaks and diseases. As declared by Alma-Ata in 1978, “the availability and accessibility of essential medicines is a basic component of primary health care” (WHO,1978).

Essential medicines are those that satisfy the priority health care needs of the population. They are chosen with consideration of public health relevance, evidence on safety, efficacy, quality and comparative cost-effectiveness. They should always be available for the functioning of a healthcare system in a sufficient quantity, with the proper dosage, and of guaranteed quality (WHO, 1978).

Healthcare in Ethiopia is provided by the public and private sectors. Most importantly, the Ministry of Health (MOH) exercises the overall oversight control for the whole system, as well as policy formulation, and monitoring and evaluation of progress in achieving set targets. Under the public health system, the Ethiopian Health Service (EHS) and teaching hospitals basically undertake the service delivery. And they constitute the bulk of the Ministry of Health institutions. Moreover, other bodies are also involved in health service delivery. Throughout the past three decades, Ethiopia's health services have improved; according to Ethiopian Demographic and Health Survey (EDHS), the maternal mortality rate (MMR) decreased from 871 in 2000 to 401 in 2017 per 100,000 live births, a 54% decrease. In a similar manner, infant and under-five mortality decreased from 97 to 47 in 2019 and from 166 to 59 in 2000, respectively. Neonatal mortality has also decreased, going from 49 in 2000 to 29 in 2016. Yet in 2019, it increased from 29 to 33 (MOH, 2020).

The core of healthcare delivery is supply chain management which is the result of the reliance of patient management on the timely and appropriate provision of medications, reagents and other medical supplies. “A supply chain in healthcare can be defined as the sequence of physical and technical resources required in order to deliver a good service to patients with complete satisfaction in a cost-optimized manner” (Arora and Gigras, 2018).

As defined by the Council of Supply Chain Management Professionals (CSCMP): “Logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements”. Planning, implementing, and controlling the efficient, effective forwards and reverse flow of goods, services, and related information between the point of origin and the site of consumption in order to meet customer demand is known as logistics management (Vitasek, 2013).

In healthcare the term “Logistics” refers to a set of techniques, methodologies, tools and infrastructure used in the management of the physical flows of pharmaceuticals (medicines, medical supply, equipment’s and reagents) and associated information from the acquisition in the market to the distribution to wards (Pinna, Carrus and Marras, 2015). Utilizing material resources that are necessary for the effectiveness, quality, and cost-efficiency of health activities within programs and structures (while maintaining acceptable levels of safety and security) is the function of health logistics. “The six rights - the right goods in the right quantities and in the right condition delivered to the right place at the right time at the right cost are typically supported by pharmaceutical logistics systems, which typically include a number of activities such as selection, forecasting, procurement, inventory management, and serving customers” (USAID | DELIVER, 2009). It involves keeping records and generating reports that receive, evaluate, and firm ensures from every level of the logistics system so that decisions about logistics and supply chain management can be made

As part of the implementation of the Pharmaceutical Logistic Master Plan, the Pharmaceuticals Fund and Supply Agency (PFSA), formerly known as the Pharmaceuticals Sup-

ply Agency (PSA), was founded in Ethiopia in 2007 as a semi-autonomous public institution. Its establishment was mandated by Proclamation No. 553/2007. The primary objectives of the PFSA include ensuring the availability of quality-assured and affordable medical supplies, supporting the growth and enhancement of health care services, and facilitating a reliable supply of pharmaceuticals. Additionally, the PFSA aims to create favorable conditions for the efficient accumulation of pharmaceuticals (Negarit Gazeta, 2007).

EPSA provides two distinct catagories of essential drugs (EDs) according to the source of funding: program EDs, non-revolving drug fund, funded by non-governmental organizations (NGO) and donors, and non-program EDs, revolving drug fund, funded by the government or revolving drug fund. In general, the pharmaceutical logistics system is considered effecctive and reliable when both program and non-program medications are adequately managed (EPSA, 2018).

Non-program pharmaceuticals are pharmaceuticals which are purchased by revolving drug funds. “Revolving drug fund (RDF) is a sum of money (contributed by the government, donors, or the community) used to purchase an initial stock of essential and commonly used medicines to be sold, ideally at a price sufficient to replace the stock of medicines and ensure a continuous supply with a primary goal of maintaining steady pharmaceutical supply while serving as many people as possible” (MSH, 2012). Non-program pharmaceuticals are also called RDF pharmaceuticals or budget pharmaceuticals.

Researches’ on healthcare logistic management practices (HCLMPs) of non-program drugs (NPDs) at public health institutions are scarce in Ethiopia. Thus, the purpose of this research was to evaluate the healthcare logistic management practices of NPDs and to identify their challenges at public hospitals under Addis Ababa City Administration Health Bureau (AACAHB).

1.2. Statement of the problem

Health is universally regarded as a fundamental human right, yet many people around the world still do not have access to basic health care. Millions of Africans in particular are unable to access or afford the services they need to survive and thrive without incurring hardship (Moeti, 2015).

According to the global use of medicines report, medicines involve the second highest expenditure after staff costs in a country's health care system. The statistics of global spending on medicines showed that amount spent on medicine globally keeps increasing. The amount of money spent on medications increased from just 887 billion dollars in 2010 to roughly 1.42 trillion dollars in 2021. By 2026, this figure is projected to rise to around 1.8 trillion, increasing at a rate of 3–6% per year. This outlook is excluding the separate impact of spending on COVID-19 vaccines separately. All around the world, spending on pharmaceuticals has increased. Yet, the United States currently leads the world in overall medical spending and is anticipated to hold that position through 2026. The money spent on buying medicines by every government is very large and 40 to 60 percent of entire public sector health budget of any country goes into buying medicines (IQVIA, 2022). Countries in Latin America, Asia-Pacific, and Africa and the Middle East are expected to grow more than 10% by volume over the five years to 2027, while spending on pharmaceuticals will increase by over 30%, indicating both population-driven volume growth and a shift in the mix of products to more expensive products (IQVIA, 2023).

Volland et al. (2017) identified that hospitals account for 29% of total healthcare expenditure at national levels and that of all hospital costs, more than 30% are related to logistics activities. That is why optimizing hospital logistics and logistics in the entire

healthcare system is considered significant by the academic community and the real sector.

Many people continue to face a scarcity of medicines in the public sector, forcing them to the private sector where prices can be substantially higher. The greatest price is paid by patients suffering chronic diseases. Effective treatments for the majority of the global chronic disease burden exist, yet universal access remains out-of-reach (WHO, 2018).

Despite progress made by EPSA in recent years, challenges persist, including insufficient essential pharmaceuticals supply, inadequate storage conditions, and ineffective stock management, resulting in wastage and stock-outs. Thus, supply chain disruptions in public health facilities lead to frequent stock shortages, worsening of infections, and hinder the delivery of quality healthcare to patients. Inadequate pharmaceuticals stock and frequent stockouts of NPDs decrease the efficiency of pharmaceutical supply sytem (EPSA, 2018).

The management of information system, storage condition, EDs availability, pharmaceutical records and documentaion quality and accuracy including management of pharmaceutical wastages, which are included under helath facilities logistic activities, are vital for the effectiveness of pharmaceutical logistics of NPDs. Many of these require more comprehension on the part of management, healthcare workers, and the community. Even if the government provided undying support and a reasonable funding allocation to improve the pharmaceutical logistics management of NPDs, complaints about inadequate implementation of the pharmaceutical logistics system persist (Aklilu and Dereje, 2022).

Poor pharmaceutical logistics management practice interms of the inventory management, logistics system performance, storage condition management and the over all per-

formance of the logistics system were founded by a study done at federal hospitals of Addis Ababa (Tekleab, 2021).

Based on pilot interviews made with two pharmacy heads and one drug supply management officer (DSM) of two selected hospitals, the respondents stated that patients are suffering from frequent stock outs of NPDs at health facilities. Quantification/forecasting of NPDs at health facilities is mostly based on experience only. This causes a problem in the stock status. These problems inturn forces store managers to perform activities like real consumption, ordering and replenishment of pharmaceuticals incorrectly. The DSM officers stated that there is poor utilization and consistency of request and requisition forms (RRFs) and bin cards at the facility level which will lead to report quality problems which can be due to errors and guessing of reports can affect quantification and procurement.

There is supply inconsistency of NPDs which makes it difficult to perform quantification/forecast and procurement. In effectiveness on those areas affects the whole pharmaceutical management process. The DSM officers and pharmacy heads also stated that lengthening of lead time which is due to unavailability/stock out of NPDs at pharmaceuticals at the procurement center, Ethiopian Pharmaceutical Supply Survice (EPSS), makes quantification and procurement difficult. All the above identified gaps need in depth investigation because identifying the gasps on those logistics practice areas can help solve healthcare logistics problems. Therefore, this study assessed the actual practice of healthcare logistics management system of NPDs and their challenges at Health Bureau Hospitals of Addis Ababa City Administration, Ethiopia.

1.3. Objective of the study

1.3.1. General objective

The objective of this study was to assess healthcare logistics management practices of NPDs and identify their challenges at Addis Ababa City Administration Health Bureau Hospitals (AACAHBHs).

1.3.2. Specific objectives

To assess the forecasting/quantification practice of NPDs in AACAHBHs

To assess the procurement management practice of NPDs in AACAHBHs

To assess the inventory management practice of NPDs in AACAHBHs

To assess the logistics management information system (LMIS) of NPDs in AACAHBHs

To assess the storage condition of NPDs in AACAHBHs

To identify the main challenges for HCLMPs of NPDs in AACAHBHs

To measure the level of influence of the main challenges of HCLMPs for NPDs in AACAHBHs

1.4. Research Question

- How forecasting/quantification is being practiced for NPDs in AACAHBHs?
- How procurement management is being practiced for NPDs in AACAHBHs?
- How inventory management of NPDs is being practiced in AACAHBHs?
- How LMIS is being used for the management of NPDs in AACAHBHs?
- How storage conditions are fulfilled for the healthcare logistic management of NPDs in AACAHBHs?
- What are the main challenges of HCLMP of NPDs in AACAHBHs?
- To what extent do the main challeges influence HCLMPs of NPDs in AACAHBHs?

1.5. Significance of the research

Effective health care logistic management system will bring about continuous flow of revolving drug fund pharmaceuticals and medical supplies to customers. This is the main component which will maintain patients' adherence to medicines and be treated at the right time and reduce the chance of disease complication and drug resistance. Logistic management can maintain the quality and faith of people in the health system by ensuring the availability of pharmaceuticals by effectively using the available resources. The information from this study might give out the current situations of HCLMP of NPDs in hospitals under AACAHB and identify gaps in the healthcare logistics management system. Also this information can be disseminated to relevant authorities including Pharmaceutical Logistic Directorate of Federal Ministry of Health so that they can work on how to strengthen and modify healthcare logistic system of NPDs. The results of this study will also be helpful for health facilities, respective health bureau and other stakeholders on how to improve logistic management practices of NPDs. This study might also have a potential to serve as a reference material for any person that would like to conduct research on logistic management practice of NPDs.

1.6. Scope of the Study

This study gave emphasis to the healthcare logistics management practice of only NPDs, excluding program drugs and medical supplies and equipment's and reagents. Geogarphically, only 5 Health Bureau hospitals which are under Addis Ababa City Administration were included in this study. So it might not be generalized to all public hospitals. Healthcare logistics management activities are many but this study focused on five activities, which are forecasting/quantification, procurement, LMIS, inventory management, and storage condition.

1.7. Definition of terms and Operational definitions

Challenge: is a problem or issue faced by an individual or organization and poses an obstacle to achieving a goal.

Health professionals: professionals who maintain human health by the application of the concepts and practices of evidence-based healthcare and medicine.

Pharmaceuticals: medicines, medical supplies/equipment's and laboratory reagents which are used for providing healthcare services.

Stock: items and supplies kept for later use.

Bin card: "An individual stock keeping record that holds information about a single product by lot number or batch number"(USAID | DELIVER, 2011).

Safety stock (buffer stock): "The stock that should always be on hand to prevent stock outs"(MSH, 2012).

Stock out: lack of usable stocks in the store or a zero balance on the bin cards (MSH, 2012).

Lead time: the time between when new stock is ordered and when it is received and available for use (USAID | DELIVER, 2011).

Internal Facility Report and Requisition Form (IFRR): is a format used to issue pharmaceuticals from store to dispensing units within the facility (PFSA, 2015).

Report and Requisition Form (RRF): a format used to request (order) pharmaceuticals from EPSA (PFSA, 2015).

Maximum months of stock: "The largest stock level needed to satisfy demand until the next order"(MSH, 2012).

Minimum months of stock: The stock level under normal conditions in which actions to replenish inventory should take place (MSH, 2012).

Emergency order point: “The level where the risk of stocking out is likely, and an emergency order should be placed immediately” (USAID | DELIVER, 2011).

Drug supply manager (DSM): “A professional who is responsible for the management of supply chain in pharmaceutical logistic”(Ayers, 2006)

Tracer drugs (TDs): are representatives of essential medicines and fulfill the population's top priorities and that are expected to be available at all times (WHO, 2010).

1.8. Organization of the study

The following five chapters comprise the organization of this study. A general introduction to the thesis is given in Chapter one, which starts with background information on healthcare logistics management practice. Other elements of the chapter are then described, including statement of the problem, objectives, research questions, scope, significance of the study, and definitions of terms. A review of empirical and theoretical literatures on healthcare logistics management practices and its major challenges are presented in Chapter two. In the third chapter, the research methodology is presented. The results, interpretations and discussions of the study are included in chapter four. Finally, summary, conclusion and recommendations of the study are presented in chapter five.

CHAPTER TWO

RELATED LITERATURE REVIEW

This chapter provides a detailed overview of the existing theoretical and empirical literatures on the problem under investigation. Reviews relevant literatures and books on logistics concepts, logistics management in healthcare system, logistics management practices in the healthcare system: forecasting/quantification practices, procurement practices, storage condition practices, inventory control management practices, LMIS practices and the main challenges that affect the HCLMPs. Conceptual framework of the study and research gaps were also included in this chapter.

2.1.Theoretical Literature Review

2.1.1. Definition and Concept of Logistics and Logistics Management

The concept of logistics was initially emerged in the military sector, and then rapidly developed to integrate the service sector. In the 1960's, the logistics concept started to appear in business related literatures focusing on outbound side of the logistics system, which is physical distribution. In the 1970's and 1980's, the business sector approach to logistics developed into inbound (materials management to support manufacturing) and outbound (physical distribution of finished goods). The business sector started to understand logistics in terms of a supply or demand chain that connected every organization from the vendor's vendor to the customer's customer in the 1990s (Coyle, Bardi and Langley, 2003 and Frazelle, 2002).

Coyle, Bardi and Langley in their book defined logistics as "Logistics is the process of anticipating customer needs and wants, acquiring the capital, materials, people, technologies and information necessary to meet those needs and wants, optimizing the goods or

service producing network to fulfill customer requests and utility to network to fulfill customer requests in a timely way" (2003).

As defined by the Council of Supply Chain Management Professionals (CSCMP): "Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements. Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers. To varying degrees, the logistics function also includes sourcing and procurement, production planning and scheduling, packaging and assembly, and customer service. It is involved in all levels of planning and execution-strategic, operational, and tactical. Logistics management is an integrating function which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions, including marketing, sales, manufacturing, finance, and information technology" (Vitasek, 2013).

Lambert et al. (1998), Coyle, Bardi and Langley (2003), and Frazelle (2002) suggested that customer service, demand forecasting and planning, inventory management, logistics communication, materials handling, customer order processing, packaging, parts and service support, plant and warehouse site selection, procurement, return goods handling, reverse logistics, traffic and transportation, and warehousing and storage are among the most important logistics activities.

Businesses and economy depend on the effective and efficient management of logistics. Because logistics is essential to every economy, the supply chain partners must coordi-

nate all logistics management activities with the goal of maintaining efficiency. Logistics tasks like product selection, demand forecasting, ordering and procuring, warehouse and storage management, inventory management, transporting goods from one place to another until they reach the customers and managing data throughout the process should be performed by every supply chain partners (Sangeeta and Nadeem, 2004).

2.1.2. Logistics Management activities in healthcare system

Logistics activities that optimize inventory management, storage, demand forecasting, procurement, transportation, and distribution are increasingly finding their application in the healthcare system. This is evidenced by the growing number of scientific studies. Now a days, efficient and sustainable healthcare systems have become an important goal of all governments (Bozic et al., 2022).

There is no single definition of logistics in healthcare context. Depending on authors and studies, logistics in healthcare facilities takes various forms and the range of its activities is not clearly limited. The French Association of Supply Chain and Logistics (ASLOG) defined healthcare logistics as "The management of flow of patients, products, materials, services and related information to ensure quality and safety at a defined level of performance and efficiency, from the supplier to the patient and, as the case may be, to the final recipient".

Healthcare logistics management practice is a crucial part of supply chain management, which includes rational quantification/forecasting, selection, procurement, storage condition management, inventory control management, information flow, distribution, transportation and patient use of medicine by offering prompt, secure, and dependable services. The main function of healthcare logistics and supply chain management is effective planning, organizing, and coordination of the transportation of pharmaceutical prod-

ucts from a place of origin to a location of patient usage. What enables healthcare organizations to lower costs while achieving better patient outcome is by analyzing and aligning the goals of heath logistics with patient-first approach (Pinna, Carrus and Marras, 2015).

Pharmaceutical logistics systems support the six rights: the right goods in the right quantity and condition, delivered to the right place at the right time and the right cost. It also involves keeping records and generating reports that receive, evaluate, and firm ensures from every level of the logistics system so that decisions about logistics and supply chain management can be made (USAID/DELIVER, 2011).

The aim of health logistics system is more than merely making sure that a product reaches its destination. The ultimate goal of every public logistics system is to guarantee commodity security for every customer. When everyone has access to and can use high-quality essential medical supplies whenever they need them, this means that there is commodity security (USAID/DELIVER, 2011).

According to the WHO, all countries should strive to achieve the four health-related Millennium Development Goals (MDGs) 4, 5, and 6, which call for lowering infant mortality, improving maternal health, and preventing HIV/AIDS, malaria, and other diseases. These are the key issues facing both developed and developing countries. To achieve these objectives, adequate logistics and logistics management are required for effective and successful service delivery (2015).

2.1.2.1. Quantification/Forecasting

Forecasting is used to direct inventory placement to meet expected customer demands. (Ismail, 2008). "Pharmaceuticals quantification refers to the process of calculating the quantities of specific pharmaceuticals required for a health program for a given amount of resources available" (Emelia et al., 2014). It entails predicting the money needed to buy

the item as well as the quantities needed of the item in question. It is crucial for guiding decisions about product selection, finance, procurement, and delivery that are made in the supply chain (PFSA, 2017). Whenever needs are estimated for a specific setting: financial resources, the capacity of human resources, the capacity of storage, and the ability to provide services must all be considered. If quantification is calculated using guess instead of a precise mathematical procedure, the availability of essential pharmaceuticals could be compromised, or they might stockout before the next procurement stage (MSH, 2012).

The pattern of common diseases, treatment facilities, the skill and training of the staff, financial resources, and environmental factors are some of the many factors that influence the selection of essential medicines when quantifying/forecasting pharmaceuticals (MSH, 2011). In Sub-Saharan countries where resources are limited, health facilities must carefully choose the medications that are most pertinent to their needs. Spending the limited funds on redundant and unneeded medications could cause scarcity of EDs.

It is necessary to establish the quantity of selected products. Quantification is the process of estimating the cost and quantity of the products needed for a particular health service, while ensuring a continuous supply for the service, and figuring out when to procure and distribute the products (USAID | DELIVER, 2011).

To forecast the quantities and costs of the medications needed for a health program, quantification links program policies at the national level with facility-level data on medicine demand. It involves estimating how much of each product will be needed to meet demand over the course of the forecast period and modifying estimated quantities to decide how much to procure and when to deliver the products (MSH, 2012).

According to MSH, "issues to consider during quantification include preparing action plan for quantification, using centralized/decentralized quantification, using manual or

computerized methods for quantification, estimating the time required for quantification, developing and organizing the medicine list, estimation of procurement period, considering the effect of lead time, estimating safety stock, identifying and adjusting medicines at risk for loss, cross checking the results of quantification, estimating total procurement costs, and finally comparison of total costs with budget and making adjustments" (2012).

2.1.2.2. Procurement

As defined by Bowersox, Closs and Cooper, "Procurement is the process of acquiring property, equipment, goods, works, or services through purchase, hire, lease, rental, or exchange, all activities leading to the delivery of the goods, including planning and forecasting, need identification, sourcing and solicitation of offers, offer evaluation, contract review and award, contracting, and all phases of contract administration"(2002).

An efficient procurement management procedure ensures that the appropriate medications are available in the appropriate amounts with fair prices and, adhering to established quality criteria (Bossert et al., 2004). Given the unique characteristics of pharmaceuticals, a well-implemented supply chain system reduces the likelihood of stock outs and overstocks that can waste limited resources and cause product expiry (MSH, 2012). As a result, managing pharmaceutical procurement is a difficult task, particularly in developing nations. Programs will unavoidably waste precious resources due to protracted and frequent stock outs, overstocks, and losses in the absence of strong pharmaceutical procurement system (Dowling, 2011). The ability to select products, estimate needs, and quantify them, as well as the regular availability of logistics data such as stock levels and consumption rates, are prerequisites for procurement (Raja, Mellon and Sarley, 2006).

Pharmaceutical procurement involves a complex set of processes with many steps and stakeholders. It takes place under institutional and national policies, rules, and regulations

that may impede or support the procurement processes overall effectiveness. The main obstacles for developing a good pharmaceutical procurement process include inadequate rules, regulations, structures and procurement policy (WHO, 1999).

The availability of pharmaceuticals and their overall costs are significantly influenced by the pharmaceutical procurement system. A functional and sustainable procurement process is needed to ensure that people have access to necessary and high-quality pharmaceuticals. This process includes precise forecasts and supply planning, prompt procurement, appropriate warehousing, and efficient transportation networks (WHO, 2011).

The methods used to procure pharmaceuticals differ greatly from country to country. The primary methods of procurement employed by the health system include direct procurement, competitive negotiation, open tender, and restricted tender. Public health facilities in Ethiopia should procure primarily through EPSS, but by using stock out certificate, they may also procure supplies from private vendors (MOH, 2019).

According to USAID/DELIVER,"procurement process consists of a series of steps which must be standardized and regulated according to public laws and regulations: need identification and aggregation (product selection and quantification), specifications, assessment and selection of procurement options, requisition of budget, funding and procurement, procurement planning, develop bidding documents and invite offers, supplier selection, supplier award, monitor supplier performance, and finally payment settlement and delivery of products" (2011).

Even if pharmaceutical procurement practices differ widely from country to country, widely applicable good pharmaceutical procurement practices include: reliable payment and good financial management, procurement by generic name (International Nonproprietary Name), procurement limited to essential medicine list, procurement in large vol-

ume, formal supplier qualification and monitoring, competitive procurement, order quantities based on reliable estimate of the actual need, separation of key functions, product quality assurance program, annual financial audit, and regular reporting of procurement performance (MSH, 2012).

2.1.2.3. LMIS

LMIS is used to gather, arrange, and present logistical data in order to enhance management decision-making by providing precise, prompt, and relevant data for managing and tracking the flow of supplies, lessen supply imbalances, and increase cost-effectiveness, which in turn enhances customer service. The function of LMIS is supporting the management of essential pharmaceuticals (Pinna, Carrus and Marras, 2015).

LMIS is one of the component of Integrated Pharmaceuticals Logistics System (IPLS) (EPSA, 2019). LMIS has three data items which used to process the logistics system.

Stock on Hand: the amount of useable stock that is available at any given moment.

Consumption Data: gives information on the quantity of pharmaceuticals consumed throughout the reporting period.

Losses: the amount of stock eliminated for any cause besides consumption.

Adjustments: a product received from other health facilities and also sometimes a correction resulting from calculation errors.

Pharmaceuticals with in a logistics system stored, moved from one facility to another or give patient services. Records and forms that gather and report the three crucial data items in relation to these three actions are part of a well-designed LMIS (PFSA, 2015).

Bin cards, Stock record cards, Internal Facility Report and Resupply Forms (IFRRs), Health Post Monthly Report and Re-Supply Forms, and Report & Requisition Forms (RRFs) are some of the LMIS tools used for recording and reporting purposes. Because

these tools must be completed manually, which is prone to mistakes and takes much time, the Healthcare Management Information System (HCMIS) was developed to address these issues and to generate actual data (Yaba, 2014).

Collecting crucial information on stock status and consumption may be done manually or automatically by an effective LMIS. The LMIS is a crucial tool in pharmaceutical logistics system which cannot function properly without prompt, and reliable data. It provides the information necessary for pharmaceutical logistics managers to anticipate demand and, more crucially, respond to it. Effective LIMS requires properly trained personnel on the forms, and tools (Shawkey & Hart, 2003).

Numerous operational difficulties can be caused by information quality issues. Inadequate forecasting may result in over commitment or a shortfall of inventories. Inventory return costs frequently result in a rise in logistics costs. Each inaccuracy in the information possibility causes disruption of the whole supply chain system. Forecasting and order management are the two information-dependent logistical activities (Ismail, 2008).

2.1.2.4. Inventory Control System (ICS)

Business processes cannot afford stocking every item to be sold to serve each customer in the facility because of the risk of high total cost. Thus, the goal of inventory management is to deliver the appropriate customer service with minimum inventory commitment and lowest possible overall cost. Inventory management ensures that the overall logistical system has the resources it needs to operate as intended (Ismail, 2008).

Inventory is the term used in pharmacy operations to describe the stock of pharmaceuticals kept on hand to meet future demand. The system specifically strives to save procurement and carrying expenses while keeping an efficient supply of items to meet customer and prescriber demands (Ali, 2011).

Pharmaceuticals should be stored till they are required by customers. Almost all businesses keep a certain amount of stock on hand for future needs. For future demands, almost every business keeps a certain quantity of inventory on hand. An inventory control system alerts on when to order, how much to order, and how to keep an appropriate stock level of every product (USAID | DELIVER, 2011). An inventory control system should be well designed inorder to maintain an appropriate stock level of every product (PFSA, 2015).

Every health facilty has maximum and minimum months of stock and an emergency order point inorder to maintain appropriate stock levels. For resupply of products every facility must submit a report for each product on a predetermined timetable. Incase of emergencies, an emergency order can be made. For RDF pharmaceuticals, hospitals complete RRFs based on the facilities review period inorder to collect products from PFSA (PFSA, 2015).

2.1.2.5. Storage management

According to MSH, "Pharmaceutical warehousing or warehouse management is the physical movement of stock into, and out of a medical store warehouse. Warehousing is a key element of pharmaceutical supply chain management. It ensures the constant availability and flow of essential quality health commodities, in appropriate quantities, in a timely and cost-efficient manner, through the supply chain system. Key warehousing functions include receiving and storing stock, inventory management, and distribution management" (MSH, 2012).

Pharmaceuticals must be properly stored. The stability of a drug is determined by its main component, which can be impacted by formulation and packaging. Inadequate distribution and storage can cause products to lose effectiveness and degrade physically and

chemically which causes reduction in the potency of the drug. The integrity of pharmaceuticals being stored is impacted by the storage environment, hence it is important to have cold storages, proper temprature controls, enough illumination, clean conditions, and humidity control including enough storage spaces (MSH, 2011). Health facility pharmacy Store enhancement is one of the main IPLS related pharmaceuticals management improvement initiatives (PFSA, 2015).

2.2. Empirical Literature Review

This section will assess researches done on logistics management practices in the healthcare system and discuss the main challenges that affect HCLM practices by using the findings from various literatures.

2.2.1. Logistics Management practices in healthcare

The goal of an efficient healthcare logistics system, as stated by USAID/DELIVER (2011), goes far beyond making sure that a product arrives to its intended location. Every public health logistics system's ultimate goal is to contribute to the provision of commodity security for each and every consumer. Thus, commodity security is achieved when every individual may access and use quality basic medical supplies whenever necessary. To ensure the security of commodities, an efficient and effective supply chain is essential; financing, policy, and devotion is required. A well functioning supply chain not only contribute to commodity security but also determine wether public health program succeeds or fails. Understanding and managing logistics practices can increase service effectiveness (Pan and Pokharel, 2007).

A study done at Harari Regional State showed that the overall health facilities pharmaceuticals logistics system of NPDs performance was moderate with 60% of health facilities performed with acceptable level of performance with the mean performance of 61.91%. The management ownership of health facilities is below expectations with 60% meet the acceptable level and most of the professionals working and managing pharmaceutical logistics system activities do not have the necessary updated trainings in pharmaceuticals supply chain and post-employment training on the pharmaceutical logistics system as a general not only for NPDs. And most of the staffs in all health facilities have more information regard-

ing logistics of program drugs but they have little general information on NPDs in the study area. Factors like management ownership of the system and the skill of healthcare professionals working in the system highly affect the current pharmaceuticals logistics system practice (Aklilu and Dereje, 2022).

Hospitals were found to have a high availability rate (over 90 percent) of blank bin cards, IFRRs, and RRFs, according to a 2015 PFSA nationwide survey. Furthermore, hospitals exact balances on bin cards varied from 29 to 71 percent for various products with an average of 49 percent, which was facility-level data.

A study done by chikumba and Ramussen at Malawi and Burkina Faso health institutions showed similar findings that the health institutions' LMIS reporting rate has poor data quality, calculation mistakes, and inaccurate data entry on stock-keeping records. The study also found that weak information communication technology and lack of skill in the study areas (2016).

A study done by Bayked, Kahissay, and Workneh showed that the inventory management, recording, and storekeeping practices were not satisfactory in the public health institutions of Dessie city administration. Calculation fallacies, recording errors, improper stock levels maintenance, lack of automatic recording, absence of wall thermometers, absence of humidity and fire control systems, absence of lockable cabinets, fail to use FEFO (first enter first out) storage technique, and holding combustibles with drugs were found to be the major pitfalls of these institutions (2021).

The majority of the health facilities (75%) reported stock out of some non-program pharmaceuticals on the day of visit, while 37.5% of them were found to have over stock

for some non-program drugs, according to a study done to evaluate the SCM performance in health facilities found in Addis Ababa (Mudzteba, 2014).

According to a report by USAID/DELIVER (2011) in Addis Ababa, accurate and effective logistics management requires knowledge of the stock status in order to make critical decisions about procurement and resupply of drugs as well as to maintain accountability and transparency. However, the finding indicated that data was not readily accessible all the time, which resulted in instability of stock status, and medicine expiry.

According to a research conducted in Eastern Ethiopia, all health facilities' data quality levels was below the national benchmark (80%). Lack of supervision, feedback, and training were the factors that were found to have an impact on the quality of the data (Teklegiorgis et al., 2016).

A significant challenge for the logistic system was shortages, and stock outs of EDs as a result of delivery of near expiry items, and delayed placing of delivery orders with limited supplies at PFSA. Weak selection, quantification, procurement and in adequate stock control and management, delay in the purchasing procedure, and unpredicted services demand or increased patient flow were challenges of IPLS. As a result, public health facilities usually place emergency orders. Furthermore, overstocking led to significant product waste (Mohammed et al., 2020).

The ministry of health's standards are still not being met, according to a study on the implementation of an integrated pharmaceutical logistics system in the Wollega Zone Oromia Region. The study's findings showed that hospitals had 100%, 83%, and 100% availability of blank bin cards, IFRRs, and RRFs, respectively. Blank bin cards, IFRR, and

RRF were 100%, 82%, and 94% available at health centers, respectively (Alemu et al., 2021).

2.2.2. Challenges of Healthcare logistics management practices

"Like any other industry due to increased cost and demand logistics in healthcare has also encountered with many problems in recent years" (Bozic et al., 2022). The management of medications is a highly technical and professional activity which can be accomplished by managerial and operational staff that are sufficiently qualified, well-trained, and skilled.

A study done in sub-Saharan Africa identified that selection and quantification of demand, a lack of transparent procurement procedures, inadequate storage facilities and capacity, lack of guidelines for good storage procedures, a lack of appropriate planning, monitoring and evaluation and inadequate budget allocation are the main challenges within the national health systems which impact the supply chains. The study also stated that there is lack of human resource, expertise skills, transparency, and communication (Schopperle, 2013).

Assessment of Ghana's logistics management system revealed that the proper use of medication, quantification, and availability at health facilities in developing nations were seriously impacted by the absence of proper skill, training gaps, and failing to deploy the necessary number of pharmacy professionals (Manso, Annan, and Anane, 2013).

Human resource challenges, financial resource challenges and information sharing and technology were identified as the main challenges of medicine supply of African countries (WHO, 2006). The result of this study is similar to a study done in Sub-Saharan African countries, the most common logistics challenges that Sub-Saharan African countries face are inadequate workers' skills, Weak and sometimes absence basic infrastructure,

that can cause cost increment in business, and also lack of information asymmetry and visibility (Kuteyi, and Winker, 2022).

A study done to asses human resources in Ethiopia's health supply chain management, showed that highlighting strategies and programs for human resources are among the short-term challenges. Whereas, the long-term health supply chain challenges include finding ways to further develop and sustain human resources and ensuring a sustainable financial base so that increased access to medicines becomes a reality for all Ethiopians. (Sporrong et al., 2016).

A study done at Laos, Malaysia, Myanmar, Singapore, and Thailand outlined that lack of data standardization and poor IT infrastructure lead to poor operational IT management. National policy is impacted by the reliability of information and the operational use of data. The infrastructure and policy of the country, including data standardization, have an impact on healthcare logistics. The country's environment has an impact on operational performance as well. Information technology management and operational logistics processes are interconnected and serve as the main building blocks of the system effectiveness. Inventory management and information and technology management must the main focus areas of enhancing healthcare logistics performance (Kritchanchai, Hoeur and Engelseth, 2017).

Goh and Pinaikul stated in their study that factors hindering logistics development include inefficient logistics information systems, acute transportation bottlenecks, and the lack of logistics management expertise. Good communication skills, logistics operations skills, understanding of new technology and the ability of logistics managers to plan and forecast for the supply chain are highly regarded as desired skills of logistics managers

(1998). Upgrading processes, developing staff skills, and promoting the benefits of logistics are the three main challenges that Quebec's logistics departments must overcome (Beaulieu, Bentahar and Benzidia, 2020).

Unjustified demand forecasting techniques, lack of internet support, and lack of warehouse space to store excessive inventory were among the obstacles found in a study done at Indonesia (Rachmania and Basri, 2013). A study conducted by Semu on the inventory management practices of pharmaceuticals showed that health facilities at Addis Ababa face three major obstacles in managing inventory: shortage of technology for inventory control, inadequate inventory management training, and insufficient storage space to hold all the necessary products (2018).

The primary facility-specific factor influencing supply chain management is management support. It establishes the organization, proportion of labor, and distribution of time and resources. Since their decisions and initiatives affect the entire supply chain, commitment is more significant than other internal elements in making the supply chain responsive (Khizer et al., 2012).

A research conducted in East Wollega Zone Ethiopia revealed that the main obstacles in the operation of the LMIS were lack of qualified human resources and lack of staff commitment at the public health facilities (Tiye and Gudeta, 2018).

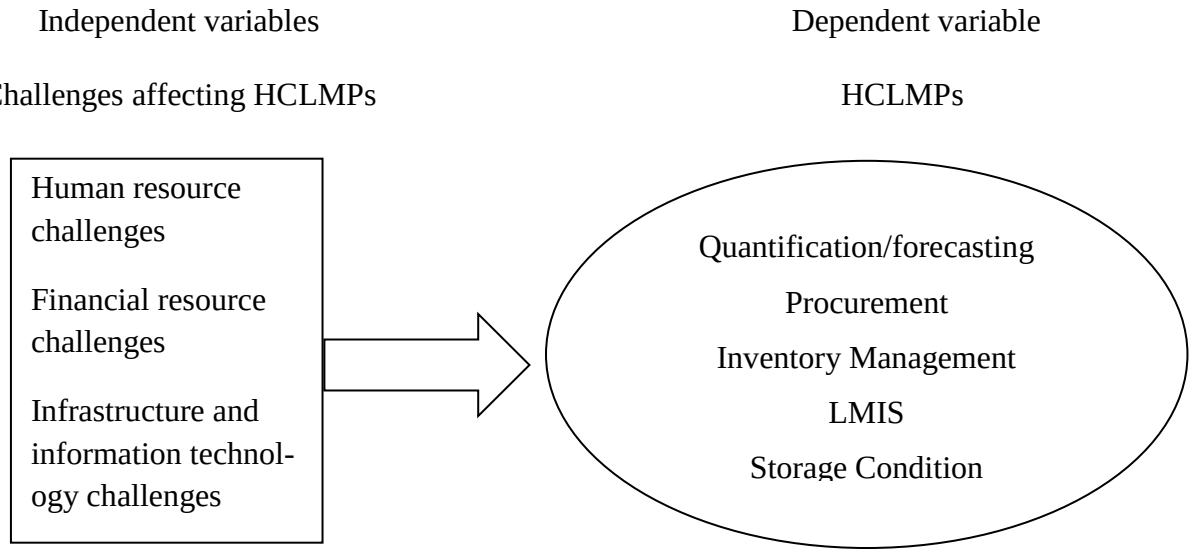
Facility management related factors, human resource management for SCM factors, LMIS related factors, and health facility infrastructure related factors are the challenges of IPLS implementation at health facilities (Alemu et al., 2021). Pharmaceutical supply decisions are impacted by an inadequate and inappropriate LMIS, which leads to quanti-

fication, procurement, and distribution that are not based on actual demand and resources waste as a result of expiry or stock outs (USAID | DELIVER, 2011).

From the above literatures the main challenges in the HCLM practices was summarized as infrastructure challenges, human resource challenges and information and technology challenges. These challenges affect the healthcare logistics management activities.

2.3. Conceptual framework of the study

Figure 1: Conceptual frame work of the study (self-depicted)



2.4. Identified literature gaps

A number of theoretical and empirical literatures that are pertinent to the thesis were reviewed. Almost all of the reviewed literatures done generally focus on the HCLMP of all essential pharmaceuticals. Most of which were on program pharmaceuticals. In Ethiopia, studies on HCLMP are very limited at public Regional Health Bureau Hospitals. A lot of studies were done on the specific indicators separately; there was no study in the hospitals which comprises most of the healthcare logistics activities and challenges on those indicators and also on non-program pharmaceuticals.

As far as the researcher is aware of only three studies have been conducted specifically on NPDs. The first one aimed to ascertain the degree and correlation between determinant factors with performance of pharmaceutical logistics system of NPDs which was done at at Harari Regional State public health facilities (Aklilu and Dereje, 2022). The second one was a study done to assess the pharmaceutical logistics system of NPDs in health centers of Addis Ababa (Mudzteba, 2014). While the third study was done to evaluate the availability of NPDs at selected health centers of Ethiopian Ministry of Defense (Worku, 2020).

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents the research approach, methods and design used by the study to assess HCLMP of NPDs and their challenges at public hospitals under Addis Ababa City Administration Health Bureau. The study population, sampling technique, sample size determination, data collection and analysis instruments including ethical considerations, validity and reliability tests were included.

3.1. Description of the study area and study period

Ethiopia is administratively divided into 11 regional states and 2 administrative councils. The study area is Addis Ababa City Administration (AACA) which is one of the two councils and the capital city of the country. It covers an area of 527 km2 with a total population of around 5.1 Million. It is administratively sub-divided into 10 sub-cities (AACA, 2023). According to the 2012 (EFY) health and health related indicators published by MOH, Addis Ababa has 12 Hospitals, 98 Health Centers out of this; Six hospitals are under Addis Ababa City Administration Health Bureau namely; Yekatit 12 specialized Hospital Medical College, Zewditu memorial hospital, Ras desta Damitew Memorial Hospital, Minillik II Referal Hospital, Gandi Memorial Hospital, and Tirunesh Bejing General Hospital. EPSA, which is currently named as Ethiopian Pharmaceutical Supply Service (EPSS), is the main supplier of pharmaceuticals. Aside from that, health institutions purchase supplies from other suppliers. The study will be conducted from June 2 to July 20, 2023.

Ras Desta Dametew Memorial Hospital: is a referal hospital located in Woreda 04, Addis Ababa Arada subcity. Constructed in 1924 E.C.

Minillik II Referal Hospital: is one of the oldest public hospital in the country located in north east Addis Ababa in Yeka Kefle Ketema specialized in urologic surgery.

Yekatit 12 Specialized Hospital Medical College (Y12HMC): is a specialized referal hospital. This hospital offers service for about above 5 million patients in the catchment area starting from the year 1923 E.C. It is one of the leading hospitals in the treatment of cleft pallet & plastic surgery.

Zewditu Hospital: is a referal hospital which took its name from Empress Zewditu. It is one of Ethiopia's top hospitals for treating Human immuno virus (HIV) patients.

Gandhi Memorial Hospital Women and Child Care and Legal Center: is 60-bedded secondary care hospital operating under the company name of Pawan Gandhi Health Care Pvt. Ltd. Established in 1989 in West Delhi by Dr. Pawan Gandhi.

Tirunesh Beijing Hospital: is located Addis Ababa, Ethiopia, Akaki-Kality sub-city. It is named after athlete Tirunesh Dibaba. The hospital mainly offers outpatient, inpatient and emergency medical services. It was established 2012.

3.2. Research approach

Both qualitative and quantitative research approaches were used in this study. Quantitative research is based on determining the quantity or amount of doing something and the qualitative approach supports the results that will be obtained quantitatively, so the combination of this approachs is expected to have a graeter impact in addressing the information comprehensively. The respondents answer were put on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Bryman defined Likert scale as “A psychological measurement device which is a most common technique for conducting an investigation of attitudes, values, and opinion, which is

named after Rensis Likert" (2012). It was found that the five-point Likert scale was the most suitable instrument for evaluating logistics practices. It allows for quantitative responses, as well as the collection of both opinion and emotion; it is also simple and inexpensive to analyze.

3.3. Study design

The study used both explanatory and descriptive research design. Facility based descriptive cross-sectional study design was computed using both qualitative and quantitative research approachs. This study design is used to describe and assess the current HCLMPs and their challenges for NPDs. It gathers data at a particular point in time with the intension of describing the nature of existing condition or assessing specific information. Moreover, an explanatory study design was used to find any causal relationships between the variables.

3.4. Target population, sample size and sampling technique

3.4.1. Target population

The target populations are hospitals under AACAHB. These are Ras Desta Damtew, Memorial Hospital, Zewditu Memorial Hospital, Menelik II Referral Hospital, and Yekatit 12 Hospital Medical College.

3.4.2. Sample size

The study employed a census sampling through non-probability sampling technique to select 111 respondents and 4 respondents purposively selected from EPSS. This therefore ruled out application of specific sampling design and sampling technique. The study used a census since the population of 111 was small and the study aimed to reach all the targeted respondents. In census sampling, data is collected from every member of the popu-

lation, rather than from a sample of the population. This means that census sampling provides a complete picture of the population being studied.

Table 1 Total number of target population in hospitals under AACAHB

Target population	Ras Desta	Zewditu	Menelik II	Yekatit 12	Ghandi	EPSS
Medical directors	1	1	1	1	1	--
Pharmacy heads	1	1	1	1	1	--
DSM officers	1	2	2	1	1	--
Store manager	4	4	4	4	2	--
Procurement officers	1	1	2	4	2	--
DTC members	18	14	10	13	11	--
Total	26	23	20	24	18	4
Sum						115

Source: Researcher's Own (2023)

A sample size of 115 target population were included. Since the study employed census all the target populations were incorporated in the study.

3.4.3. Sampling technique

Because they are familiar with the nature of the problem, DSM officers, pharmacy heads, store managers, medical directors, procurement officers, and drug and therapeutic committee (DTC) members (doctors, nurses, pharmacists, and laboratorists) were included in the study. And 4 personnel from EPSS from the inbound and out bound logistics were selected purposively to participate in the in-depth interview. The required knowledge areas of participants and Interviewees are: LMIS, product selection, forecasting, procurement, inventory control procedures and warehousing and storage.

3.5. Variables of the study

The independent variables of the study were challenges affecting HCLMPs. While HCLMP was the study's dependent variable.

3.6. Inclusion and exclusion criteria

All hospitals under AACAHB and NPDs were included in the study while hospitals which are not under AACAHB, and non-program medical supplies/equipment and reagents including program pharmaceuticals were excluded.

3.7. Data collection instruments and procedures

The self administered questionnaire was prepared by using a book MSH (2012), prior related literatures custumized based on the aim of the study. Then it was pilot tested on pharmacy heads and DSM officers of two health facilities and then comments were used to correct and improve the questionnaire. Based on this a 5-point likert scale questionnaire was prepared. For the observational checklist and storage condition management Logistics Indicator Assessment Tool (LIAT) was used by custumizing it to the research objective. "LIAT is a quantitative data collection instrument developed by DELIVER, is used to conduct a facility-based survey to assess health commodity logistics system performance and commodity availability at health facilities" (JSI/DELIVER, 2005).

An interview guide which was also pilot tasted was used to collect qualitative data. The questionnaire's questions were all grouped and ordered according to the specific problems they were meant to address. The data was collected from June 2 to July 20, 2023.

There were three sections on the questionnaire. The first section contains questions about participants' sociodemographic characterstics. The second section consists of questions for assessing HCLMPs and the last section contains questions for assessing challenges affecting HCLMPs of NPDs. The observational checklist was used to collect quantitative data; it contains questions to assess the stock status of non-program tracer drugs (TDs). These non-program TDs are developed by Federal Ministry of Health (FMOH) for health

facilities in Addis Ababa. 17 TDs were included in the study. And finally qualitative data was collected by using interview.

3.8. Method of data analysis and presentation

Before the collected data was entered and analyzed using Microsoft Excel 2010 and SPSS version 21, it was manually reviewed to ensure completeness and consistency. Tables and graphs were used to display the findings. Both descriptive and inferential stastics were used to process the quantitative data. The descriptive statistics included mean, percentages, and frequency. While, the degree to which the independent variables influence the dependent variable was analyzed using inferential statistics. Thematic analysis and narrative summarization were used to present the qualitative data from both the questionnaire and interview.

3.9. Validity and Reliability Test

To make sure that the questionnaire and observational checklist were understood by the respondents, pretest was conducted outside of the selected institutions prior to the commencement of data collection. 12 health professionals (pharmacists, doctors and nurses) participated in the questionnaire's validity assessment.

Cronbach's Alpha technique was used to evaluate the reliability of the questionnaire. The Cronbach Alpha coefficient, as suggested by Nunnally (1978), was computed and found to be within the acceptable level, 0.9, which showed that the questionnaire was reliable, hence used to collect the required data.

Table 2 Reliability of HCLMPs and their challenges

Reliability Statistics		
HCLMPs and its challenges	Cronbach's Alpha	N of Items
Forecasting/quantification practice	0.865	15

Procurement practice	0.816	10
LMIS practice	0.811	12
Inventory management practice	0.864	9
Storage condition practice	0.883	14
Human resource challenge	0.825	6
Financial resource challenge	0.753	3
Infrastructure and information technology challenge	0.888	11
All variables	0.906	80

Source: Researcher's Own (2023)

3.10. Ethical considerations

Ethical clearance was obtained from Addis Ababa Public Health Research and Emergency Management Directorate. Then a letter of cooperation was taken for each health facility. Before enrolling any respondent as a study participant, verbal agreement was obtained. The aim of the study, the reason for participant selection including what is expected from them were all explained to the respondents during the consent. Participants received guarantees on the privacy of any information collected for the study. Instead of using the respondents' personal identifier and also the name of the health facility, code were used to present the findings. Finally, the findings of the study were analyzed without manipulating participant ideas and results of the study will be disseminated to Addis Ababa Public Health Research and Emergency Management Directorate.

CHAPTER FOUR

RESULTS, INTERPRETATION AND DISCUSSION

This chapter begins with an introduction, which presents the major sections to be included in the chapter, and includes a brief presentation of the data collection processes, data analysis tools and what has been done to meet the research objectives.

4.1. Introduction

This chapter presents the findings, interpretations and discussions of the study obtained from the 5-item Likert scale questionnaire, observational checklist and interview. Both Microsoft Excel 2010 and SPSS version 21 were used to enter and analyze the data. And both descriptive and inferential statistics techniques were used for analysis. The findings will be presented using tables, figures, and narration.

4.2. Response rate

From the total of 111 Likert scale self-administered questionnaires, 98 were filled and returned, which makes a response rate of 88.3%. And also interview was made with pharmacy heads of each hospital and 4 employees from EPSS to collect qualitative data.

4.3. Socio-demographic characteristics of the respondents

The total sample size was 98 respondents. The majority of the study participants were pharmacists who work on various positions in the study area like DSM officer, store manager, pharmacy head, procurement officer, quality officer, medicine dispensary units, drug information service focal, and clinical pharmacy service providers, because of the nature of the problem. The ratio of male to female respondents was 3 (74 and 24 respectively). Most of the study participants were within the age range of 31-45 years (64), followed by 18-30 (29) and the remaining were within the age range of 46-55 (5%). The ed-

ucational levels of the respondents were 3 internist, 72 degree, 21 Master's and 2 diplomas. The study participants included 76 pharmacy professionals, 11 medical doctors, 1 health officer, 5 nurses and 5 laboratorists. Most of the respondents 41 (41.8%) had 6-10 years of work experience, followed 35 (35.7%) had 1-5 years of work experience, and the remaining 22 (22.4%) had more than 10 years of work experience.

Table 3 Socio-demographic characteristics (N=98)

Variables	Category	Frequency	Percent
Gender	Male	74	75.5
	Female	24	24.5
Age	18-30 Years	29	29.6
	31-45 years	64	65.3
	46-55 years	5	5.1
	Above 55 years	0	0
Educational level	College certificate	0	0
	Diploma	2	2.0
	Bachelor degree	72	73.5
	Master's degree	21	21.4
	Other	3	3.1
Profession	Medical doctor	11	11.2
	Pharmacy professional	76	77.6
	Laboratorist	5	5.1
	Nurse	5	5.1
	Other	1	1.0
Position in the organization	Medical director	5	5.1
	Pharmacy head	5	5.1
	DSM officer	10	10.2
	Store manager	18	18.4
	Procurement officer	2	2.0
	Other	58	59.2
Work experience in years	1-5 years	35	35.7
	6-10 years	41	41.8
	Above 10 years	22	22.4

Source: Researcher's own (2023)

4.4. Descriptive statistics of healthcare logistics management practices

In this sub section the findings of descriptive statistics were presented using mean, frequency and percentages. Tables were used to display the responses of the 5-point Likert scale.

Table 4 Healthcare logistics management practices of NPDs and their challenges (N =98)

Healthcare logistics management practices of NPDs and its challenges	Number of items	Grand Mean
Quantification/Forecasting practices	15	2.68
procurement practices	10	2.61
LMIS Practices	12	2.95
Inventory management practices	9	3.62
Storage condition practices	14	3.17
Human resource challenges	6	3.31
Financial resource challenges	3	3.43
Infrastructure and information technology challenges	11	3.41

Source: Researcher's Own (2023)

4.4.1. Quantification/Forecasting practices of NPDs

Table 5 Summary of responses on quantification/forecasting practices of NPDs

Quantification/Forecasting practices of NPDs		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
There is documented policy or guideline for quantification/forecasting	Freq.	10	14	5	55	14	2.50	1.20
	%	10.2	14.3	5.1	56.1	14.3		
Action plan is prepared for quantification	Freq.	4	9	9	62	14	2.26	0.96
	%	4.1	9.2	9.2	63.3	14.3		
Decentralized quantification is used	Freq.	5	12	11	63	7	2.44	0.97
	%	5.1	12.2	11.2	64.3	7.1		
Use computerized method for quantification	Freq.	22	36	8	27	5	3.44	1.25
	%	22.4	36.7	8.2	27.6	5.1		
The time required for quantification is estimated	Freq.	6	11	5	68	8	2.38	1.00
	%	6.1	11.2	5.1	69.4	8.2		
Facility specific medicine	Freq.	6	9	6	68	9	2.34	0.98

list is developed and organized		6.1	9.2	6.1	69.4	9.2		
Procurement period is estimated	Freq.	6	9	8	65	10	2.35	1.00
	%	6.1	9.2	8.2	66.3	10.2		
The effect of lead time is considered	Freq.	4	4	13	71	6	2.28	0.81
	%	4.1	4.1	13.3	72.4	6.1		
Safety stock needed for each medicine is calculated	Freq.	2	7	19	64	6	2.34	0.79
	%	2.0	7.1	19.4	65.3	6.1		
Medicines at risk for loss are identified and their quantity is adjusted	Freq.	6	6	13	67	6	2.38	0.93
	%	6.1	6.1	13.3	68.4	6.1		
The results of quantification are cross checked	Freq.	7	7	14	61	9	2.41	1.00
	%	7.1	7.1	14.3	62.2	9.2		
Total procurement costs are estimated	Freq.	37	30	1	23	7	3.68	1.37
	%	37.8	30.6	1.0	23.5	7.1		
Comparison of total costs with budget and adjustments are made	Freq.	18	36	14	26	4	3.39	1.18
	%	18.4	36.7	14.3	26.5	4.1		
Consumption method of quantification is used	Freq.	20	42	5	14	17	3.35	1.41
	%	20.4	42.9	5.1	14.3	17.3		
Morbidity method of quantification is used	Freq.	10	11	23	42	12	2.64	1.15
	%	10.2	11.2	23.5	42.9	12.2		
Grand Mean							2.68	0.19

Source: Researcher's Own (2023)

1=Strongly Disagree (SD); 2=Disagree (D); 3=Neutral (N) (Neither agree nor disagree); 4=Agree (A) and 5=Strongly Agree (SA).

The above table showed that participants were asked 15 different questions to assess quantification/forecasting practice of NPDs in hospitals under AARHB. The grand mean for quantification/forecasting practices was 2.68 (SD=0.19). Most of the respondents "Disagreed" for that there is documented policy or guideline for quantification/forecasting with an average of 2.50 (SD=1.20), action plan is prepared for quantifi-

cation with an average of 2.26 (SD=0.96), decentralized quantification is used with an average of 2.44 (SD=0.97), the time required for quantification is estimated with an average of 2.38 (SD=1.00), facility specific medicine list is developed and organized with an average of 2.34 (SD=0.98), procurement period is estimated with an average of 2.35 (SD=1.00), the effect of lead time is considered with an average of 2.28 (SD=0.81), safety stock needed for each medicine is calculated with an average of 2.38 (SD=0.79), medicines at risk for loss are identified and their quantity is adjusted with an average of 2.38 **(**SD=0.93), the results of quantification are cross checked with an average of 2.41 **(**SD=1.00), and morbidity method of quantification is used with an average of 2.64 (SD=1.15). Whereas, most of the respondents "Agreed" for use computerized method for quantification is used with an average of 3.44 (SD=1.25), comparison of total costs with budget and adjustments are made with an average of 3.39 (SD=1.18), consumption method of quantification is used with an average of 3.35 (SD=1.41).

As by MSH the followings must be considered to say good quantification/forecasting practices; there should be documented policy or guideline for quantification/forecasting, action plan should be prepared, decentralized quantification should be used for NPDs, the quantification process should be computerized, the time required for quantification should be estimated, facility specific medicine list should be developed and organized to undergo quantification/forecasting process, procurement period should be estimated and the effect of lead time should be considered, safety stock needed for each medicine should be calculated, medicines at risk for loss should be identified and their quantity must be adjusted, the results of quantification should be cross checked, total procurement

costs should be estimated and finally comparison of total costs with budget and adjustments should be made. This all make up good quantification/forecasting practice (2012). Since from the above findings it can be concluded that the quantification/forecasting practices of the facilities is poor. This finding in line with the finding of Muhia, Waithera and Songole in which poor quantification/forecating caused over ordering and under ordering of medicines (2017).

4.4.2. Procurement Practices of NPDs

Table 6 Summary of responses on procurement practices of NPDs

Procurement Practices of NPDs		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
The facility has updated standard operating procedure (SOP) for the procurement of NPDs	Freq.	8	4	16	61	9	2.40	1.00
	%	8.2	4.1	16.3	62.2	9.2		
Procurement is being processed based on procurement plan	Freq.	5	6	14	69	4	2.38	0.87
	%	5.1	6.1	14.3	70.4	4.1		
Procurement is limited to the medicines list of the facility	Freq.	4	5	12	67	10	2.24	0.86
	%	4.1	5.1	12.2	68.4	10.2		
There is ABC/VEN classification for procurement and budget allocation in the facility	Freq.	25	43	2	11	17	3.49	1.43
	%	25.5	43.9	2.0	11.2	17.3		
There is always low level of bureaucracy at this facility for purchasing NPDs	Freq.	15	13	14	46	10	2.77	1.26
	%	15.3	13.3	14.3	46.9	10.2		
Medicines are requested and delivered timely	Freq.	16	6	15	50	11	2.65	1.25
		16.3	6.1	15.3	51.0	11.2		
The facility has good	Freq.	9	3	14	67	5	2.43	0.98

working relation with suppliers	%	9.2	3.1	14.3	68.4	5.1		
This facility effort to exchange procurement related documents and transactions with suppliers through Electronic data interchange (EDI) is satisfactory	Freq.	11	10	11	52	14	2.51	1.19
	%	11.2	10.2	11.2	53.1	14.3		
Local suppliers' services are satisfactory to the facility	Freq.	17	7	27	38	9	2.85	1.23
	%	17.3	7.1	27.6	38.8	9.2		
There is appropriate forecasting & follow up to procure efficiently and effectively in the facility	Freq.	5	8	22	47	16	2.38	1.02
	%	5.1	8.2	22.4	48.0	16.3		
Grand Mean							2.61	0.19

Source: Researcher's Own (2023)

As shown in the above table 6, a total of 10 questions were used to assess procurement practices of NPDs in hospitals under AARHB. The grand mean for procurement practices was 2.61 (SD=0.19). Most of the respondents "Disagreed" for that the facility has updated standard operating procedure (SOP) for the procurement of NPDs with an average of 2.40 (SD=1.00), procurement is being processed based on procurement plan with an average of 2.38 (SD=0.87), procurement is limited to the medicines list of the facility with an average of 2.24 (SD=0.86), there is always low level of bureaucracy at this facility for purchasing NPDs with an average of 2.77 (SD=1.26), medicines are requested and delivered timely with an average of 2.65 (SD=1.25), the facility has good working relation with suppliers with an average of 2.43 (SD=0.98), this facility effort to exchange procurement related documents and transactions with suppliers through electronic data interchange (EDI) is satisfactory with an average of 2.51 (SD=1.19), local suppliers' services

are satisfactory to the facility with an average of 2.85 (SD=1.23) and there is appropriate forecasting & follow up to procure efficiently and effectively in the facility with an average of 2.38 (SD=1.02). Whereas, most of the respondents "Agreed" for that there is ABC/VEN classification for procurement and budget allocation in the facility with an average of 3.49 (SD=1.43). The finding of the study is in line with a study done by Mirkena, Megersa and Ayalew at Jimma University Specialized Hospital in that pharmaceutical procurement process involves several lengthy non-value adding cyclical activities (2021). Similarly studies showed that lack of consistency and written guidelines for procuring medicines and bureaucratic procurement procedures became a major challenge which resulted in delay of supplier payments and contracts, increased pharmaceutical costs (Muhia, Waithera, and Songole, 2017; Mbwasi et al., 2022).

4.4.3. LMIS Practices of NPDs

Table 7 Summary of responses on LMIS practices of NPDs

LMIS Practices of NPDs		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
There is documented policy or guideline for managing LMIS in the facility	Freq.	7	5	10	67	9	2.33	0.97
	%	7.1	5.1	10.2	68.4	9.2		
The facility uses Automated Health Commodity management Information System (HCMIS)	Freq.	37	35	7	14	5	3.87	1.22
	%	37.8	35.7	7.1	14.3	5.1		
The facility uses manual LMIS	Freq.	37	35	7	11	8	3.84	1.27
	%	37.8	35.7	7.1	11.2	8.2		
The LMIS accurately tracks inventory levels in the facility	Freq.	8	3	14	66	7	2.38	0.97
	%	8.2	3.1	14.3	67.3	7.1		
The current LMIS employed by this health facility is effective and appropriate	Freq.	4	6	15	63	10	2.30	0.89
	%	4.1	6.1	15.3	64.3	10.2		
The data from LMIS in the	Freq.	5	8	18	60	7	2.43	0.9

facility has quality and is reliable								3
	%	5.1	8.2	18.4	61.2	7.1		
The LMIS tools in the facility are filled by properly trained personnel	Freq.	9	8	13	64	4	2.53	1.03
	%	9.2	8.2	13.3	65.3	4.1		
In the facility the logistics form: Stock record cards is filled	Freq.	14	9	11	63	1	2.71	1.13
	%	14.3	9.2	11.2	64.3	1.0		
In the facility the logistics form: Bin cards (in dispensary units) is filled	Freq.	40	19	12	21	6	3.67	1.36
	%	40.8	19.4	12.2	21.4	6.1		
In the facility the logistics form: Bin cards (in store) is filled	Freq.	26	32	7	22	11	3.41	1.38
	%	26.5	32.7	7.1	22.4	11.2		
In the facility the logistics form: IFRRs is filled	Freq.	25	36	6	19	12	3.44	1.38
	%	25.5	36.7	6.1	19.4	12.2		
In the facility the logistics form: RRFs is filled	Freq.	8	6	11	71	2	2.46	0.95
	%	8.2	6.1	11.2	72.4	2.0		
Grand mean							2.95	0.19

Source: Researcher's Own (2023)

As shown in the above table 7, a total of 12 questions were used to assess the LMIS practices of NPDs in hospitals under AARHB. The grand mean for LMIS practices was 2.95 (SD=0.19). The majority of the respondents "Disagreed" for that there is documented policy or guideline for managing LMIS in the facility with an average of 2.33 (SD=0.97), the LMIS accurately tracks inventory levels in the facility with an average of 2.38 (SD=0.97), the current LMIS employed by this health facility is effective and appropriate with an average of 2.30 (SD=0.89), the data from LMIS in the facility has quality and is reliable with an average of 2.43 (SD=0.93), the LMIS tools in the facility are filled by properly trained personnel with an average of 2.53 (SD=1.03), in the facility the logistics form: Stock record cards is filled with an average of 2.71 (SD=1.13), and in the facility

the logistics form: RRFs is filled with an average of 2.46 (SD=0.95). And most of the respondents "Strongly agreed" for that the facility uses automated health commodity management information System (HCMIS) with an average of 3.87 (SD=1.22), the facility uses manual LMIS with an average of 3.84 (SD=1.27), and in the facility the logistics form: Bin cards (in dispensary units) is filled with an average of 3.67 (SD=1.36). Whereas, most of the respondents "Agreed" for that in the facility the logistics form: Bin cards (in store) is filled with an average of 3.41 (SD=1.38) and in the facility the logistics form: IFRRs is filled with an average of 3.44 (SD=1.38).

The finding from this study is in line with findings of Chikumba and Ramussen at Malawi and Burkina Faso health institutions the LMIS reporting rate had poor data quality, calculation mistakes, and inaccurate data entry on stock-keeping records (2016). And also this finding is similar to the study done by (Teklegiorgis, et al, 2016) which showed that the level of data quality was low in all health facilities of Eastern Ethiopia. This can be due to the reason that LMIS at the facilities still depend on paper and the LMIS tools are not filled by properly trained personnel which affects the quality of used for decision making.

Pharmaceutical supply decisions are impacted by an inadequate and inappropriate LMIS, which leads to quantification, procurement, and distribution that are not based on real demand and either waste resources due to drug expiration or stock outs of essential items (USAID | DELIVER, 2011). Goh and Pinaikul also stated in their study that factors hindering logistics development include inefficient logistics information systems (1998).

4.4.4. Inventory Management Practices of NPDs

Table 8 Summary of responses on inventory management practices of NPDs

Inventory Management Practices of NPDs		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
There is SOP for managing inventory in the facility	Freq.	31	37	10	14	6	3.74	1.22
	%	31.6	37.8	10.2	14.3	6.1		
First-to expire, first-out (FEFO) inventory control procedure is used to manage and issue stock in the facility	Freq.	27	44	3	14	10	3.65	1.30
	%	27.6	44.9	3.1	14.3	10.2		
Damaged/expired products are physically separated from inventory and removed from stock records in the facility	Freq.	26	35	8	15	14	3.45	1.40
	%	26.5	35.7	8.2	15.3	14.3		
There is system for tracking product losses and other adjustments in the facility	Freq.	25	41	11	3	18	3.53	1.39
	%	25.5	41.8	11.2	3.1	18.4		
There are established procedures for placing emergency orders in the facility	Freq.	25	45	8	7	13	3.63	1.30
	%	25.5	45.9	8.2	7.1	13.3		
The facility record keeping is good (Bin card and model 19)	Freq.	30	39	7	5	17	3.61	1.42
	%	30.6	39.8	7.1	5.1	17.3		
Electronic inventory management system is well implemented in the facility	Freq.	24	40	8	15	11	3.52	1.32
	%	24.5	40.8	8.2	15.3	11.2		
Manual inventory management system is well implemented in the facility	Freq.	40	30	4	10	14	3.73	1.45
	%	40.8	30.6	4.1	10.2	14.3		
Physical inventory of NPDs is done monthly in the facility dispensary units	Freq.	25	44	3	25	1	3.68	1.15
	%	25.5	44.9	3.1	25.5	1.0		
Grand mean							3.62	0.10

Source: Researcher's Own (2023)

Table 8 shows that a total of 9 questions were used to assess the inventory management practice of NPDs in AARHBHs. The grand mean for the inventory management practices was 3.60 (SD=0.10). Most of the respondents "Agreed" for eight out of the nine questions that were used to analyze inventory management practices of NPDs. 3.74 (SD=1.22), 3.65 (SD=1.30), 3.45 (SD=1.40), 3.53 (SD=1.39), 3.63 (SD=1.30), 3.61 (SD=1.42), 3.52 (SD=1.32), and 3.68 (SD=1.15) were the mean and standard deviation-values of the respondents who agreed for that there is SOP for managing inventory in the facility, first-to expire, first-out (FEFO) inventory control procedure is used to manage and issue stock in the facility, damaged/expired products are physically separated from inventory and removed from stock records in the facility, there is system for tracking product losses and other adjustments in the facility, there are established procedures for placing emergency orders in the facility, the facility record keeping is good (Bin card, and model 19), electronic inventory management system is well implemented in the facility, and physical inventory of NPDs is done monthly in the facility dispensary units respectively. Whereas the respondents strongly agreed that manual inventory management system is well implemented in the facility with an average value of 3.73 (SD= 1.45).

The finding of this study is similar to the findings of (Bahiru and Tilahun, 2022) in that inventory management practice was performed well in the studied public health facilities. Whereas this result is contrary to the result of Bayked, Kahissay, and Workneh which showed that the inventory management, recording, and storekeeping practices were not satisfactory in the public health institutions of Dessie. Calculation fallacies, recording errors, improper stock levels maintenance, lack of automatic recording, fail to use FEFO inventory control procedure (2021). And also contrary to the finding of a study done at

health facilities of East Shewa Zone that the inventory management practice was found to be weak (Gurmu and Ibrahim, 2017).

4.4.5. Storage Condition Practices of NPDs

Table 9 Summary of responses on storage condition practices of NPDs

Storage Condition Practices of NPDs		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
This facility developed and regularly updated SOP related to storage practices to ensure proper storage	Freq.	9	10	15	62	2	2.61	1.02
	%	9.2	10.2	15.3	63.3	2.0		
In this facility the store room is maintained in good condition clean, dry, well ventilated and out of direct sunlight	Freq.	13	10	17	52	6	2.71	1.16
	%	13.3	10.2	17.3	53.1	6.1		
Fire safety equipment is available, functional and accessible in the storage rooms of the facility	Freq.	29	34	13	14	8	3.63	1.27
	%	29.6	34.7	13.3	14.3	8.2		
NPDs are stored, organized and arranged in a manner that is accessible for First-to-expire, First-out (FEFO) procedures and stock management in the facility	Freq.	31	41	11	10	5	3.85	1.13
	%	31.6	41.8	11.2	10.2	5.1		
Cold storages for NPDs are always maintained for as required in the facility	Freq.	11	9	12	60	6	2.58	1.11
		11.2	9.2	12.2	61.2	6.1		
Storage areas in the facility are accessible only to the authorized personnel and controlled substances are always stored in locked up storage	Freq.	30	33	8	22	5	3.62	1.27
	%	30.6	33.7	8.2	22.4	5.1		
There is separate place for unusable pharmaceuticals from usable pharmaceuticals in the	Freq.	33	39	10	2	14	3.77	1.33
	%	33.7	39.8	10.2	2.0	14.3		

facility								
The storage area in the facility is visually free and protected from harmful insects and rodents	Freq.	12	6	16	58	6	2.59	1.11
	%	12.2	6.1	16.3	59.2	6.1		
The current storage space and organization in the facility is sufficient for existing products and reasonable expansion (i.e. receipt of expected product deliveries for foreseeable future)	Freq.	15	15	23	41	4	2.96	1.17
	%	15.3	15.3	23.5	41.8	4.1		
In the facility Products are stored at the appropriate room temperature	Freq.	8	9	10	67	4	2.49	1.01
	%	8.2	9.2	10.2	68.4	4.1		
There is temperature monitoring thermometer for the fridges in the facility storage rooms	Freq.	25	35	8	26	4	3.52	1.25
	%	25.5	35.7	8.2	26.5	4.1		
Cartons are stacked at least 10 cm off the floor, at least 30 cm away from the walls and other stacks and no more than 2.5 meters high.	Freq.	26	44	13	10	5	3.78	1.11
	%	26.5	44.9	13.3	10.2	5.1		
Cartons and drugs are protected from water and humidity during all seasons	Freq.	17	46	12	12	11	3.47	1.24
	%	17.3	46.9	12.2	12.2	11.2		
Enough budget always allocated by this facility for renovating or renewing the store or for other related storage practices	Freq.	19	14	5	43	17	2.74	1.42
	%	19.4	14.3	5.1	43.9	17.3		
Grand Mean							3.17	0.12

Source: Researcher's Own (2023)

As shown in table 9, a total of 14 questions were used to assess storage condition practices of NPDs at AARHBHs. The grand mean for storage condition practices was 3.17

(SD=0.12). Out of the 14 questions respondents “Agreed” for 7 questions while “Disagreed” also for 7 questions. The respondents agreed for that fire safety equipment is available, functional and accessible in the storage rooms of the facility with a mean value of 3.63 (SD=1.27), NPDs are stored, organized and arranged in a manner that is accessible for First-to-expire, First-out (FEFO) procedures and stock management in the facility with a mean value of 3.85 (SD=1.13), storage areas in the facility are accessible only to the authorized personnel and controlled substances are always stored in locked up storage with a mean value of 3.62 (SD=1.27), there is separate place for unusable pharmaceuticals from usable pharmaceuticals in the facility with a mean value of 3.77 (SD=1.33), there is temperature monitoring thermometer for the fridges in the facility storage rooms with a mean value of 3.52 (SD=1.25), cartons are stacked at least 10 cm off the floor, at least 30 cm away from the walls and other stacks and no more than 2.5 meters high with a mean value of 3.78 (1.11), and cartons and drugs are protected from water and humidity during all seasons with a mean value of 3.47 (SD=1.24). Whereas, the respondents disagreed for that the facility developed and regularly updated SOP related to storage practices to ensure proper storage with a mean value of 2.61 (SD=1.02), in the facility the store room is maintained in good condition clean, dry, well ventilated and out of direct sunlight with a mean value of 2.71 (SD=1.16), Cold storages for NPDs are always maintained for as required in the facility with a mean value of 2.58 (1.11), the storage area in the facility is visually free and protected from harmful insects and rodents with a mean value of 2.59 (SD=1.11), the current storage space and organization in the facility is sufficient for existing products and reasonable expansion (i.e. receipt of expected product deliveries for foreseeable future) with a mean value of 2.96 (SD=1.17), in the facility Products are

stored at the appropriate room temperature with a mean value of 2.49 (SD=1.01), enough budget always allocated by this facility for renovating or renewing the store or for other related storage practices 2.74 (SD=1.42).

This study finding is in contrary to a study conducted by USAID/DELIVER at facilities in Ethiopia shows that, the storage condition for a significant percentage of health facilities did not meet the standard criteria (2015). And also the finding of this study is in contrary to (Solomon, 2017).

Each of the above stated storage principles are important for ensuring medicine quality, safety and also in limiting expiry. So most of them should be fulfilled in order to say that a facility fulfills good pharmaceutical storage practice.

In-depth interviews were performed with the pharmacy heads of the five health facilities. The questions focused on assessing the current practice of quantification/forecasting, procurement, LMIS, inventory management, storage conditions of NPDs giving emphasis to strength and limitations, including the main challenges on those practices in the facility. The key informants response is as follows:

H1, Pharmacy head

"Limitations in the quantification/forecasting practice is that the forecasting accuracy rate is so small which is below 75%. Mostly consumption method is employed. Procurement is done depending on the hospitals service demand, but there is over or under due to forecasting accuracy. Even if IFRR and RRF are filled there are still gaps due to high trained staff turnovers. The inventory management system is in a good position. Still now there is stock out of vital NPDs. Order fill rate is still low from the sole supplier because

we did not procure the exact required quantity. If a requested medicine is available at EPSS and there is no delay of request from the facility then the lead time is shorter."

"The main challenge of HCLMP of NPDs in our facility is that most patients use health insurance, price is collected by revolving drug fund so the hospital may not get the exact price of the sold medicine. But in the procurement process one of the big challenges is that pharmaceuticals procurement is not done by pharmacy professional and they are procured together with other equipment's or supplies (mass procurement) in the hospital by non-pharmacy professionals. We only support the process and provide what medicines we want to be procured. This leads to inaccuracy and poor quality procurement. Which can lead to problems is availability of medicines. So this should be given more emphasis. There is also a network connection problem in performing logistics activities digitally."

"There is transportation problem and no separate transportation to bring medicines from the supplier site. And also labor shortage to carry medicines from transport to stores. There is problem of delay in lead time for EPSS stock out medicines. As our hospital is just going to start a new forecasting tool since there is problem of forecasting inaccuracy in the existing tool from EPSS. And lastly there is also lack of commitment of pharmacy professionals on logistical activities."

H2, Pharmacy head

"One of the biggest challenge in the quantification/forecasting practice is that it is not done by well trained professional. And the quality of consumption based data from bin cards is very poor. As a strength previously forecasting was done only yearly by a tool from EPSA which uses only consumption and morbidity based data which has many challenges like pre-set price by EPSS only, only considers days out of stocks (no information

on expiry), but now a new updated forecasting tool from MOH is demand based quantification tool which is a best tool which allows us to forecast quarterly. Price is set by by the facility based on the current market price and it includes the expiry information."

"Storage space is still an issue, since not standardized and not enough. There is human resource shortage since staff allocation is not based on workload analysis. Enough budget is not also allocated for procuring NPDs in the facility, since much budget is allocated for medical equipment's. And availability of NPDs has been a challenge. In case of procurement as a challenge the way of procurement is not merely done based on ABC/VEN analysis mostly it is done by estimation. DSM officers day to day visit EPSS for availing pharmaceuticals since there is no enough stock at EPSS, since facilities are not getting the requested quantity, which is also due to the reason that facilities request NPDs when they completely stock out."

H3, Pharmacy head

"*It is difficult to get the requested quantity of NPDs on time. Even if the item is available at EPSS facilities do not find the requested quantity of medicines. This is availability issue causing variation in lead time, and also transportation issues in the facility. Affordability issue when buying from private suppliers when medicines are stock out of EPSS. There is also budget issue in procuring NPDs to go as planned. Non-EPSS items need longer time to procure due to lengthy procurement process and availability issues."*

"Even if activities' digitalization of LMIS makes work easier like to monitor stock status frequently, to monitor expiry. EMR which is a system which integrates various activities together also makes work easier. EMR and DAGU, Electronic Health Commodity Management System, are not integrated. But both systems are working in the store. DAGU is

local which remains only at stores and communicating with the sole supplier, while EMR integrates all activities from patient visiting card room to living the hospital and also stores with the dispensary units. Even if they both have their own benefits, it is one big problem the facility is facing which causes work load on the pharmacists by making them do one work twice which is repetition."

H4, Pharmacy head

"Regarding the strength With respect to quantification/forecasting was that proper training was taken by the DSM officer and the pharmacy head are training of trainers certified and perform quantification by a better tool from the previous, which is only recently updated by MOH, but previously it was done by a tool from EPSS which was EXCEL based. And the type of quantification most of the time used is consumption based, but morbidity type of quantification is used like in new service expansion areas like for the new oncology service. While one big weakness of facilities is that not performing quantification properly, this may mislead the sole supplier."

"Other weakness is that the difference in the two tools which are EPSS and MOH tools of quantification. The EPSS tool is filled with EPSS price only non-EPSS list is not included. While the MOH updated tool can include both EPSS and non-EPSS items and the price is also the current price in the hospital. And also some parameters are added like transfer from other facilities, wastage information and also source of supplier is included. This can be used for analyzing data in a better way. So this makes it a better tool."

H5, Pharmacy head

"Strengths in healthcare logistics management practices is that recently we have started to perform quantification/forecasting quarterly but previously it was done yearly. The big

limitation is that we are not availing NPDs based on the quantified/forecasted quantity. Since the procurement system with EPSS is credit if the NPD is available there, whereas EPSS stock out items are procured if external supplier once it is discussed and decided by DTC members. The problem while procuring from EPSS is that we don't get the exact requested quantity, whereas during procuring from another external supplier is that it takes longer time to avail the medicines at the required time. The LMIS practice and inventory management practice is somewhat good and we use both manual and electronic systems. There is lack of proper storage space and also there is shortage of trainings on logistics activities."

4.4.6. Challenges of healthcare logistics management practices of NPDs

Table 10 Summary of responses on challenges of healthcare logistics management practices of NPDs

Human resource challenges		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
Lack of adequately skilled and experienced professionals working on HCLM activities is a challenge in the logistics management of NPDs	Freq.	14	44	9	20	11	3.31	1.26
	%	14.3	44.9	9.2	20.4	11.2		
Lack of sufficient number of adequately skilled and trained personnel on HCLMP is a challenge in the logistics management of NPDs	Freq.	13	46	10	24	5	3.39	1.15
	%	13.3	46.9	10.2	24.5	5.1		
Lack of proper training on healthcare logistics activities is a challenge at the facility in the logistics management of NPDs	Freq.	12	48	14	19	5	3.44	1.09
	%	12.2	49.0	14.3	19.4	5.1		
Inadequate number of staffs working on HCLM activities is a challenge in the logistics management of NPDs	Freq.	16	32	21	19	10	3.26	1.24
	%	16.3	32.7	21.4	19.4	10.2		

Lack of awareness and understanding of the advantages of the proper management of the logistics of NPDs in the health facility is a challenge in the logistics management of NPDs	Freq.	10	50	12	21	5	3.40	1.09
	%	10.2	51.0	12.2	21.4	5.1		
Lack of commitment and support by the health facility top management is a challenge in the logistics management of NPDs	Freq.	12	26	27	23	10	3.07	1.19
	%	12.2	26.5	27.6	23.5	10.2		
Grand mean							3.31	0.07
Financial resource challenges		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
Insufficient budget is allocated by the government for procuring NPDs	Freq.	17	43	13	19	6	3.47	1.17
	%	17.3	43.9	13.3	19.4	6.1		
Lack of proper understanding of healthcare logistics costs during budget planning is a challenge in the logistics management of NPDs	Freq.	19	36	16	20	7	3.41	1.22
	%	19.4	36.7	16.3	20.4	7.1		
There is inefficient utilization of the allocated budget for availability of NPDs	Freq.	14	38	24	19	3	3.42	1.05
	%	14.3	38.8	24.5	19.4	3.1		
Grand mean							3.43	0.08
Infrastructure and information technology challenges		SA (5)	A (4)	N (3)	D (2)	SD (1)	Mean	SD
Lack of sufficient storage space to handle the current quantities of NPDs is a challenge in the facility	Freq.	21	38	8	21	10	3.40	1.31
	%	21.4	38.8	8.2	21.4	10.2		
The store is not equipped with standardized shelves for pharmaceuticals	Freq.	19	38	11	26	4	3.43	1.19
	%	19.4	38.8	11.2	26.5	4.1		
Lack of sufficient number of computers for warehouse management is a challenge in the logistics management of NPDs	Freq.	18	33	21	17	9	3.35	1.23
	%	18.4	33.7	21.4	17.3	9.2		
Lack of well-trained staff to use computers to perform their activities is a challenge in the logistics management of NPDs	Freq.	19	30	23	22	4	3.39	1.15
	%	19.4	30.6	23.5	22.4	4.1		

Warehouse activities are not automated in the facility	Freq.	20	33	16	23	6	3.39	1.22
	%	20.4	33.7	16.3	23.5	6.1		
Lack of up-to-date technology to apply for forecasting is a challenge in the logistics management of NPDs	Freq.	20	29	27	15	7	3.41	1.18
	%	20.4	29.6	27.6	15.3	7.1		
Lack of standard system to track expiry information on NPDs is a challenge in the facility	Freq.	22	27	25	20	4	3.44	1.17
	%	22.4	27.6	25.5	20.4	4.1		
Lack of consumption data summary of NPDs is a challenge in the facility	Freq.	16	31	23	22	6	3.30	1.17
	%	16.3	31.6	23.5	22.4	6.1		
Lack of adequate availability of NPDs is a challenge in the facility	Freq.	16	43	19	16	4	3.52	1.08
	%	16.3	43.9	19.4	16.3	4.1		
Decisions are not made based on available information is a challenge in the logistics management of NPDs	Freq.	15	42	19	16	6	3.45	1.12
	%	15.3	42.9	19.4	16.3	6.1		
Lack of adequate transportation to transport NPDs from the supply site to the facility is a challenge	Freq.	20	43	8	18	9	3.48	1.26
	%	20.4	43.9	8.2	18.4	9.2		
Grand mean							3.41	0.07

Source: Researcher's Own (2023)

Table 10 shows the main challenges that affect healthcare logistics management practice of NPDs in hospitals under the study. A total of six questions were used to assess human resource challenges. The grand mean for human resource challenges was 3.43 (SD=0.08). The majority of the respondents "Agreed" for five of the six questions. Lack of adequately skilled and experienced professionals working on HCLM activities is a challenge in the logistics management of NPDs was agreed by 3.31 (SD=1.26) of the respondents. Lack of sufficient number of adequately skilled and trained personnel on HCLMP is a

challenge in the logistics management of NPDs was agreed by 3.39 (SD=1.15) of the respondents. Lack of proper training on healthcare logistics activities is a challenge at the facility in the logistics management of NPDs was agreed by 3.44 (SD=1.09) of the respondents. Inadequate number of staffs working on HCLM activities is a challenge in the logistics management of NPDs was agreed by 3.26 (SD=1.24) of the respondents. Lack of awareness and understanding of the advantages of the proper management of the logistics of NPDs in the health facility is a challenge in the logistics management of NPDs was agreed by 3.40 (SD=1.09) of the respondents. While the majority of the respondents response was neutral for the question that lack of commitment and support by the health facility top management is a challenge in the logistics management of NPDs with a mean value of 3.07 (SD=1.19).

The finding of this study is in line with a study done in assessing Ghana's logistics management system that the proper use of medication, quantification, and availability at health facilities in developing nations were seriously impacted by a lack of appropriate skill, training gaps on the system, failing to deploy the necessary number of pharmacy professionals (Manso, Annan, and Anane, 2013). Similarly a study done in sub-Saharan Africa identified that there is a lack of human resource capacity and expertise skills to take care of all responsibilities is one of the main challenge within the national health systems which impact the supply chains (Schopperle, 2013). And also this finding is in line with the findings of a study done at Sub-Saharan African countries, public health facilities of East Wollega Zone, Ethiopia, and public hospitals in Tanzania (Kuteyi, and Winker, 2022; Tiye and Gudeta, 2018; Kagashe and Massawe, 2012; Aklilu and Dereje,

2022) that logistic skills level of personnel involved in medicine supply in the hospitals studied was poor, which highly affect the pharmaceuticals logistics system practice.

According to a report by (USAID/DELIVER, 2011) in Addis Ababa, accurate and effective logistics management requires knowledge of the stock status in order to make critical decisions about procurement and resupply of drugs as well as to maintain accountability and transparency. However, the report indicated that information was not always readily accessible or well-organized, which resulted in overstock, stock-outs, and medicine expiry. The main facility specific factors that influence the management of supply chain is support from management (Khizer et al., 2012).

As shown in table 10, three questions were used to assess financial resource challenges. The grand mean for financial resource challenges was 3.43 (SD=0.08). The majority of the respondents "Agreed" for the three questions. Insufficient budget is allocated by the government for procuring NPDs with a mean value of 3.47 (SD=1.17). Lack of proper understanding of healthcare logistics costs during budget planning is a challenge in the logistics management of NPDs with a mean value of 3.41 (SD=1.22) and there is inefficient utilization of the allocated budget for availability of NPDs with a mean value of 3.42 (SD=1.05). This finding is in line with the findings of Schopperle that inadequate budget allocation is one of the main challenges within the national health systems of Ghana which impact the supply chains (2013). Similarly a study found that inadequate financial allocation is a challenge in pharmaceutical logistics system which can be due to incomplete understanding of pharmaceutical logistics costs during budget planning and utilization (Mohammed, 2019).

The above table 10 also shows that eleven questions were used to assess infrastructure and information technology challenges. The grand mean for infrastructure and information technology challenges was 3.41 (SD=0.07). The majority of the respondents "Agreed" for all the eleven questions. Lack of sufficient storage space to handle the current quantities of NPDs is a challenge in the facility with a mean value of 3.40 (SD=1.31). The store is not equipped with standardized shelves for pharmaceuticals with a mean value of 3.43 (1.19). Lack of sufficient number of computers for warehouse management is a challenge in the logistics management of NPDs with a mean value of 3.35 (SD=1.23). Lack of well-trained staff to use computers to perform their activities is a challenge in the logistics management of NPDs with a mean value of 3.39 (SD=1.15). Warehouse activities are not automated in the facility with a mean value of 3.39 (SD=1.22). Lack of up-to-date technology to apply for forecasting is a challenge in the logistics management of NPDs with a mean value of 3.41 (SD=1.18). Lack of standard system to track expiry information on NPDs is a challenge in the facility with a mean value of 3.44 (SD=1.17). Lack of consumption data summary of NPDs is a challenge in the facility with a mean value of 3.30 (SD=1.17). Lack of adequate availability of NPDs is a challenge in the facility with a mean value of 3.52 (SD=1.08). Decisions are not made based on available information is a challenge in the logistics management of NPDs with a mean value of 3.45 (SD=1.12). Lack of adequate transportation to transport NPDs from the supply site to the facility is a challenge with a mean value of 3.48 (SD=1.26).

This study finding is similar to a study done in Sub-Saharan African countries that the most common logistics challenges that Sub-Saharan African countries face are weak and sometimes absence basic infrastructure, lack of enabling infrastructure (Kuteyi, and

Winker, 2022). The findings of (Chikumba and Ramussen, 2016) also showed that weak information communication technology in the Malawi and Burkina Faso health institutions is a challenge. Similarly a study done at Laos, Malaysia, Myanmar, Singapore, and Thailand outlined that lack of data standardization and poor IT infrastructure lead to poor operational IT management. National policy is impacted by the reliability of information and the operational use of data.

The infrastructure and policy of the country, including data standardization, have an impact on healthcare logistics and information and technology management must be the main focus areas of enhancing healthcare logistics performance (Kritchanchai, Hoeur and Engelseth, 2017). In adequate storage space is a major challenge in pharmaceutical logistics system in health facilities was found by the studies of (Mohammed, 2019; USAID/DELIVER, 2015). A study done at some South Africa hospitals showed that medicine orders made by unreliable consumption data by some hospitals caused shortage of medicines because insufficient quantities ordered (Modisakeng et al., 2020).

The respondents response which was collected from the questionnaires showed that there are also other major challenges that affect the HCLMPs of NPDs other than challenges stated by the researcher:

"In healthcare logistics management system drug shortage, data shortages, unavailability of NPDs in the market, inefficient management of the stock in facilities, lack of intervention, lack of quality report, transportation and chain of supplier, physician preferences of NPDs are major challenges in facilities." H5 (Hospital 5)

"There is rising risk in supply chain, increasing flight price, digital transformation, difficult demand forecasting and also market price variation." H5 (Hospital 5)

"If NPDs are stock out at EPSS, it takes longer process to avail the medicines on time because of lengthy procurement process of government which leads to longer lead time. It is not easy to buy medicines from suppliers like private community pharmacy." H5 (Hospital 5)

"Quality of storage space or inadequate storage space/warehouse and unavailability of medication in the country, vehicle shortage for pharmacy department, lack of pharmacist involvement in tender process (all activities are done by non-pharmacy (non-health care provider), budget allocation issue with current private sector pricing of NPDs does not go with the reality." H5 (Hospital 5)

"Insufficient supply of products, delay in product supply, unaffordability, lack of commitment of store managers & others, lack of labor for loading and unloading, and professionals lack of commitment and ignorance of logistics data management tools which makes it difficult for auditing NPDs." H4 (Hospital 4)

"There is communication gap between suppliers and facilities, in adequate planning and risk management in facilities, lack of proper forecasting/quantification, inability of EPSS to provide the requested quantity of drugs and in relation to private supplier facilities inability to pay its payment on time due to bureaucracy of the facility or budget shortage."H3 (Hospital 3)

"Since the electronic medical recording (EMR) is new some contents are missed, top management lack of control of medicine stores, the presence of only one sole supplier in the country, forecasting is made on estimation but not on the actual consumption, lengthy procurement process of pharmaceuticals (it takes up to a maximum of 4-6 months to pro-

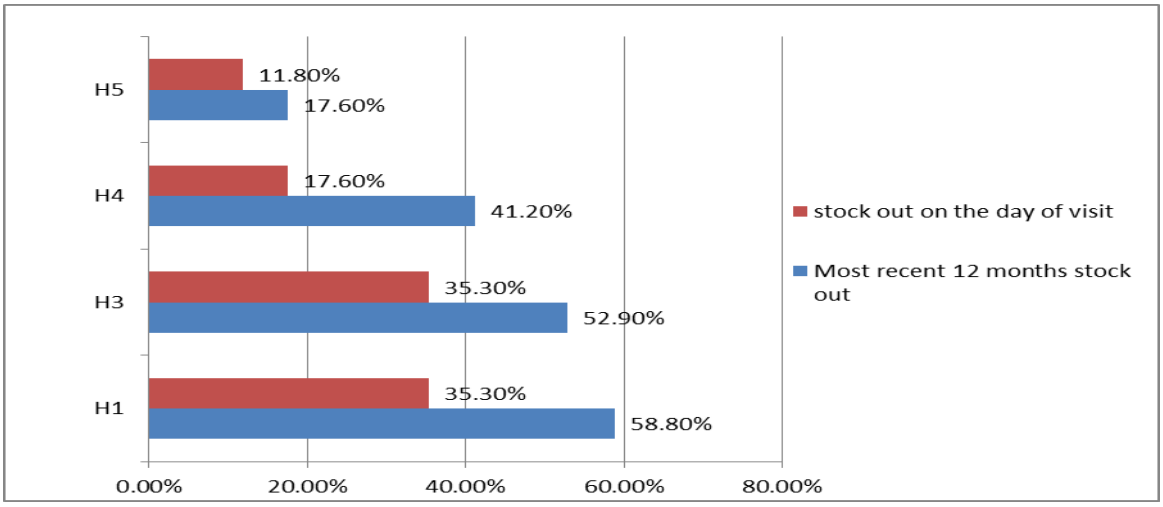
cure by open tender and avail essential NPDS if the medicine is stock out at EPSS." H2 (Hospital 2)

"World wide price inflation, inadequate budget allocation in relation to customer needs, non-flexible procurement policy, data for action and governance unit (DAGU) system interruption in the stores of facilities, poor store management, and delivery of near expiry items from supplier."H1 (Hospital 1)

4.4.7. Availability of Tracer NPDs

Observational checklist was used in order to assess the availability of 17 tracer NPDs at the hospitals. The checklist was only used to observe the stock status, number of stock-outs in most recent 12 months and stock-outs on the day of visit. The data was collected from both DAGU and manual bin card, depending on the availability. The observation was made on four hospitals, because of the unavailability of bin cards of some tracer NPDs at one of the hospital and full information was not found.

Figure 2 Percentage of most recent 12 months stock out tracer NPDs and stock outs on the day of visit (n=17)



Source: Researcher's Own (2023)

As shown in the above figure 2 at H1 (hospital 1) from the total of 17 NPDs 10 (58.8%) of the NPDs were stock out most recently (12 months). With varying frequency of stock outs ranging from 1-8 times. But from these 1 NPD was stock out throughout the year and 6 (35.3%) NPDs were stock out on the day of visit.

At H3 (hospital 3) from the 17 tracer NPDs 9 (52.9%) NPDs were stock out most recently (12 months) with 1-5 times frequency of stock outs throughout the year. And from those 2 tracer drugs were stock out throughout the year. 6 (33.3%) NPDs were stock out on the day of visit.

At H4 (hospital 4) the finding from the observational checklist showed that 7 (41.2%) of the tracer NPDs were stock out in most recent 12 months with 1 time frequency of stock out throughout the year. And 3 (17.6%) of the NPDs were stock out on the day of visit.

And finally the finding from H5 (hospital 5) showed that 3 (17.6%) of the NPDs were stock out most recent 12 months and only 1 NPD was stock out throughout the year. And only 2 (11.8%) of NPDs were stock out on the day of visit.

The reason for the stock outs of tracer NPDs as stated by the store managers were the same for the hospitals which was due to stock out of the medicines at EPSS and sometimes supply of near expiry medicines from EPSS. And also the minimum and maximum months of stocks for the tracer NPDs were also the same for all the facilities which is 2 months and 4 months respectively.

These finding is in line with the finding that significant challenge for the logistic system is limited availability, shortages, and stock outs of essential medicines as a result of stock outs, delivery near expiry items; delayed placing of delivery orders with limited supply at EPSS is a major obstacle for logistic system (Mohammed et al., 2020). Another study

showed that most of, 75% of health facilities found in Addis Ababa reported stock out of some NPDs on the day of visit, while 37.5% of them were overstocked for some NPDs (Mudzteba, 2014).

4.5. Inferential data analysis

This section presents inferential data analysis by using correlation and regression analysis and the results of statistical test, by using statistical software Excel and SPSS. Based on this, the outputs of the measurement of correlation and regression are discussed.

4.5.1. Correlation analysis

Correlation analysis is a statistical method used to measure the degree of relationship between two or more variables. Correlation analysis was performed between healthcare logistics management practices and its challenges in order to obtain the significance of relations among dependent and independent variables. “Correlation analysis uses correlation coefficient to indicate the strength and direction of the relationship, while the p-value indicates the relationship's significance” (Sharma, 2005). “The Pearson’s product-moment correlation coefficient (Pearson’s r) describes the linear relationship between two quantitative variables. The correlation coefficient (r) ranges from -1 to 1. A correlation coefficient of -1 indicates a perfect negative linear relationship. +1 indicates a perfect positive linear relationship, and 0 indicates no linear relationship. r=+ or - .10 to .29 is small, r=+ or - .30 to .49 is medium (moderate), r=+ or - .50 to 1.0 is large (strong)” (Cohen, 1988, pp.79-81).

The findings of the correlation matrix analysis between healthcare logistics management practices and human resource, financial resource and infrastructure and information technology challenges are shown in table 11 below.

Table 11 Summary of correlation test (Correlation Matrix) (N=98)

	HCLMP	**HRC**	**FRC**	**IITC**
HCLMP	Pearson Correlation	1		
	Sig. (2-tailed)			
HRC	Pearson Correlation	.422**	1	
	Sig. (2-tailed)	.000		
FRC	Pearson Correlation	.467**	.206*	1
	Sig. (2-tailed)	.000	.042	
IITC	Pearson Correlation	.555**	.103	.195
	Sig. (2-tailed)	.000	.313	.055
****. Correlation is significant at the 0.01 level (2-tailed).**				
***. Correlation is significant at the 0.05 level (2-tailed).**				

Source: Researcher's Own (2023)

As shown in the above table 11 the Pearson correlation coefficient between healthcare logistics management practices and human resource related challenge is 0.422(r=0.422), which is a moderate relationship with a significant value of p (0.000). With a Pearson correlation coefficient of 0.467 (r=0.467) and with a significant value of P (0.000), healthcare logistics management practices and financial resource challenge are moderately correlated. While there is high (strong) correlation between healthcare logistics management practices and infrastructure and information technology challenge with a Pearson correlation coefficient of 0.555 (r=0.555) and a significant value of p (0.000). On the other hand the correlation between human resource challenge and financial resource challenge 0.206 (r=0.206), human resource challenge and infrastructure and information technology challenge 0.103 (r=0.103) and financial resource challenge and infrastructure and information technology challenge is small 0.195 (r=0.195) with a significance value of P (0.042, 0.313 and 0.055) respectively. Based on the finding there is no negative cor-

relation between variables. All variables are correlated positively with healthcare logistics management practice with varying correlation strengths.

4.5.2. Regression analysis

Multiple regression analysis assesses the relationship between one dependent variable and several independent variables. It helps a researcher understand to what extent the change of the value of the dependent variable causes the change in the value of the independent variables, while other independent variables are kept unchanged (Wulder, 2005). Multiple regression provides information about the relative contribution of each of the variables that make up the model and the model as a whole (Pallant, 2011).

The relationship between healthcare logistics management practices and human resource, financial resource and infrastructure and information technology challenges were studied using multiple regression to know the magnitude of effect of independent variable on dependent variable; a p-value of less than 0.05 indicates that human resource, financial resource and infrastructure and information technology challenges have a statistically significant effect on healthcare logistics management practices.

Model for the linear regression: $Y = \beta0 + \beta1\ X1 + \beta2\ X2 + \beta3\ X3 + \epsilon$ where Y = HCLMP; β0= the y intercept when x is zero; β1, β2, β3, are regression coefficients of the following variables respectively; x1-HRC; x2-FRC; x3-IITC; ϵ is the error term

4.5.2.1. Test of assumptions of multiple regression

According to Tabachnick and Fidell, 2003 as cited by (Pallant, 2016), "there are some assumptions about the data that need to be met in order to make sure a strong fit of the regression model. The major assumptions for multiple regression include absence of multicollinearity of IVs, residuals should be normally distributed about the predicted depend-

ent variable scores, the residuals should have a linear (straight-line) relationship with the predicted dependent variable scores, the variance of the residuals about predicted dependent variable scores should be the same for all predicted scores (homoscedastic), absence of outliers, and independence of residuals."

4.5.2.2. Multicollinearity test

This refers to the relationship among the independent variables. Multicollinearity exists when there are high correlations between two or more independent variables (r=.9 and above). Since it can lead to confusing results, high correlation between independent variables is not required for a good fit of regression model. It is examined by Tolerance and VIF (variance inflation factor). A Tolerance value of less than 10% is very small, it indicates that the multiple correlation with other variables is high, suggesting the possibility of multicollinearity. And a VIF values (above 10) indicates the presence of multicollinearity (Pallant, 2016).

Table 12 Multicollinearity test of Ivs

Model	Tolerance	VIF
HRC	.954	1.049
FRC	.927	1.078
IITC	.958	1.044

Source: Researcher's Own (2023)

Dependent Variable: Healthcare Logistics Management Practice

The above table 12 shows that the tolerance values are greater than 10% and the VIF values are less than 10, so there is no multicolinearity problem of independent variables.

4.5.2.3. Normality test

Errors/residuals in multiple regression should follow a normal distribution, and a plot of the residual values should be near to a normal curve.

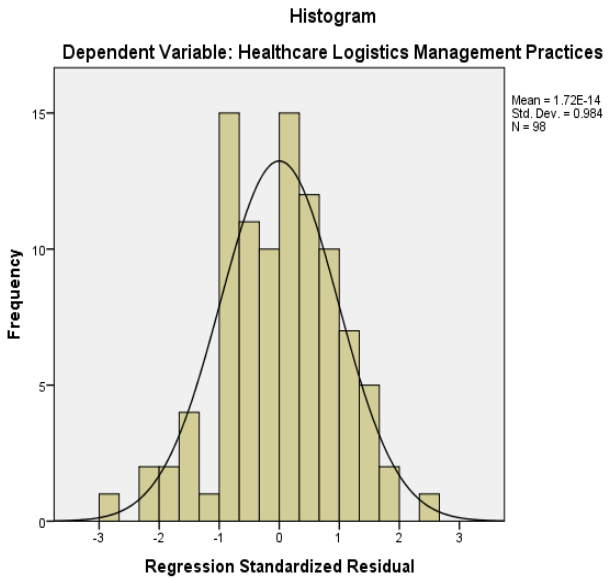
Table 13 Test of normality

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Studentized Residual	.062	98	.200*	.989	98	.634
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

Source: Researcher's Own (2023)

The results obtained from the Shapiro-Wilk test on the above table 13 showed that the significance is 0.634 which is greater than 0.05; therefore it can be concluded that the residual value is normally distributed.

Figure 3: Model Assumptions of Histograms



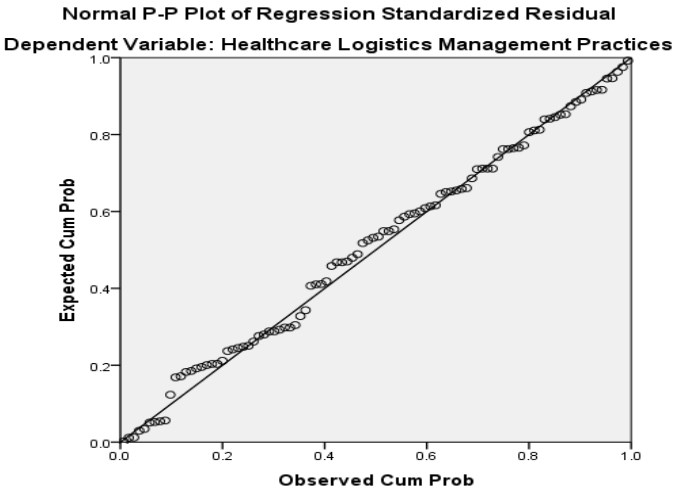
Source: Researcher's Own (2023)

According to the above histogram finding normality assumption was fulfilled since the histogram is bell-shaped.

4.5.2.4. Linearity test

The output figure 4 below showed that there a positive relationship between the dependent and independent variables. In the probability plot (p-p plot) dots lied almost exactly along the diagonal line from bottom left to top right since regression model assumes that the dispersion of points is linear.

Figure 4: Model Assumption of Linearity



Source: Researcher's Own (2023)

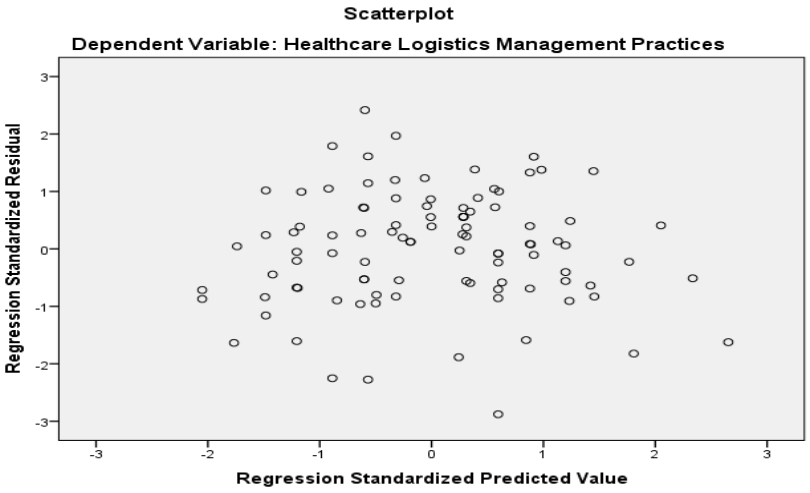
4.5.2.5. Test of independence observation

The assumption of independence assumes that no two observations in a dataset are related to each other in any way. Durbin-Watson coefficient is used to test the independence observations. Which mean residual are uncorrelated. Table 14 below shows that the Durbin-Watson coefficient was 1.341, which is a value near to 2 indicates no-auto correlation. This did not violate regression assumption significantly.

4.5.2.6. Test of homoscedasticity and outliers

"Homoscedasticity shows that the variance of the residuals is the same for all dependent variables and outliers are very high or very low scores with standardized residual values above about 3.3 (or less than –3.3)" (Fidell and Tabachnick, 2003). As shown in figure 5 below, the scatter plot shows that the residuals are roughly almost rectangulary distributed without forming a clear pattern and there are no standardized residual values above 3.3 or below -3.3. So these assumptions are also fulfilled.

Figure 5: Homoscedasticity assumption by scatterplot



Source: Researcher's Own (2023)

4.5.2.7. Evaluating the regression model

4.5.2.7.1. Coefficient of determination of R square

Table 14 Model summary (b) independent variables as predictors to Healthcare logistics management practices

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.730[a]	.533	.518	.10722	1.341

Source: Researcher's Own (2023)

a. Predictors: (Constant), Infrastructure and Information Technology Challenge, Human Resource Challenge, Financial Resource Challenge

b. Dependent Variable: Healthcare Logistics Management Practice

"R Square tells how much of the variance in the dependent variable is explained by the model" (Pallant, 2016). The above table 14 shows the prediction capability of the proposed model. Based on the result independent variables (human resource, financial resource and infrastructure and information technology challenge) are capable to predict healthcare logistics management practices which is indicated by the adjusted R square= 0.518. This means that the model explains 51.8 % variance in the dependent variable is explained by the independent variable. However, 48.2% of the variance in dependent variable is explained by other challenges which are not covered in the study.

4.5.2.7.2. ANOVA test

Table 15 ANOVA (a) independent variables as predictors to dependent variable

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1.235	3	.412	35.797	.000[b]
Residual	1.081	94	.011		
Total	2.315	97			

Source: Researcher's Own (2023)

a. Dependent Variable: HCLMPs

b. Predictors: (Constant), HRC, FRC, IITC

According to the above ANOVA test table, the regression model has a less than 0.001 chance of making a false prediction. This shows that the model is an appropriate predic-

tor of the effect of human resource, financial resource and infrastructure and information technology challenges on healthcare logistics management practices.

4.5.2.7.3. Coefficients results

Table 16 Coefficients (a) results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.366	.253		1.448	.151		
HRC	.216	.050	.310	4.292	.000	.954	1.049
FRC	.202	.047	.313	4.284	.000	.927	1.078
IITC	.353	.055	.462	6.415	.000	.958	1.044

Source: Researcher's Own (2023)

a. Dependent Variable: HCLMPs

The magnitude of influence between variables is measured by Standardized Coefficient Beta values, the higher the values indicate the strong the influence. Beta value measures the contribution of independent variable for prediction of dependent variable. The above table showed the effect of independent variable on dependent variable. The effect of the three IVs was significant. It shows that there is a statically significant relationship between HCLMPs and HRC, FRC and IITC with varying Beta values. Based on the Beta values, IITC significantly affects HCLMPs with a Beta value of (0.462, P=0.000<0.05), followed by FRC with a Beta value of (0.313, P=0.000<0.05) and HRC with a Beta value of (0.310, P=0.000<0.05).

Generally, the effect of the three independent variables was significant and the overall regression model expressed as:

The regression analysis formula with Beta coefficients is as follows:

$Y= 0.366 + 0.310\ (HRC) + 0.313\ (FRC) + 0.462\ (IITC) + 0.05\ \epsilon$

4.6. Qualitative findings

In this section the findings from the in-depth interviews of four focal persons from in-bound and outbound logistics of EPSS were discussed. The interview questions focused on the quality of reports on NPDs from AARHBHs, the major challenges that EPSS faces in terms of availing NPDs and assess the cause supply inconsistency of NPDs.

"RRF reports of NPDs from health facilities lack data quality; they sometimes don't even contain average monthly consumption (AMC). Availability is still a problem due to budget both at the facilities and EPSS, inappropriate requests from facilities and communication problems between facilities and supplier. Facilities do not provide reports on time. And also currency problems nationally. Mostly EPSS do not provide the requested quantity of NPDs, even if an accurate AMC is reported by the facility due to scarcity of resources nationally and the agency distributes NPDs for many facilities depending on service volumes. The main cause for the supply inconsistency of NPDs is unavailability of products nationally." — From the deputy director general of outbound logistics, focal person from the directorate of warehouse and inventory management

"*Data quality and visibility has always been a problem of facilities which affects forecasting accuracy, I personally do not believe that reports from facilities are prepared by taking adequate preparations because the reports lack most of the components. This finally leads to excess and shortages of medicines. There is always a doubt whether the requested quantity is the actual demand or not. Always the forecasting accuracy has been 75% and sometimes also below." — From the deputy director general of inbound logistics of EPSS, focal person from directorate of tender management*

"Currently we are facing a hard currency issue (foreign exchange) which makes it harder for us to avail NPDs at the required quantity and right time. As by the Ethiopian Food and Drug Authority (EFDA) directive every product entering to our country should be registered, but only less than 40% of the products are registered, so this is one big challenge EPSS is facing on most of the tender processes. On the other hand one challenge which affects availing NPDs on time is that local manufacturers manufacturing capacity has decreased from more than 20% to below 5%. The above stated challenges directly affect supply consistency of NPDs. Stakeholders like health bureau, MOH, EFDA, Commercial bank of Ethiopia (CBE) and the Ethiopian shipping lines (ESL) also have direct and indirect involvements in the consistency of supply of NPDs. And demand fluctuation of facilities from time to time is I believe the other cause of supply inconsistency of NPDs."—*From the deputy director general of inbound logistics of EPSS, focal person from directorate of tender management*

"Poor data quality of the reports from facilities is the biggest challenge which can lead to forecasting inaccuracy then over or under procurement and then finally which can affect the distribution error due to inaccurate data. As a country there is shortage of foreign currency which makes procurement of the required product harder. On time delivery of NPDs is affected by network problems internally and foreign currency externally." — From the deputy director general for outbound logistics of EPSS, focal person from director of distribution and flight management

"Financial capacity of facilities is the biggest challenge, since facilities purchase NPDs by credit they request again without paying the previous credit. Supply inconsistency of NPDs and on time unavailability of NPDs is caused by sea shipping takes longer time.

Hard currency shortage nationally is the other biggest challenge in availing NPDs. There is also contract management challenge since 3 months is given for the supplier to avail the product based on the contract agreement (Letter of credit)/CAD (cash against document), this expiry data is long. Sometimes it takes time to get vessel after purchasing the products and getting priorities to ship, there are many robust customer rules which need to be fulfilled to ship products, thus fulfilling this requirements also takes time. And the other is EFDA rules of inspection of shipped products to the country; they inspect NPDs both before and after entering into the country and then registering them also time taking process." — From the deputy general of inbound logistics, focal person from directorate of contract management

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Introduction

This chapter summarizes the major findings of the study, draw conclusions based on the findings, present recommendations and suggestions for future researchers on the area of healthcare logistics management practices.

5.2. Summary

The main objective of the study was to assess healthcare logistics management practices of NPDs and to identify their main challenges in hospitals under AACAHB. The data collected through structured questionnaire was analyzed by using both descriptive and inferential statistics. In order to describe the healthcare logistics management practices, which are quantification/forecasting, procurement, LMIS, inventory management and storage condition practices (dependent variable) and their main challenges which are human resource, financial resource and infrastructure and information technology challenges (independent variables) and to identify any causal links between the variables. The qualitative data was collected through questionnaire and in-depth interviews and analyzed thematically. Quantitative data was also collected through observational checklist. Based on the finding of the study most of the respondents were male 74 (75.5%) who were pharmacists working at various positions due to the nature of the problem.

The descriptive analysis of quantification/forecasting practice showed that the majority of the respondents disagreed for most of the good quantification/forecasting practice measurements with a grand mean of 2.68. From the total of 10 criteria's to assess procurement practice of NPDS, most of the respondents disagreed for the majority of the criteria's

with a grand mean of 2.61. The majority of the respondents also disagreed for most of the items which were used to measure LMIS practices with a grand mean of 2.95.

Most of the respondents agreed for having good inventory management practices with a grand mean of 3.62, which is high. And the majority of the respondents agreed for half of the good storage principles while the majority of the respondents disagreed also for half of the good storage principles with a grand mean value of 3.17.

Regarding the challenges of healthcare logistics management practices agreed for the presence of human resource challenges, financial resource challenges and infrastructure and information technology resource challenges with relatively high mean scores.

The findings of observational checklist which was used to assess the availability of tracer NPDs showed that most recent 12 months stock out of tracer NPDs were 58.85, 52.9%, 41.2% AND 17.6% while tracer NPDs which are stock out on the day of visit were 35.3%, 33.3%, 17.6% and 11.8% in the assessed health facilities. Whereas some tracer NPDs were stock out throughout the year. And the reason for the stock outs was due to stock out of the medicines at EPSS and sometimes supply of near expiry medicines from EPSS. And also the minimum and maximum months of stocks for the tracer NPDs were also the same for all the facilities which is 2 months and 4 months respectively.

The findings of inferential analysis showed that there is strong correlation between healthcare logistics management practice and infrastructure and information technology with a Pearson correlation coefficient of r=0.555 and a significant value of p (0.000). Whereas healthcare logistics management practice has moderate correlation with human resource challenges and financial resource challenges with a Pearson correlation coeffi-

cient r=0.422 and a significant value of p (0.000) and r=0.467 with a significant value of P (0.000) respectively.

The result of the regression model showed that an adjusted R square= 0.518, which means that the model explains 51.8 % variance in the dependent variable is explained by the independent variable.

Qualitative findings from key informants from EPSS in their interview stated that AAR-HBHs RRF reports lack data quality which affects forecasting accuracy is a major challenge. And also the reports are not sent on time which makes availing the requested quantity and availing NPDs on time harder; whereas the other major challenges that EPSS faces in terms of availing NPDs and the cause supply inconsistency of NPDs are there is hard currency problem nationally, absence on some products in the market, decrease of local manufacturers manufacturing capacity, facilities demand fluctuation, low financial capacity of facilities, contract management challenge with suppliers, problems like delay of product registration by EFDA, shipping delay, and lack of communication and collaboration among stake holders like health bureau, MOH, EFDA, CBE, ESL and also EPSS.

5.3. Conclusion

Essential medicines (both program and non-program) should always be available in a sufficient quantity for the functioning of a healthcare system. Both program and non-program pharmaceuticals should be managed properly for a better functioning of pharmaceutical logistics system. Many developing countries are influenced by scarcity of stock and stock outs of NPDs because of poor pharmaceutical supply system and NPDs take a large portion of healthcare budget. The management of all logistics activities within health facilities is necessary for NPDs to perform pharmaceutical logistics more effec-

tively since understanding and managing logistics practices can increase service effectiveness.

Based on the major findings of the study the following conclusions can be made: quantification/forecasting practice of NPDs in hospitals under AARHB shows that there is no documented policy or guideline for quantification/forecasting, action plan is not prepared for quantification, use centralized quantification, the time required for quantification is not estimated, facility specific medicine list is not developed, procurement period is not estimated, the effect of lead time is not considered, safety stock needed for each medicine is not calculated, medicines at risk for loss are not identified and their quantity is not adjusted, the results of quantification are not cross-checked, the facilities do not have updated SOP for procuring NPDs and mostly consumption method of quantification is used by the facilities. Whereas the facilities use computerized method of quantification, total procurement costs are estimated for budget planning and comparison of total costs with budget and adjustments are made and the facilities use morbidity method of quantification during service expansions.

The procurement practices of NPDs is not being processed based on procurement plan, procurement is not limited to medicine list of the facility, there is high level of bureaucracy for procuring NPDs in the facilities, medicines are not requested and delivered timely, the facilities does not have good working relations with suppliers, procurement related electronic data exchange of the facilities is not satisfactory, local suppliers services are not satisfactory to the facilities and the forecasting data are not appropriate which affect efficient and effective procurement. While in the facilities there is ABC/VEN classification for procurement and budget allocation.

Depending on the findings of the assessment of LMIS practice it can be concluded that there is no documented policy or guideline for managing LMIS in the facilities, the facilities use both automated and manual LMIS, but the LMIS do not accurately track inventory levels because of that the LMIS tools in the facilities are not filled by properly trained personnel, so the data has no quality and it is not reliable which finally makes the current LMIS employed by the facilities in appropriate and in effective. From the LMIS tools bin cards (in stores and dispensary units) and IFRRs are filled whereas stock record cards and RRFs are not filled.

Inventory management practices in the facilities is good that there is SOP for managing inventory in the facilities, FEFO inventory control procedures are employed to manage and issue stock, damaged/expired products are physically separated from inventory and are removed from stock records, there is a system for tracking product losses and other adjustments, there are established procedures for placing emergency orders, the facilities record keeping is good (bin cards, and model 19), both electronic and manual inventory management systems are well implemented, and physical inventory is done monthly in the facilities dispensary units.

Based on the findings of storage condition practices it can be concluded that there is functional and accessible fire safety equipment, NPDs are stored and organized in FEFO procedures, the storage areas are accessible only to the authorized personnel and controlled substances are always stored in lock, and there is a separate place for unusable pharmaceuticals from usable ones, even if there are thermometers in the storage rooms products are not stored at the appropriate room temperature, cartoons are stacked at least 10cm off the floor, at least 30cm away from the walls, and cartoons and drugs are pro-

tected from water and humidity during all seasons. Whereas there is no developed and updated SOP related to storage practices, the store rooms are not maintained in a good condition which is clean, dry, well ventilated and they are not out of direct sunlight, cold storages for NPDs are not always maintained, the storage areas in the facilities are not visually free and protected from harmful insects and rodents, products are not stored in appropriate room temperatures, the current storage space and organization in the facilities is not sufficient for existing products and reasonable expansion and enough budget is not allocated for renovating the stores.

Human resource, financial resource and infrastructure and information technology challenges are among the major challenges that affect healthcare logistics management practices. Other than challenges stated in the study other main challenges as stated by the respondents include: unavailability of NPDs in the market, increasing flight price, digital transformation, difficult demand forecasting and also market price variation, physician preferences of NPDs, lack of pharmacist involvement in tender process, insufficient supply of products, delay in product supply, unaffordability, lack of commitment of store managers & others, lack of labor for loading and unloading, and professionals lack of commitment and ignorance of logistics data management tools, there is communication gap between suppliers and facilities, in adequate planning and risk management in facilities, inability of EPSS to provide the requested quantity of drugs, supply inconsistency of NPDs and delivery of near expiry items from supplier affect healthcare logistics management of NPDs.

Findings of the observational checklist can be concluded there are still stock outs of tracer NPDs, even is tracer NPDs are essential and should always be available since they are

essential and lifesaving. In all the facilities there are stock outs of tracer NPDs due to stock outs at EPSS and sometimes supply of near expiry items is the cause of the stock outs in the facilities.

There is strong correlation between healthcare logistics management practice and infrastructure and information technology with a Pearson correlation coefficient of r=0.555 and a significant value of p (0.000). Whereas healthcare logistics management practice has moderate correlation with financial resource challenges and human resource challenges with a Pearson correlation coefficient r=0.467 and a significant value of p (0.000) and r=0.422 with a significant value of P (0.000) respectively.

Healthcare logistics management practice is strongly correlated with infrastructure and information technology challenges while moderately correlated with human and financial resource challenges as by the finding of correlation analysis. This means that infrastructure and information technology challenge highly affects healthcare logistics management practices followed by financial and then human resource challenges.

Based on the finding of the regression model 51.8 % variance in the dependent variable is explained by the independent variable, while the rest 48.2% of the variance in dependent variable is explained by other challenges which are not covered in the study.

5.4. Recommendation

Based on the result and conclusion of qualitative and quantitative findings the following recommendations are made

Recommendations for AACAHBHs

Hospitals under AACAHB should not perform quantification/forecasting based on experience, quantification/forecasting should be done based on nationally developed and

available policy or guideline by communication with the FMOH (federal ministry of health) for availing the guideline. This is expected to solve problems like forecasting error due to poor data quality. So generally the facilities should work on improving quantification/forecasting practice of NPDs.

Updated SOP for procuring NPDs should be made available by communicating with MOH. Every procurement procedure under the guideline should be strictly followed. The level of bureaucracy in procuring NPDs should be revised through discussion of health facilities with the concerned stakeholder. Hospital managements should allocate enough budget for procuring NPDs. So the facilities should work jointly for improving the procurement practices.

Procurement of NPDs should be done solely by pharmacy professional under pharmacy directorate. And also to prevent frequent stock outs as solution facilities should consider safety stocks while procuring to avoid the mentioned problems. And the method of open tender should be corrected because of mass purchasing system of medicines together with other medical supplies and equipment's in the facilities, which may lead to increased lead time for availing medicines.

The LMIS practice of the health facilities needs improvement since it is the back bone of other healthcare logistics activities. Documented policy or guideline to guide LMIS activities should be available; the LMIS tools like bin cards, IFRRs, RRFs, and stock records should be corrected filled and reports should be reported on time in order to increase data quality, reliability and effectiveness of the LMIS.

In the LMIS the facilities use both DAGU and EMR, so there should only be one system or these systems should be integrated. Even if EMR is being implemented there are prob-

lems and also still not paper free. Even if DAGU has been implemented for more than 12 years there is still paper work (manual) which makes work harder for the store managers. So if possible higher stake holders should work on integrating EMR and DAGU.

Since the findings the inventory management practices are good. The facilities should maintain this strength.

Medical stores are not given more emphasis which was a major challenge identified by the study. Medical stores of all the health facilities under AACAHB are narrow and old which are out of standard, this prevents from fulfilling the internationally accepted storage condition principles. So infrastructures around the medical store should be fulfilled and standardized. Enough budget should be allocated by the facility management for renovating or renewing the stores.

DTC plays a great role in the hospitals top decisions since it consists of multidisciplinary team, the facilities should establish a properly trained case team under the DTC, whose only responsibility is enhancing the quality of the logistics activities by closely following the practices the communicates with the hospital management and other stake holders outside the facilities and who presents periodic reports for better improvement of the logistics system.

Proper in-service trainings and seminars on healthcare logistics system activities and other capacity building trainings should be given, if possible also pre-service trainings for all healthcare professionals especially pharmacy professionals and the hospital higher management should be given by the collaboration of the facilities with MOH, federal technical and vocational education and training (FTVET) and health science colleges (HSCs).

Supportive onsite follow up, monitoring, evaluation and feedback of healthcare logistics activities should be provided by the facilities higher management and MOH.

On the basis of this study findings, since infrastructure and information technology challenges are highly affecting the healthcare logistics activities; the hospital managements should work on availing sufficient number of computers for warehouse management, all warehouse activities should be automated to increase data accuracy and to ease work, all the facilities should use the new forecasting tool provided by MOH, and separate trucks with sufficient number should be prepared for only transporting NPDs from the supplier site to the facilities.

And finally facilities should use NPDs wisely by avoiding wastages and also if possible it is recommended for the facilities to use alternative medicines whenever necessary when medicines stock out and also facilities should apply stock control mechanisms by using standard methods in forecasting the future requirements considering the stock-out periods, buffer stocks and the stock on hand.

Recommendations for government, EPSS and partners

Even if there are some improvements the availability of NPDs is still a challenge. EPSS needs to increase its ability to provide NPDs; hence the results of the study indicated that EPSS is not supplying NPDs as required.

EPSS is a single supplier of pharmaceuticals (supplies reagents, medical supplies/equipment and medicines) in our country, so if possible to decentralize EPSS, to decrease workload and to avail items better. Since working on one area might strengthen the facility. This issue needs big attention by the higher stake holders.

Enough budget should be allocated by government for procuring NPDs nationally since they are vital for saving human lives priority should be given.

As a solution since stakeholders like MOH, health bureau, EFDA, CBE, ESL and other partners who have direct or indirect involvements in availing NPDs on time, there should be inter and intra communication and collaboration in order to reduce and prevent supply inconsistency. And also frequent review meeting between supplier and facilities is necessary.

The market instability (inflation) is highly affecting the pharmaceutical system nationally as stated by the key informants, government should work on it. And also the country should work on hard currency issues,

Responsible stakeholders should work on minimizing the Letter of credit and Cash against document expiry date and also EFDA should work on minimizing the time it takes for inspection and registration of entered NPDs in the country.

5.5. Suggestion for further study

Since the study's scope is limited only to five hospitals which are only under Addis Ababa administration's health bureau, and the sample size is small. Considering those facts to some extent it might limit generalizability of the study. As stated in the study there are other healthcare logistics management practices, but this study only focused on five activities. And also as stated in the study based on prior research findings and findings of the qualitative analysis there are various challenges that affect healthcare logistics management practices, but under this study only three challenges were studied, which is shown by the findings of the statistical model that 51.8 % variance in healthcare logistics management practices is explained by the three challenges in this study, while the rest

48.2% of the variance is explained by other challenges which are not covered by this study. The study focused only on non-program drugs, by excluding other pharmaceuticals like program drugs, medical supplies/equipment's, and reagents.

Therefore, further research should be conducted by incorporating a larger sample size and other healthcare facilities, other pharmaceuticals, and also by increasing the number of dependent and independent variables.

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ANNEXES

ANNEX I: Questionnaire

Addis Ababa University School of Commerce

Department of Logistics & Supply Chain Management

Information sheet and Informed consent

Dear respondents,

My name is Eden Habte, I am a logistics and supply chain management Graduate class student at Addis Ababa University College of Business and Economics School of Commerce. Currently I am conducting a research with the title *"Healthcare logistics management practice of non-program drugs and their challenges in Hospitals under Addis Ababa City Administration Heath Bureau"*. The objective of this study is to assess healthcare logistics management practices of non-program drugs and to identify their main challenges in your institution. The information you are giving will be used for the partial fulfillment of the master's thesis. I assure you that the information you provide will be kept confidential and also you are not asked to provide the name of your institution. I ask your frank response for the success of the study.

I want to thank you in advance for your kind cooperation and dedication of your precious time to fill this questionnaire.

General Instruction:

A. Base your answers on your own actual work experiences

B. Please make tick mark (√) in the appropriate box or encircle your choices.

C. This questionnaire will take approximately 10 to 15 minutes based on your answers.

Please don't hesitate to contact me for any inquiry, I am available as per your need at mobile: 09-00021379 or e-mail: edenhabte14@gmail.com

SECTION 1: Socio-demographic Characteristics of Respondents

1. Sex Male ☐ Female ☐

2. Age Range 18-30 years ☐ 31-45 ☐ 46-55 ☐ Above 55 years ☐

3. Educational Level

- ☐ College certificate
- ☐ Diploma
- ☐ Bachelor degree
- ☐ Master's degree

Others, specify _____

4. Profession/ Qualification

- ☐ Medical doctor
- ☐ Pharmacy professional
- ☐ Laboratorist
- ☐ Nurse

Others, specify_____

5. What is your position in the organization?

- ☐ Medical director
- ☐ Pharmacy head
- ☐ DSM officer
- ☐ Store manager
- ☐ Procurement officer

Other, specify _____

6. Work Experience (in years)

- ☐ 1- 5 Years
- ☐ 6-10 Years
- ☐ Above 10 years

SECTION 2: Questions on Healthcare Logistics Management Practices (Quantification/Forecasting, Procurement, Logistics Management Information System (LMIS), Inventory Management and Storage Condition Management) of non-program drugs (NPDs).

For each statement on the left, please encircle one number which best describes the level of your agreement (1=Strongly Disagree (SD); 2=Disagree (D); 3=Neutral (N) (Neither agree nor disagree); 4=Agree (A) and 5=Strongly Agree (SA))

S.no	Healthcare Logistics Management Practices	Scale				
A	**Quantification/Forecasting practices of Non-program drugs (NPDs)**	**SD**	**D**	**N**	**A**	**SA**
1	There is documented policy or guideline for quantification/forecasting					
2	Action plan is prepared for quantification					
3	Decentralized quantification is used					
4	Use computerized method for quantification					
5	The time required for quantification is estimated					
6	Facility specific medicine list is developed and organized					
7	Procurement period is estimated					
8	The effect of lead time is considered					
9	Safety stock needed for each medicine is calculated					
10	Medicines at risk for loss are identified and their quantity is adjusted					
11	The results of quantification are cross checked					
12	Total procurement costs are estimated					
13	Comparison of total costs with budget and adjustments are made					
14	Consumption method of quantification is used					
15	Morbidity method of quantification is used					
B	**Procurement Practices of NPDs**	**SD**	**D**	**N**	**A**	**SA**
1	The facility has updated standard operating procedure (SOP) for the procurement of pharmaceuticals					
2	Procurement is being processed based on procurement plan					
3	Procurement is limited to the medicines list of the facility					
4	There is ABC/VEN classification for procurement and budget allocation in the facility					
5	There is always low level of bureaucracy at this facility for purchasing NPDs					
6	Medicines are requested and delivered timely					
7	The facility has good working relation with suppliers					
8	This facility effort to exchange procurement related documents and transactions with suppliers through Electronic data interchange (EDI) is satisfactory					

9	Local suppliers' services are satisfactory to the facility					
10	There is appropriate forecasting & follow up to procure efficiently and effectively in the facility					
C	**LMIS Practices of NPDs**	**SD**	**D**	**N**	**A**	**SA**
1	There is documented policy or guideline for managing LMIS in the facility					
2	The facility uses Automated Health Commodity Management Information System (HCMIS)					
3	The facility uses manual LMIS					
4	The LMIS accurately tracks inventory levels in the facility					
5	The current LMIS employed by this health facility is effective and appropriate					
6	The data from LMIS in the facility has quality and is reliable					
7	The LMIS tools in the facility are filled by properly trained personnel					
8	In the facility the logistics form: Stock record cards is filled					
9	In the facility the logistics form: Bin cards (in dispensary units) is filled					
10	In the facility the logistics form: Bin cards (in store) is filled					
11	In the facility the logistics form: IFRRs is filled					
12	In the facility the logistics form: RRFs is filled					
D	**Inventory Management Practices of NPDs**	**SD**	**D**	**N**	**A**	**SA**
1	There is SOP for managing inventory in the facility					
2	First-to expire, first-out (FEFO) inventory control procedure is used to manage and issue stock in the facility					
3	Damaged/expired products are physically separated from inventory and removed from stock records in the facility					
4	There is system for tracking product losses and other adjustments in the facility					
5	There are established procedures for placing emergency orders in the facility					
6	The facility record keeping is good (Bin card, and model 19)					
7	Electronic inventory management system is well implemented in the facility					
8	Manual inventory management system is well implemented in the facility					
9	Physical inventory of NPDs is done monthly in the facility dispensary units					
E	**Storage Condition Practices of NPDs**	**SD**	**D**	**N**	**A**	**SA**
1	This facility developed and regularly updated SOP related to storage practices to ensure proper storage					

2	In this facility the storeroom is maintained in good condition clean, dry, well ventilated and out of direct sunlight					
3	Fire safety equipment is available, functional and accessible in the storage rooms of the facility					
4	NPDs are stored, organized and arranged in a manner that is accessible for First-to-expire, First-out (FEFO) procedures and stock management in the facility					
5	Cold storages for NPDs are always maintained for as required in the facility					
6	Storage areas in the facility are accessible only to the authorized personnel and controlled substances are always stored in locked up storage					
7	There is separate place for unusable pharmaceuticals from usable pharmaceuticals in the facility					
8	The storage area in the facility is visually free and protected from harmful insects and rodents					
9	The current storage space and organization in the facility is sufficient for existing products and reasonable expansion (i.e. receipt of expected product deliveries for foreseeable future)					
10	In the facility Products are stored at the appropriate room temperature					
11	There is temperature monitoring thermometer for the fridges in the facility storage rooms					
12	Cartons are stacked at least 10 cm off the floor, at least 30 cm away from the walls and other stacks and no more than 2.5 meters high.					
13	Cartons and drugs are protected from water and humidity during all seasons					
14	Enough budget always allocated by this facility for renovating or renewing the store or for other related storage practices					

SECTION 3: Questions on challenges of Healthcare Logistics Management Practices (HCLMP) of Non-program drugs (NPDs).

For each statement on the left, please encircle one number which best describes the level of your agreement (1=Strongly Disagree (SD); 2=Disagree (D); 3=Neutral (N) (Neither agree nor disagree); 4=Agree (A) and 5=strongly Agree (SA))

	Challenges of HCLMP of NPDs	**Scale**				
A	**Human resource challenges**	**SD**	**D**	**N**	**A**	**SA**
1	Lack of adequately skilled and experienced professionals' working on HCLM activities is a challenge in the logistics management of NPDs					
2	Lack of sufficient number of adequately skilled and trained personnel on HCLMP is a challenge in the logistics management of NPDs					
3	Lack of proper training on healthcare logistics activities is a challenge at the facility in the logistics management of NPDs					
4	Inadequate number of staffs working on HCLM activities is a challenge in the logistics management of NPDs					
5	Lack of awareness and understanding of the advantages of the proper management of the logistics of NPDs in the health facility is a challenge in the logistics management of NPDs					
6	Lack of commitment and support by the health facility top management is a challenge in the logistics management of NPDs					
B	**Financial resource challenges**	**SD**	**D**	**N**	**A**	**SA**
1	Insufficient budget is allocated by the government for procuring NPDs					
2	Lack of proper understanding of healthcare logistics costs during budget planning is a challenge in the logistics management of NPDs					
3	There is inefficient utilization of the allocated budget for availability of NPDs					
C	**Infrastructure and information technology challenges**	**SD**	**D**	**N**	**A**	**SA**
1	Lack of sufficient storage space to handle the current quantities of NPDs is a challenge in the facility					
2	The store is not equipped with standardized shelves for pharmaceuticals					
3	Lack of sufficient number of computers for warehouse management is a challenge in the logistics management of NPDs					
4	Lack of well-trained staff to use computers to perform					

	their activities is a challenge in the logistics management of NPDs					
5	Warehouse activities are not automated in the facility					
6	Lack of up-to-date technology to apply for forecasting is a challenge in the logistics management of NPDs					
7	Lack of standard system to track expiry information on NPDs is a challenge in the facility					
8	Lack of consumption data summary of NPDs is a challenge in the facility					
9	Lack of adequate availability of NPDs is a challenge in the facility					
10	Decisions are not made based on available information is a challenge in the logistics management of NPDs					
11	Lack of adequate transportation is a challenge to transport NPDs from the supply site to the facility					

1. What are the major Healthcare logistics management related challenges for NPDs in the facility?

_____

_____

_____

_____

ANNEX II: Observational checklist

SECTION 4: Observational Check list

On top of this, I would like to actually observe the stock status of the selected tracer NPDs

Preparation: Be sure you have access to electronic or manual bin cards, and store managers

Column:

1. List the TD

2. Check if the bin card is available, answer Y for yes or N for no.

3. Check if the bin card had been updated within the last 30 days, answer Y for yes or N for no. Note: If the bin card was last Updated with the balance of 0 and the facility has not received any resupply, consider the bin card up-to-date.

4. Record if the facility has had any stock out of the product during the most recent 12 full months before the survey, answer Y for yes or N for no. Note: If the answer to column 2 is N, record NA in this column.

5. Record how many times the product stocked out during the most recent full 12 months before the survey. Note: If the answer to column 2 is N, record NA in this column.

6. Record the number of months the issued data represents. Note: If column 2 is N, record NA in this column.

7. Record if the facility is experiencing a stock out of the product on the day of the visit, answer Y for yes or N for no.

Maximum months of stock_____ Minimum months of stock _____

Note: For any product that experienced a stock out in the last 12 months (including the day of the visit), please note reasons.

No	Tracer NPDs	Bin card available?(Y/N)	Bin card updated?(Y/N)	Stock-out most recent 12 months? (Y/N)	Number of stock-outs (most recent 12 month)	Number of months of issue data available(#)	Stock-out today? (Y/N)
	1	2	3	4	5	6	7
1	Gentamycin injection						
2	ORS + Zinc sulphate						
3	Iron + Folic acid						
4	Albendazole/Mebendazole/sus/tab						
5	TTC eye ointment						
6	Co-trimoxazole 240mg/5ml						
7	Amlodipine tablet						
8	Frosemide tablet						
9	Metformin tablet						
10	Normal saline 0.9%						
11	40% glucose						
12	Adrenaline injection						
13	Tetanus anti toxin(TAT) injection						
14	Omeprazole capsule						
15	Metronidazole capsule						
16	Ciprofloxacin tablet						
17	Hydralyzine injection						
Comments:							

ANNEX III: Interview guide

Section 5: Interview guide for Pharmacy head

Introduction

I want to thank you for taking the time to meet with me today. My name is Eden Habte. I am a post graduate student of Addis Ababa University College of Business and Economics School of Commerce. Currently I am conducting a research with the title *"Healthcare logistics management practice of non-program drugs and their challenges in Hospitals under Addis Ababa City Administration Heath Bureau"*. The objective of this study is to assess healthcare logistics management practices of non-program drugs (NPDs) and to identify their challenges in your institution. The information from this study will give out the current situations of healthcare logistic management practice of NPDs in hospitals under Addis Ababa City Administration Health Bureau and will identify gaps in the healthcare logistics management system. The findings from this study can also be useful for health facilities, respective health bureau and other stakeholders on how to improve logistic management practices of NPDs.

The interview should take less than an hour. The information you are giving will be used for the partial fulfillment of the master's thesis. I will be taking some notes and also I will be taping during the session so as not to miss any of your comments. I assure you that all responses you provide will be kept confidential. This means that any information I include in my report will not identify you as the respondent. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time. I ask your frank response for the success of the study.

1. Back ground information of the key informant

1.1 Age range 18-30 years ☐ 31-45 ☐ 46-55 ☐ Above 55 years ☐

1.2 Highest level of education…….

1.3 Total work experience……..

1.4 Job title/Qualification……

2. Guiding questions for in-depth interview with head of pharmacy

1. How do you assess the current practice of healthcare logistics management of NPDs in your health facility giving emphasis to the strengths and limitations?

Probing (1): With respect to activities:

a. Quantification/Forecasting

b. Procurement

c. LMIS

d. Inventory management

e. Storage conditions

2. What are the main challenges of HCLMP of NPDs in your facility?

Probing (1): With respect to:

a. Human resource

b. Financial resource

c. Infrastructure and information technology

Others specify_____

3. Guiding questions for in-depth interview with key informants from EPSS/to identify the main challenges from the sole supplier perspective.

1. How do you assess the current situation of data quality regarding reports on NPDs from AARHBHs? Do they use all the components?

2. What are the major challenges that you face in terms of availing NPDs to AARHBHs?

3. What do you think cause supply inconsistency of NPDs?

Thank you for you cooperation!!