# PHARMACEUTICALS INVENTORY MANAGEMENT PRACTICES, CHALLENGES AND PERFORMANCE OF PUBLIC HEALTH FACILITIES IN MEKELLE ZONE, TIGRAY REGIONAL STATE, ETHIOPIA

**By**

**Kiflom Solomon (BPharm)**

**A Thesis Submitted to School of Pharmacy, Department Of Pharmaceutics and Social Pharmacy for Partial Fulfillment of the Requirements for the Degree of Master of Science in Health Supply Chain Management**

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**Addis Ababa, Ethiopia**

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# Addis Ababa University

## School of Graduate Studies

This is to certify that the thesis prepared by Kiflom Solomon, entitled "*Pharmaceuticals Inventory Management Practices, Challenges andPerformance of Public Health Facilities in Mekelle Zone, TigrayRegional State, Ethiopia"* is submitted in partial fulfillment of the requirements for the degree of Master of Science in Health Supply Chain Management**.** It complies with the regulations of the university, and meets the accepted standards with respect to originality and quality.

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# Abstract

Pharmaceuticals Inventory Management Practices, Challenges and Performance of Public Health Facilities in Mekelle Zone, Tigray Regional State, Ethiopia.

**Kiflom Solomon**

**Background:** Effective inventory management is essential for enhancing the quality of healthcare services in the pharmaceutical supply system. Conversely, poor inventory management can result in wastage of financial resources, shortages or overage of essential medicines, and ultimately, a reduction in healthcare service quality.

**Objective:** To assess the pharmaceuticals inventory management performances of Public Health Facilities (PHF) located in Mekelle zone, Tigray regional state northern part of Ethiopia.

**Method:** A cross-sectional study was conducted in 15 PHF of Mekelle zone from February 01 to March 30, 2021. Qualitative data for selected indicators of inventory management performancewas collected using semi-structured questionnaire customized from USAID|DELIVER's deliver logistic indicators assessment tool and logistics system assessment tool (LIAT and LSAT). Interview data was collected using key informant interview. Descriptive statistics were used to analyze the data, and the collected key informant interview data was analyzed manually.

**Results**: A set of standard indicators measured inventory management performance of PHF. Logistic forms and reporting formats had 60% implementation status. Of the 40 selected EMs and tracer medicines, 16.75% were stocked at Min-Max level, 28.13% were overstocked, and 33.3% were understocked. Nearly half of EMs and tracers were stock out at the day of visit, 30.73% were stock out in past 6 months, with average stock out days of 54.38. Wastage rate in 15 PHFs was 2.69%. 7 (46.67%) of facilities complied with good storage practices. Lead time for resupply of the study PHF from EPSS varied from weekly to a month. This study also explored the challengesof pharmaceutical inventory practice. Some of these include: high turnover of skilled pharmacy professional, absence of standardized warehouse facilities, poor coordination among stakeholders in the supply system, budget constraints, lack of a strong monitoring and evaluation system, and poor motivation and commitment among facility managers and pharmacy staff.

**Conclusion:** The findings of this study indicate that logistic forms and reporting formats were not fully available, updated and accurate in the study PHF. Furthermore, a significant proportion of essential medicines and tracer medicines were stock out, with longer durations of stock out days in the six months period. Additionally, majority of study PHF did not meet the requirements for proper storage conditions. In conclusion, the study highlights inadequate inventory management practices among the studied PHF.

**Recommendation**:Health facilities in Tigray region are recommended to implement and utilize the electronic stock management tool (HCMIS) in a more efficient manner to enhance transparency and information sharing, minimize wastage, reinforce stock recording practices, increase pharmaceutical availability, and elevate the quality of healthcare services.

**Key words:** Inventory management, Performance, PHF, Mekelle.

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# Abbreviation and Acronyms

| | | |
|---|---|---|
| **AIDS** | - | Acquired Immune Deficiency Syndrome |
| **APTS** | - | Auditable Pharmaceuticals Transactions and Services |
| **EDTA** | - | Ethylene Diamine Tetra Acetic Acid |
| **CEO** | - | Chief Executive Officer |
| **CSA** | - | Central Statistical Agency |
| **E.C** | - | Ethiopian Calendar |
| **FMOH** | - | Federal Ministry of Health |
| **FEFO** | - | First Expired First Out |
| **FIFO** | - | First In First Out |
| **HIV** | - | Human Immune Virus |
| **IFRR** | - | Internal Facility Request and Report Form |
| **IPLS** | - | integrated pharmaceutical logistics system |
| **LIAT** | - | Logistics Indicator Assessment Tool |
| **LIFO** | - | Last in First Out |
| **LMIC** | - | Low and middle income countries |
| **LMIS** | - | Logistics Management Information System |
| **LSAT** | - | Logistics System Assessment Tool |
| **MAX-MIN** | - | Maximum Minimum Stock Level |
| **HCMIS** | - | Health Commodity Management Information System |
| **EPSS** | - | Ethiopian Pharmaceutical Supply Service |
| **RRF** | - | Request and Report Form |
| **RHZE** | - | Rifampicin Isoniazid Pyrazinamide Ethambutol |
| **SSA** | - | Stock Status Analysis |
| **SOP** | - | Standard Operating Procedure |
| **UN** | - | United Nations |
| **VEN** | - | Vital Essential, Non-Essential |
| **WHO** | - | World Health Organization |

# CHAPTER ONE

# 1. INTRODUCTION

*This chapter presents the background of the study, statement of the problem, objectives of the study, research questions, significance and scope of the study.*

## 1.1. Background of the study

Pharmaceuticals are expensive and valuable resources in any healthcare program. Therefore, they must be managed effectively and efficiently in all levels of the supply chain to ascertain the availability of quality health commodities at all times. Effective and efficient drug supply management is important to ensure the cost-effective distribution of pharmaceuticals given that the cost of medicines is often high and mismanagement results in wastage, stock-out and pilferage. Moreover, there is a need for efficient management of the drug supply cycle to prevent stock out and all types of wastage, including shrinkage and expiries (Nakyanzi, Kitutu&Fadhiru, 2010).

Chronic, non-communicable diseases (NCD) currently account for more than 60% of all deaths worldwide, of which the vast majority occur in low and middle income countries (LMIC). According to the World Health Organization-NCD country profile of 2014, NCDs are estimated to account for 30% of deaths in Ethiopia. In this report, cardiovascular diseases accounted for 9%, cancers for 6% and respiratory disease for 3% of all causes of death. Furthermore, diabetes accounted for 1%, injuries for 10% and other NCDs for 11% of causes of deaths in the same year(Draft, 2014)**.** However, the essential medicines required to treat such priority health problems are not available on a continuous basis in all PHF. Weaknesses in the governance of the pharmaceutical sector are believed to contribute to most of the challenges to the continuous availability of essential medicines (Tadeg, Ejigu&Geremew, 2014).

In addition, protecting stored items from loss, damage, theft, or wastage and managing the reliable movement of supplies from source to user in the most economical and expeditious way are the key storage management activities. Therefore, a well-located, well-built and secured storage is an essential component of a pharmaceutical supply system that affects directly inventory management performance. Additionally, Proper inventory of drugs in a good way, right time, right quantities, and right quality and at affordable cost in medical store is very crucial

as drugs save lives of humans (Kokilam, Joshi & Kamath, 2015; For & Integrated, 2014). According to this study, reviewing expensive drugs was revealed to account in saving 20% of the total budget for pharmacy storage management (Kokilam, Joshi & Kamath, 2015).

One of the basic concerns of hospital management is the issue of medicines expenditures especially for the pharmacy managers; since most of the time financial resources are limited. In health care systems, availability of essential medicine at all times in adequate amounts, appropriate dosage, at affordable price for the individual client play a decisive role and have made a significant contribution towards improving the health status of populations over time. Therefore, ensuring high quality health service provision and improving the health of patients is their concern. However, On average 24.9 % of total health expenditure is spent on medicines, with a wide range from 7.7% to 67.6% and the World Medicines Situation report showed that the proportion spent on medicines is higher in low per capita income countries (WHO, 2011).

Inventory management is one of the components of logistics functions and it is the heart of the pharmaceutical supply system. Moreover, the major aims of inventory management and the healthcare supply chains are reducing the health care cost without affecting the quality of the service to the patient by improving efficiency and productivity of the healthcare system (Ali., 2011).

For some developing countries, especially those in Africa, the challenges are even more acute. Low-income countries face the prospect of not only an increase in the burden of chronic diseases, but also the ongoing burden of treating illnesses such as AIDS, TB, malaria and other infectious diseases, the so-called "*double burden*". In countries with high rates of these infectious diseases, the proportion of health resources spent on anti-infective medicines is likely to rise as patient numbers continue to rise and resistance to treatment expands. Furthermore, as new medicines are developed and better health systems are established, the continuing demand for anti-infective medicines will create even more competition for limited resources (WHO, 2011).

The highest hospital budget for buying pharmaceuticals, maintaining smooth and uninterrupted supply of the required stock should be the most important task of health facilities (Ali., 2011; Dwivedi, Kumar &Kothiyal, 2012). In addition, keeping a close supervision on important

drugs, prevention of pilferage, and priority setting in purchasing and distribution of drugs are also vital issues of hospital and pharmacy managers (Dwivedi, Kumar &Kothiyal, 2012). Therefore, this study will try to assess and identify the key factors affecting inventory management performance of PHF in Mekelle Zone Tigray, Ethiopia.

## 1.1. Statement of the problem

Managing inventory is essential for the supply systems of pharmaceuticals because it involves overseeing the regular process of ordering drugs. It helps to ensure a steady supply for patients, avoid product shortages and reduce inventory costs(Kefale and Shebo, 2019a). It also affects the quality of healthcare by influencing three key aspects of drug supplies used in health facilities: availability, safety and cost. These are the main factors that determine the quality of care and patient satisfaction with public health services (Saha and Ray, 2019).

Inventory management remains a significant challenge for health systems and hospitals in Africa, hindering their ability to effectively manage medicines and improve health outcomes.Poor inventory management may result in overstocking or understocking of EMs, resulting in resource waste and increased morbidity and mortality owing to a lack of life-saving medications(Kefale and Shebo, 2019a). A study conducted in Kenya highlighted the difficulties faced by pharmaceutical services in ensuring the continuous availability of drugs, as well as the issues of stock outs and expired medications(Odhiambo and Kihara, 2018). Similarly, a study in Uganda identified several factors contributing to stock outs, including inadequate quantification of morbidity and consumption methods during drug requisitions, distribution delays, and the provision of short shelf life or less consumable medicines.(Care *et al.*, 2015).

In Ethiopia, Essential Medicines (EMs) stock out is still a prevalent problem, with varying degrees from facility to facility, ranging from 26% to 91%. The primary reason cited for the availability challenges is poor inventory management practices, including inadequate storage, ineffective stock management, and long periods of essential drug stock outs (Gurmu and Ibrahim, 2017a; Kefale and Shebo, 2019a; MekashawBayked, Haile Kahissay and DemekeWorkneh, 2021). This resulted in wastage or blockade of financial resources, irrational utilization of drugs, shortage or overage of essential medicines resulting in expiration, increase in holding cost, and reduction in enterprise's flexibility and decline in quality of healthcare service.

These inefficiencies have highly compromised access to essential medicines and health services (Adinew, 2015).

Despite the fact that, the FMOH, EPSS and other partners have taken different initiatives and institutional reforms on PHF, the problem of inventory management performances are not improved as required. Moreover recent studies have showed that availability of medicines is low (65%), storage condition (55%) which is below the minimum score of the standard (80%), and high wastage due to expiration (0.5% to 9%) at health facilities (above the maximum standard <2%) (Shewarega et al., 2015). Hence, it requires further investigation in order to identify the underlining gaps.

Few studies are conducted in assessing the inventory performance of health facilities in the different part of Ethiopia [Gondar, Adama, Bahirdar), however the low availability of essential medicines and inventory performance is the most problem of the public sector and the scope of the problem is different from setting to setting. Hence, it is crucial to assess inventory management performance of PHF in Mekelle zone, Tigray region, Ethiopia using various indicators like stock out rate, inventory accuracy rate, logistic record updating practices, medicines wastage rate, value of unusable stock and storage condition of health facilities.

## 1.2. Objectives of the study

### 1.2.1. General Objective

- ✓ To assess the inventory management performances of pharmaceuticals and its associated factors in PHF at Mekelle Zone, Tigray, Ethiopia.

### 1.2.2. Specific Objectives

- ✓ To assess the inventory management practice among PHF in Mekelle Zone.
- ✓ To determine the inventory management performance among PHF in Mekelle Zone.
- ✓ To identify factors affecting inventory management practice of PHF in Mekelle Zone
- ✓ To identify challenges of inventory management performance among PHF in Mekelle Zone.

## 1.3. Research Questions

- ✓ What are the inventory management practices among PHF in Mekelle Zone?

- ✓ What are the inventory management performances among PHF in Mekelle Zone?
- ✓ What are the factors that affect inventory management practice of PHF in Mekelle Zone?
- ✓ What are the challenges of inventory management performance among PHF in Mekelle Zone?
- ✓

## 1.4. Significance of the Study

The primary objective of this research is to evaluate the inventory management performance of public hospitals located in the northern part of Ethiopia's Tigray regional state using various measuring indicators. The study aims to identify gaps and provide specific information on the current inventory management practices to assist pharmacists, health supply chain managers, and health facility administrators in taking corrective measures as necessary. Additionally, the findings will guide policy makers in supporting suitable system development for pharmaceutical inventory management in the supply chain performance. The research will also benefit pharmaceutical managers and suppliers in gaining a better understanding of the outcome of proper inventory management practices in the supply chain. Furthermore, the study aims to minimize stock outs, reduce wastage of resources, and improve storage conditions of medicine in public health facilities, ultimately improving the overall supply chain of pharmaceuticals in the country. Finally, this research will serve as a baseline for future studies in this field.

## 1.5. Scope of the Study

This study covered the practice, performance, and challenges of inventory management in Mekele zone, Tigray, Ethiopiafrom February 01 to March 30, 2021. The study targeted 15 health facilities specifically hospitals and health centers. The study assessed the performance of the pharmaceutical supply chain in terms of inventory management practices by using semi-structured questionnaire customized from USAID|DELIVER's deliver logistic indicators assessment tool and logistics system assessment tool (LIAT and LSAT).

## 1.6. Operational definition

**Standards for the Inventory Management Performance of Pharmaceuticals**

Since there is no national benchmark for measuring inventory management performances of pharmaceuticals and there are limited studies on this subject area, the following standards were taken from different resources for measuring the result of these studies.

**Table 1: Suggested standards for inventory management performances**

| S. No | Variable | Bench mark (standard) for performances | Sources |
|---|---|---|---|
| 1 | Stock out rate | 0% | HSDP IV |
| 2 | Stock out duration | 0% | HSDP IV |
| 3 | Record accuracy | 100% | Assumption |
| 4 | Wastage rate | <2% | HSDP IV |
| 5 | Acceptable storage condition | ≥80% | National IPLS survey |
| 6 | Order fill rate by suppliers | ≥80% | EPSS M&E training manual |
| 7 | Work force | 100% | Assumption |
| 8 | Maintain Min- Max stock level | ≥80% | assumption |
| 9 | Supportive supervision frequencies | 4 times | Assumption |
| 10 | Availability of tracer drugs | 100% | Assumption |
| 11 | Inventory management performances | ≥80% | Assumption |

**Table 2: Levels of inventory management performances**

| S. No | Level of performances | Rate in percent |
|---|---|---|
| 1 | Poor Performances | ≤20 |

| | | |
|---|---|---|
| 2 | Inadequate Performances | 21-40 |
| 3 | Common Performances | 41-60 |
| 4 | Good Performances | 61-80 |
| 5 | Best Performances | >80, <2*,0* |

**Inventory:** the stock of pharmaceutical products retained to meet future demand.

**Inventory Management:** the continuing "process of planning, organizing and controlling inventory" that aims at "minimizing the investment in inventory while balancing supply and demand"

**Inventory Management Performance:** an action done or carried through an achievement of inventory management efficiently and effectively.

**Integrated Pharmaceutical Logistics System:** the single pharmaceuticals reporting and distribution system which aims to ensure that patients always get pharmaceuticals they need.

**Logistics Indicator Assessment Tool:** tool that enables the data collectors to collect all necessary information needed to address study objectives.

**Public health facility**: a facility building or place managed and owned by the public health sector that is operated or designed to provide health care service.

**Stock out rate**: is the percentage of facilities that normally carry the vital medicine but do not have it in stock at the time of visit and any experience six month prior to the study.

## 1.7. Organization of the Study

This study paper was organized into five chapters. Chapter one is composed of the introduction of the study including the background of the study, statement of the problem, objectives of the study, significance of the study, and operational definitions. Similarly, thesecond chapter deals with the review of related literatures. This chapter has three fundamentalcomponents namely theoretical literature review, empirical literature review, and conceptual framework that shows the overall map of the study.Chapter three discusses the research methodology details. In this

chapter, different partsincluding a description of the study area, research design, research approaches, source and studypopulation, sampling techniques and sample size determination, data collection methods andinstruments, and variables of the study. Thechapter also discussed the data entry and analysis plan, ethical consideration, and disseminationplan of the final paper to the respective stakeholders.The results and discussion part of the study are presented in the fourth chapter, whereas, the fifthchapter constitutes the conclusion and recommendation, and limitations.Furthermore, this study includes references and annexes (questionnaire, interview protocol, riskchecklist, and some analysis results) sections.

# CHAPTER TWO

# 2. RELATED LITERATURE REVIEW

*This chapter contains theoretical and empirical literature reviews with the conceptual framework of the study.*

## 2.1. Theoretical Literature Review

Inventory management is the heart of the pharmaceutical supply system. The major aims of inventory management and the healthcare supply chains is to reduce healthcare cost without sacrificing the quality of the service to the patient by improving efficiency and productivity of the health care system (Ali., 2011). In health care system the following basic issues must be considered for effective, and efficient inventory management. The knowledge of professionals about inventory management, the records and reports that will provide the foundation for inventory management, the selection of items to be stocked ,the balance between service levels including the policy on when to order and how much to order. The control of costs associated with inventory management (ordering, stock out, and stock holding), and proper storage management (WHO, 2011).

Well-trainedpharmacy professionals are the key role players in managing inventory management activities and improvement of its performance in any health facility. Inventory management processes like purchasing, storing, distributing and controlling of drugs are the activities performed by healthcare professionals with the ultimate aim of improving patient care in the health facilities. Hence, these activities are very vital and requires special pharmaceutical inventory management skill from the pharmacy managers.

### 2.1.1. Inventory management Practices

All facilities need an inventory management system and written procedure to deal with ordering supplies, receiving and storing stocks and recording and accounting for stocks (Management Science for Health [MSH], 2012). Pharmacy inventory management is a complex but critical process within the healthcare delivery system. Thus, inventory system should be developed in a

cost effective manner (Montoni*et al*, 2014). These control mechanisms can provide a basis for consistent quality, better financial performance and improved regulatory compliance when implemented appropriately and adhered to during day-to-day operations (Wijayawickrama& Woo-Miles, 2009). The hospital pharmacist should be an expert on medicines who advice on prescribing, administering, and monitoring as well as a supply manager who ensures that medicines are available through procurement, storage, distribution, inventory control and quality assurance (MSH, 2012).

Stock records are the core records in the inventory management system. They are the primary source of information used in the various supply system activities; they are also the source of data used to compile performance reports (Dias, 2012). Accurate and current stock records are essential to good inventory management. Inaccurate records produce inaccurate needs estimations (and problems with stock outs and expiry). When a facility relies on inventory records in decision-making, the impact of inaccurate inventory records on performance can be severe (Mahoro, 2013). Poor inventory management and inaccuracy of records meant that procurement and budgeting was based on unreliable information (Mahoro, 2013; Dias, 2012; Kagashe and Massawe, 2012).

Health facilities are the last component of the pharmaceutical supply chain. Managing pharmaceutical supply at the facility level directly affects the quality of health care. If medicines are consistently unavailable, patients suffer and staff members lose motivation. Everyone loses confidence in the health system, and patient attendance decreases. A constant pharmaceutical supply promotes effective care, inspires confidence in the health facility, and contributes to job satisfaction and self-esteem among staff. Every health facility, however large or small, needs to store and manage its medicine stocks. Systems must be in place to ensure secure storage, storage in correct environmental conditions, effective reordering, effective stock rotation and expiry monitoring, effective fire prevention and theft prevention (Dias, 2012).

Most of the literatures summarize the necessity of pharmacy inventory management at health facilities. Pharmacy inventory management is a complex but critical process within the healthcare delivery system. Without adequate pharmacy inventory management practices, hospitals run the risk of not being able to provide patients with the most appropriate medication

when it is most needed. Drug selection choices have a direct effect on the affordability of care. Utilizing drugs that are not on the formulary may be costly to the patient or may result in a lower than expected reimbursement. In addition to these drug traceability, inventory reporting and inventory management elevate the importance of maintaining effective control over drug inventories in today's ever expanding healthcare compliance environment.

### 2.1.2. Inventory management performance

A max-min inventory control system is designed to ensure that the quantities in stock fall within an established range. Using this approach, one defines a theoretical maximum stock for each item to provide sufficient, but not excessive, stock to last from one order to the next, as well as a minimum stock level or reorder level that determines at what point an order should be placed. Safety stock may be included in the minimum stock level, or an additional quantity maybe assigned to protect against variations in demand and supplier performance (Dias, 2012).

In developing country most successful inventory control systems used for managing health commodities are max-min systems. (Leung *et al.*, 2016). However study done in Zambia criticizes this method of inventory control due to: First, this policy ignores demand seasonality, even though the need for malaria medicines and other health products may be driven by seasonal events (e.g., flooding, changes in water quality, harvest-related exposures etc.). Specifically, its replenishment targets fail to anticipate upcoming predictable changes in demand. Secondly, these targets also ignore predictable changes in delivery lead-times over time (due to seasonal flooding) and across health facilities (due to local variations in transportation resource availability).

Finally, the system relies on past consumption as opposed to demand data for predicting future demand. This may create a negative self-perpetrating cycle whereby historical stock outs are ignored, resulting in insufficient replenishment quantities and increased likelihood that more stock-outs will subsequently occur (Leung *et al.*, 2016). Adherence to the established max-min inventory control improves the performance of drug supply and health care services. So far, most literatures and researchers recommend that min-max inventory controlling system must be combined with ABC, ABC-VEN matrix and stock status analysis to prevent the above-mentioneddrawbacks.

## 2.2. Empirical Literature Review

### 2.2.1. Inventory management Practices

Regarding inventory control methods,the study conducted by KagasheandMassaweshowed that 65% were unable to mention the methods used. Regarding safety stock levels and time for placing orders, sixty-six percent (66%) of respondents said there was no predetermined time for placing orders for different medicines stored. Poor knowledge in logistics is a factor in inventory management. It is recommended that personnel involved in medicines supply be trained in procurement and supply chain management (Kagashe&Massawe, 2012).

Poor inventory management results in product wastage and decrease the quality of healthcare services. A study done in Uganda to investigate the reason for stock out showed that average stock-out duration of essential medicines and supplies was 23.89% (20.47 % for essential medicines and 27.32% for medical supplies). Among the short falls of the stock out were; drug requisitions based on neither morbidity nor consumption methods of quantification, delays during distribution, supplying medicines with short shelf life, rare condition drugs or low usage drugs (Care *et al.*, 2015).

These studies show the association of poor inventory management and poor outcome of health services. However, study done in Kenya showed inventory management practices would greatly contribute to reduce the wastage of medicines. Proper inventory management practice, inventory planning and scheduling improving the infrastructure of warehouse contributes greatly to inventory management performance and reduce wastage (Wanjau, 2012).

Poor storage conditions may result in spoiled stock (for example, dressings may be soaked by a leak in the roof, or inject able medicines may lose potency if the storeroom is too hot). An article review on Temperature excursion management: A novel approach of quality system in pharmaceutical industry in Saudi states reported that the storage condition for product is assigned based on scientific studies to avoid deterioration during product life cycle. If the temperature excursion is not taken due care the following negative impacts are commonly noticed: Loss of

assay (active ingredient), Increase of impurity, Separation of layers of liquid products, Change in dissolution pattern of solid dosage, and Discoloration of products (Kumar &Jha, 2017).

Another study in United Arab Emirates done on storage conditions of pharmaceuticals also reported that a total of 59 samples were collected from 48 medicine outlets. Using predetermined acceptance criteria, 12 samples (20.3%) were non-compliant. Eight (13.6%), 10 (16.9%), and 20 (33.9%) samples failed quantity, content uniformity, and dissolution tests, respectively. An improper packaging and storage condition reduces the quality of amoxicillin–clavulanic acid preparations at community pharmacies (Khan *et al.*, 2013).

### 2.2.2. Inventory management performance

Literatures on socio demographic characteristics which are associated with inventory management performances of pharmacists are limited. Some of the variables which are identified by the limited literatures include age, work experience and training. In a study entitled 'physical environment of hospital pharmacies and hospital pharmacists' work outcomes 'hospital pharmacists' age was positive and highly correlated with their working years as professional pharmacists ($r = .83$, $p < .001$), and hospital pharmacists' professional experience was positive and highly correlated with their working years in the surveyed hospital pharmacy ($r = .75$, $p < .001$).Thus the study shows work experience and age are associated with inventory management performances (Oballah&Waiganjo, 2015; Schafheutle et al., 2011).

Other socio demographic variable associated with inventory management performance is training which has positive outcome on inventory management performances. A study done in Tanzania on the knowledge of inventory management in pharmacists reported the association of medicines logistic management knowledge with medicines waste is correlated. As the study reported most participants were pharmacy professionals. From the participant about sixty-five percent (65%) were unable to mention the method they were using for quantification. About twenty two percent (22%) mentioned the consumption method while twenty seven percent (27%) said they quantify the amounts of medicines depending on the funds available (Kagashe&Massawe, 2012).

In a study on medicine stock outs and inventory management in Tanzanian public hospitals, (Kagashe&Massawe, 2012) reported discrepancies between recorded quantities on stock cards and physical count. Mwananyamala hospital had 72% of recorded balance on stock cards that

was greater than the physical count, while the hospital had 8% of recorded balance on stock cards that was less than the physical count. These discrepancies were due to poor logistics skills. Accurate information obtained during the stock-taking will not only help in maintaining adequate stock levels of medicines, but also in establishing the basic information needed for ordering (Mahoro, 2013).

An indicator based assessment of medicines storage and inventory management practice in public hospitals in Thailand recommended medications have to be stored in accordance with regulatory requirements and manufacturer recommendations since decomposition of a drug may result not only in a decrease in their efficacy but also in the possible presence of toxic degradation products. In this study, overall adherence towards various storage conditions was found to be less than 50% and lack of adherence to the basic inventory management principles was found to be common (Iqbal, Geer & Dar, 2015). The above result is almost similar to the national survey of IPLS implementation in Ethiopia in which 55% of the PHF fulfilled the adherence to acceptable storage condition (Shewarega et al., 2015).

### 2.2.3. Challenges of Inventory management

Further study in South Africa the Limpopo Province Pharmaceutical Services has been experiencing many challenges with regard to inventory management; shortage of budget in one hand and high wastage on the other hand of medicines. As the study reported the main reasons were overspending on allocated budgets by facilities, increased amount of expired stock at facility levels, Information systems not being reliable, lack of internal control measures, lack of training in drug supply management, and centralized budget and lack of accountability for overspending by managers (Motlanthe, 2010).

## 2.3. Conceptual Framework

Following an extensive review of the literature, the following conceptual framework was adopted for this study. The framework shown below (Figure 1) represents the KPI of Inventory management in which this study employed: availability, updating and recording accuracy of logistic format; stock status analysis; product wastage; store management practice; supplier related factors; practice/service related factors.

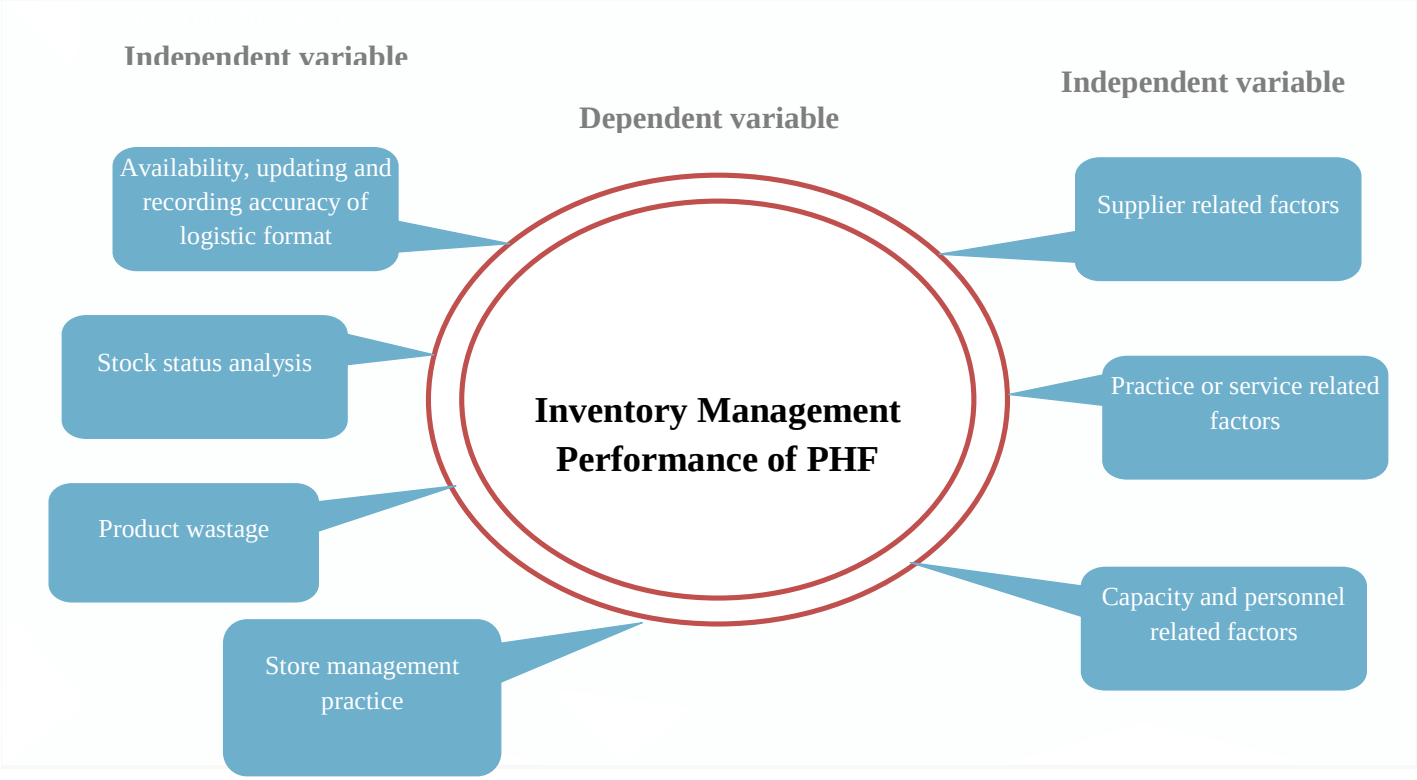


**Figure 1: Conceptual framework of inventory management performances Adopted from (Rogers, 2011)**

# CHAPTER THREE

# 3. METHODOLOGY

*This chapter includes study area description, research design, research approach, source and study population, sampling techniques and sample size determination, data collection methods and instruments, variables of the study, data entry and analysis, and ethical consideration of the final paper.*

## 3.1. Study Area and Period

Administratively, Tigray is divided into seven zones in which Mekelle is its capital city and is located around 780 kilometers north of the Ethiopian capital city Addis Ababa. In the region, there are 712 health posts, 214 health centers, 15 hospitals, 22 primary hospitals and one referral hospital. There are also around 629 different private health institutions and the health care coverage of the region reaches around 92%. From the seven zones of the region, Mekelle is considered a Special Zone, which is divided into seven sub cities with a population of 376,533 (CSA, 2007).

According to Tigray regional health bureau 2011 EFY profile report, there are 5 public hospitals and 10 health centers in Mekelle Zone and there are more than 1600 health care providers (1054 professionals and 587 supportive staff) working in the public hospitals. Currently, Mekelle zone has 15 --PHF;1 referral hospital, 3 general hospitals, 1 primary hospital and 10 health centers. The proportion of health facility to population ratio was 1:5,256,746 for specialized hospital, 1: 350,450 for general hospital, 1: 225,344 primary hospital, and 1: 24,542 for Health centers

## 3.2. Study design and study period

An explanatory and descriptive research design, accompanied by a qualitative method was employed to conduct the study. The data collection period was from February 01 to March 30, 2021 GC in PHF located in Mekelle Zone, Tigray regional state.

## 3.3. Population

### 3.3.1. Target Population

All PHF located in Mekelle Zone.

### 3.3.2. Source Population

All PHF of Mekelle Zone, (hospitals, health centers and health posts), all health professionals, Chief Executive Officers working in those facilities, all logistic records and reports and all pharmaceuticals.

### 3.3.3. Study Population

The study populations were all PHF; pharmacy professionals involved in inventory management, essential drugs of those facilities, head pharmacy and professionals on managerial position (CEO for hospitals and Medical director for Health centers) of those PHF that fulfill the inclusion criteria.

## 3.4. Eligibility Criteria

### 3.4.1. Inclusion Criteria

- ✓ All PHF, which have implemented IPLS before 1year.
- ✓ Pharmaceutical stores
- ✓ Key informants who gave informed consent for interviewing i.e. Head of pharmacy department, Pharmacy Procurement Officer and CEO of the PHF with a minimum of 1-year experience in the study hospitals.
- ✓ All logistic records, reports and all the tracer medicines plus other selected first and second line drugs used to treat the top ten disease of the study area were included.

### 3.4.2. Exclusion Criteria

- ✓ Health posts were exclude from the study since most of the inventory management and logistic practices has done at theircorresponding health centers.
- ✓ Private health clinics and hospitals.
- ✓ Health facilities administered by NGOs, and ministry of defense.
- ✓ Staffs with < 6 months of experience
- ✓ Documents with incomplete information.

## 3.5. Sampling technique and Sample size determination

All the 15(fifteen) PHF from seven sub-cities of Mekelle Zone were selected using census sampling method. The pharmaceutical recording and reporting forms, cards and guidelines of one year prior to the study period was also selected and reviewed to collect top ten diseases,

essential drugs and logistics related data. Accordingly, essential medicines were selected from the list of tracer medicines and medicines used to treat the top ten diseases were selected from the facility documents and charts using the standard treatment guidelines. By taking into consideration the study time and budget limitation, only first and second line drugs used to treat the top ten disease were included in the study.

Since the sampling method for the study is census method, 15 pharmacy heads, ten store managers from all health centers and a total of 15 store managers two from each (Primary, general and referral hospitals), 15 medical directors, and 15 procurement officers with a minimum of 6 months' work experience from each health facility were selected for the study.

In addition, using a purposive sampling technique 4 CEOs and 3 chief pharmacists from health facilities and 2 pharmacists from regional health bureau and two managers from Mekelle EPSS hub (1 branch manager and 1 stock keeping and distribution officer ) were included for interview approached as key informants of the study for the qualitative data.

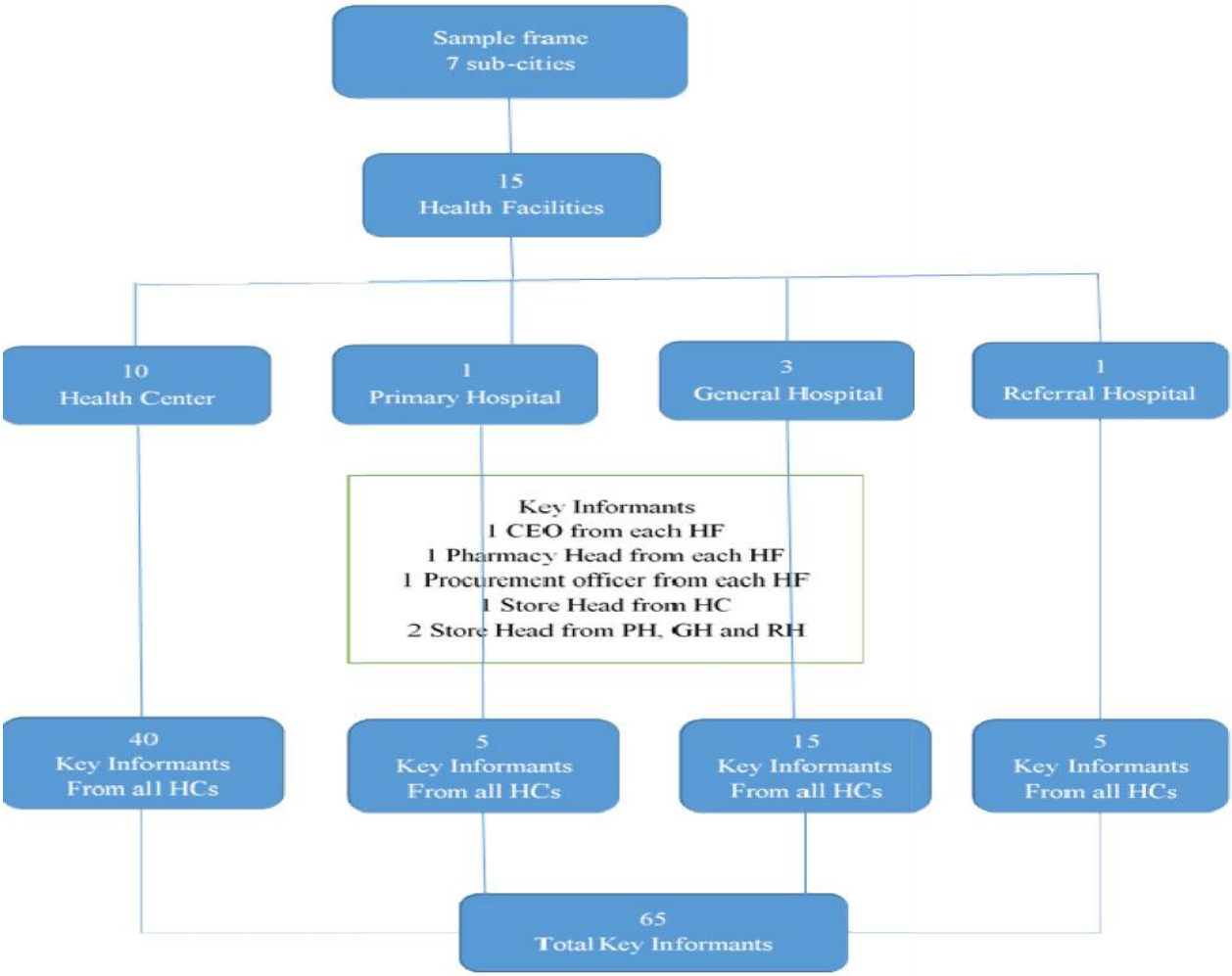


**Figure 2: Sampling Procedure and Sample size determination**

## 3.6. Data collection instruments and Data Collection procedures

The quantitative data for this study was collected using structured questionnaires and checklists adopted from United States Agency for International Development Deliver Project Logistic indicators assessment and logistics system assessment tool (Project, 2011). A qualitative data was collected from the CEO, pharmacy head, pharmacy store managers and procurement officers of each health facility through in depth interview using self-administrated interview questionnaire's to elucidate management level perspective on inventory management operation and performances. Pharmaceutical recording and reporting documents were reviewed using the adopted checklist. During document review, issuing and receiving models, RRF, IFRR, bin

cards, stock recording cards, ledgers, logistic records with a maximum of six-month duration was assessed.

Two data collectors with bachelor degree of pharmacy were recruited and given one-day training on filling data of the intended inquires and questionnaires from the study subjects. Additionally, an introduction of the overall objectives and methods of the study were given to the data collectors during the training. Spot checking and routine site supervision of data collectors was carried out by the principal investigator and any data completeness, clarity, accuracy and consistency were checked by the principal investigator on daily basis during the data collection period.

## 3.7. Variables of the study

### 3.7.1. Dependent variable

- ✓ Inventory management performance

### 3.7.2. Independent variable

- ✓ Capacity and professionals related factors
- ✓ Supplier related factors
- ✓ Practice/service related factors
- ✓ Storage management practice

## 3.8. Data quality assurance

Data quality assurance mechanisms were done to ensure the accuracy, completeness and consistency data during the data collection period and data analysis.

The face validity of the study instruments was confirmed by the advisors. A pre-test of the data collection tools was done on selected five percent of the study participants to check any inconsistencies and appropriateness of the tools. According to the findings and experiences gained from the pre-test necessary modifications of the data collection tools and procedures was done. Training was given to the data collectors before the data collection period and supervision was provided on daily basis by the principal investigator. Then the data in the paper questionnaire was entered to MS-excel for further analysis. Additionally, data inconsistency between the paper questionnaire and the electronic data was checked again.

## 3.9. Data analysis

Before actual data analysis, completeness and consistency of the data were checked, Imported from MS-excel to SPSS version 20 for further statistical data analysis. Descriptive analysis like frequency, percentage, mean & standard deviation, were used to present data in the form of tables and graphs. The association of independent variables and inventory management performance were explored using inferential statistics (regression and Chi-square). A P-value < 0.05 was declared significant. For qualitative part, content analysis (thematic analysis) technique were used to analyze the data. Thematic areas were specified according to the research concept and each concept was categorized as a theme for detailed analysis. The analysis was conducted manually.

## 3.10. Ethical consideration

Ethical clearance & approval letter was obtained from Ethical Review Board of school of pharmacy, Addis Ababa University and it was submitted to Tigray Regional Health Bureau (TRHB). After received the permission letter from TRHB it was given to respective public facilities responsible officers. Officers was provided with the information regarding the purpose of the study, why and how they were selected to participate in this study and what would have expected from them. At the health facilities, permission was obtained from the CEO before starting any activity of the research. Participants of the study were asked for their consent before participating in the study and were assured to withdraw at any time in the process. In addition, participants were assured of the confidentiality of information in the course of study and informed also that analysis were done in aggregate. For qualitative study, a verbal informed consent also was obtained from key informants and confidentiality of the information was maintained by avoiding the use of personal identifiers.

## 3.11. Dissemination of the result

The final result of the study will be disseminated to responsible bodies such as School of Pharmacy Addis Ababa University, for all public facilities administrators included in the study, Tigray Regional Health Bureau and other responsible bodies. Finally, the study finding will be submitted to reputable professional journal for publication so as to serve as base line for further studies.

# CHAPTER FOUR

# 4. RESULTS AND DISCUSSION

## 4.1. RESULTS

*In this chapter of the research, the data collected through questionnaire and interview is presented, analyzed and interpreted. It deals with the demographic nature of the respondents and analysis and interpretation of main findings. The analysis of data is processed in line with the basic research questions and objectives of the study.*

### 4.2. Demographic Profile of the Respondents

A total of 15 PHF were included in this study: 1 (6.67%) federal referral hospital, 3(20%) general hospitals, 1 (6.67 %) primary hospitals and 10(66.7%) health centers. All of these PHF implemented IPLS at different times and have practiced IPLS for more than one year.

Of the total 278 pharmacy professionals, self-administered questionnaires was distributed to 50 pharmacy professionals to the study health facilities and the response rate was 50 (100 %) (Because of their direct involvement to the study area). Majority of the participants were male (56%) and degree holders (78%). More than two-thirds of the pharmacy professionals had an experience of 3 years (42%) and 3to 6 years (38%), respectively. (See table below).

**Table 3: Socio demographic characteristics of respondents included in the study PHF of Mekelle -Tigray region in March 2021.**

| | Demographic characteristics | Category | Frequency | Percentage |
|---|---|---|---|---|
| 1 | Sex | Male | 28 | 56 |
| | | Female | 22 | 44 |
| 2 | Marital status | Married | 23 | 46 |
| | | Never married | 25 | 50 |
| | | Separated | 1 | 2 |
| | | Divorced | 0 | 0 |
| | | Widowed | 1 | 2 |

| | | | | |
|---|---|---|---|---|
| 3 | Level of education | MSc. | 8 | 16 |
| | | B pharm | 39 | 78 |
| | | Diploma (TVET) | 3 | 6 |
| 4 | Work experience | < 1 year | 0 | 0 |
| | | 1-3 years | 21 | 42 |
| | | 3-6 years | 19 | 38 |
| | | >6 years | 10 | 20 |

## 4.3. Inventory Management Practice

### 4.3.1. Availability, Updating and record accuracy of bin cards

Updating on time and accurately recording bin cards on a consistent basis provides basic information for inventory management performance decision making. As a result,for availability, updating and record accuracy of bin cards were found to be 34.75(86.88%), 31.44(78.56 %) and 27.38(68.45%) for 15 assessed PHFs of 40 selected essential drugs respectively.(See figure 5 below).

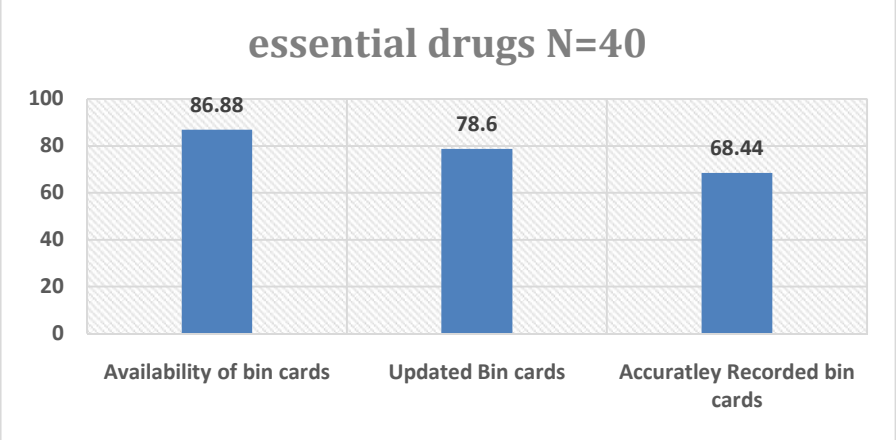


**Figure 3: Percentage of Availability, Updating and Record Accuracy of bin cards in Mekelle PHF -Tigray region in March 2021.**

### 4.3.2. Availability of Logistics Management Forms and Tools

Availability and usage of standard forms and tools are critical supply chain indicators. As shown in table 4, the overall proportion of implementation status of these logistic formats were found to be 60%.

**Table 4: Availability of logistics management forms and tools, Mekelle PHF -Tigray region in March 2021**.

| S.N. | Type of format or job aid | Yes | No | Total |
|---|---|---|---|---|
| 1 | Stock card | 10 | 5 | 15 |
| 2 | RRF | 14 | 1 | 15 |
| 3 | IFRR | 15 | 0 | 15 |
| + | SOP | 8 | 7 | 15 |
| 5 | HCMIS | 5 | 10 | 15 |
| 6 | Functional computer | 10 | 5 | 15 |
| 7 | Internet accesses | 1 | 14 | 15 |
| Total | | 63 | 42 | 105 |
| | Proportion | 9 | 6 | 15 |

### 4.3.3. Utilization, Record Accuracy and Completeness of RRF and IFRR

Logistics data report formats (RRF and IFRR) were used to measure the inventory management performances in hospitals. Accordingly, findings of this study show that, 14(93.3 %) health facilities use RRF and IFRR for requesting and reporting pharmaceuticals. Among these health facilities, 13 (86.6 %) of them were completing and sending RRF to supplying EPSS every two months while 12 (80 %) of them complete and send IFRR to their respective facility stores,

The records and reports used for logistics reports should be complete and accurate enough so as to allow the generation of informed decisions by appropriate bodies. Review of the completeness of the report formats involving one review periods between (Feb 2021-Mar 2021) show that 12(80 %) and 11(73.3%) of these PHF had completed data items on RRF and IFRR, respectively

Accuracy of information reported on the report formats (RRF) was evaluated by comparing the reports generated between Feb 2021-Mar 2021 with stock keeping (bin card) and transaction records (proof of deliveries Model 19). Accordingly, discrepancy in the calculated consumption compared to total quantity issued from the PHF stores recorded on the bin card during the review

period was observed in 6(40%) facilities. Similarly, discrepancy in the ending balance record between RRF data and bin card records was seen in 5(33.3 %) of the health facilities.

Review of accuracy of four internal reports (IFRR) during the one supply periods/intervals assessed showed that a discrepancy on the loss/ adjustment section of the report in only 1 (6.67 %) health facility

**Table 5: Record Accuracy and completeness of data on RRF and IFRR at PHF of Mekelle - Tigray region in March 2021. (n =15)**

| **Variables** | Yes | No |
|---|---|---|
| Calculated Consumption indicated on the RRF(CC ) | 12 | 3 |
| Maximum stock quantity indicated on the RRF(CC*x2) | 11 | 4 |
| QO* indicated on the RRF (Max SLQ*–EB quantity) | 9 | 6 |
| QR* of RRF Vs quantity in receiving voucher /model 19 / | 10 | 5 |
| EB* of RRF Vs EB* of bin card | 11 | 4 |
| Loss/adjustment of RRF Vs loss/adjustment of bin card | 13 | 2 |
| CC* of RRF Vs Quantity issues of bin card | 9 | 6 |
| IFRR calculated consumption | 10 | 5 |
| Loss/adj. of IFRR Vs Loss/adj. of bin card | 12 | 3 |
| IFRR quantity ordered | 8 | 7 |
| RRF includes beginning Balance | 13 | 2 |
| RRF includes Stock on Hand data | 13 | 2 |
| RRF includes quantity loss/adjustment data | 11 | 4 |
| RRF includes quantity received data | 13 | 2 |
| IFRR includes beginning balance | 12 | 3 |
| IFRR includes stock on hand data | 14 | 1 |
| IFRR includes loss/adjustment data | 13 | 2 |
| IFRR includes quantity received data | 14 | 1 |

### 4.3.4. Store Management Practice Related Factors

The storage condition for pharmaceutical products should comply with the recommended Good Storage Practices so as to preserve the integrity of the products stored. Accordingly, the storage

conditions of the pharmaceuticals were assessed by using 13 standard criteria. Among the observed PHF, only 7 (46.67%) of these PHF have met the storage conditions and standards.

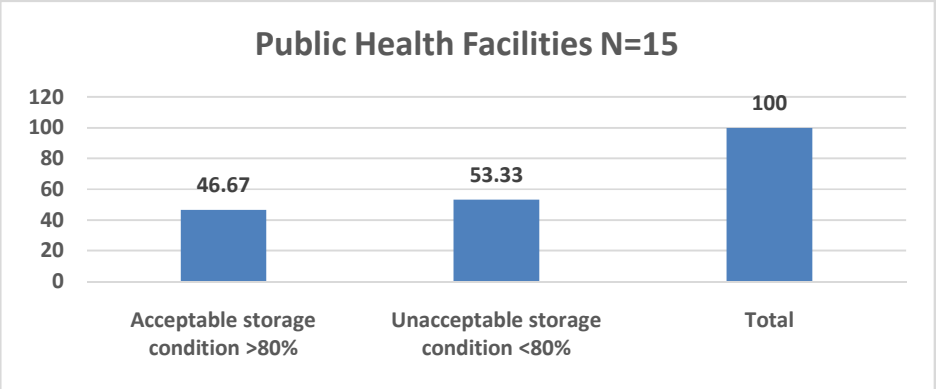


**Figure 4: Storage practices in percentage of these PHF in March 2021 (n=15)**

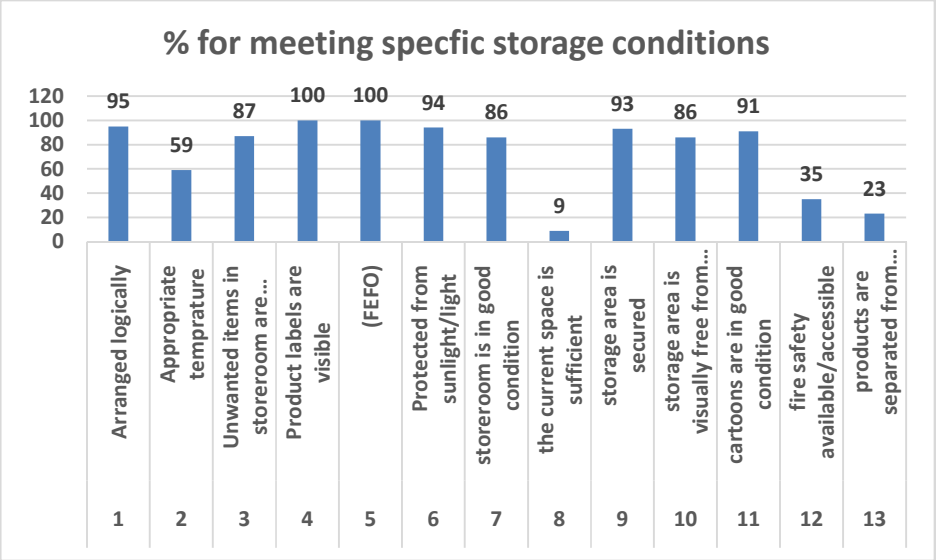


**Figure 5: Percentage of PHF meeting specific storage conditions in Mekelle Tigray in March 2021 (n =15).**

### 4.3.5. Capacity and Personnel Related Factors

***Training of staff members for inventory management***

Equipping pharmaceutical managers with timely and up to date information of inventory management performances is an important indicator of ensuring staff capacity building and motivation. PHF were asked whether the staff members were trained for inventory management practices. Generally, 54 (75 %) professionals received at list one type of training of pharmacy

practices. Concerning the type of trainings 31(57.41%) IPLS, 9(16.67%) APTS, 6 (11.11%) HCMIS 4 (7.41%) LMIS and 4(7.41%) others were provided in the region.

***Supportive supervision***

In the current study, respondents from the sample PHF were asked about supportive supervision and its frequency by higher level officials concerning the performances of inventory management. Almost all PHF (100 %) were visited at least once in the current year. when the frequency of supervision is evaluated it ranges from 1-4 times per year. In this study, 10 PHF`s (66.7%) were supervised by higher officials 2 times per year. 2 (13.33 %) PHF`s were visited one time per year. As illustrated in the following table the PHF almost have relatively the same frequency of visit. There is no significant difference between time and frequency of supporting supervision.

**Table 6: Supportive supervision frequency in PHF at Mekelle Tigray in 2021**

| Frequency of visit | N | % |
|---|---|---|
| 1 | 2 | 13.33 |
| 2 | 10 | 66.67 |
| 3 | 2 | 13.33 |
| 4 | 1 | 6.67 |
| Total | 15 | 100 |

### 4.3.6. Stock status analysis of sample drugs

A set of standard indicators were selected to measure the inventory management performance and stock status of essential and tracer drugs. Specifically, quantitative information on the selected 40 essential and tracer drugs was collected. As described in the following figure the proportion of items maintained between Min-Max stock levels of these PHF were 16.75%.

In addition, the percentage of over stocked and under stocked items were assessed and accordingly, the percentage of overstocked items and under stocked items of these 40 selected essential items were found to be 28.13% and 33.3% respectively.

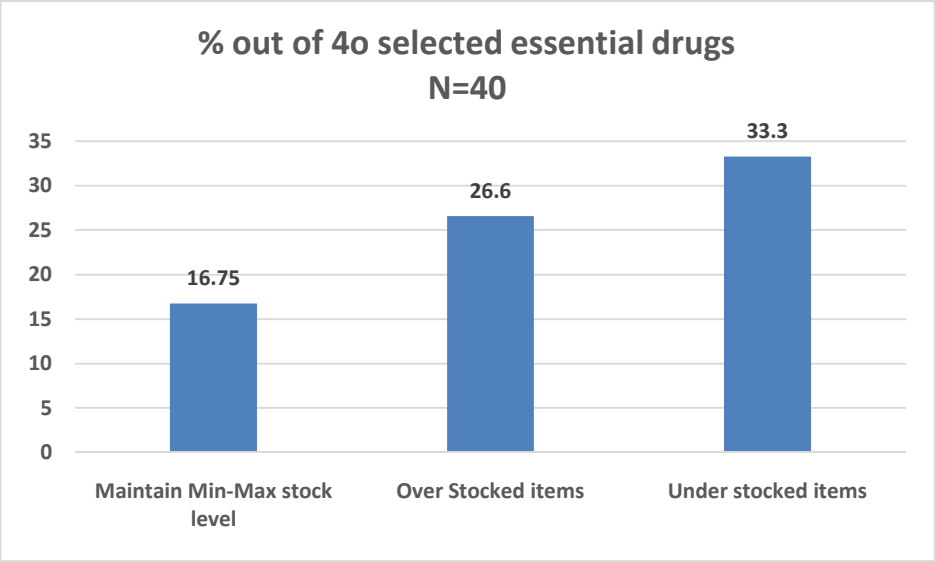


**Figure 6: Percentage of stock status of 40 essential drugs of these PHF (n=40)**

### 4.3.7. Stock out Rate in Previous Six Months and on the Day of Visit

Three indicators were used to measure the stock out rates of the sampled 40 essential and tracer drugs: The presence of essential and tracer drugs on the day of visit, the tendency to be out-of-stock over a period in the last six months before the study and length of days stocked out were taken for evaluation. As described in the following table 19.79 (49.48%), 12.29(30.73%) and 46.69 were observed stock out of essential drugs in the last six months, stock out of essential drugs on the day of visit and duration of stock out days in the last six months respectively.

**Table 7: Stock status analysis of 40 essential drugs in 15 PHF of Mekelle -Tigray region in March 2021.**

| S.N | Variable | Mean | % |
|---|---|---|---|
| 1 | Stock out in the last six months | 19.79 | 49.48 |
| 2 | Stock out on the day of visit | 12.29 | 30.73 |
| 3 | Average Stock out days in the six months | 46.69 | ___ |

As illustrated in the following figure the proportion percentage of stock out of essential drugs in six months' duration of these PHF was 53.60 %. The stock out on the day of visit for these essential drugs of these PHF was 31.10 %. The average duration of stock outs days of the essential and tracer drugs in the last six months was found to be 54.38 days in these PHF.

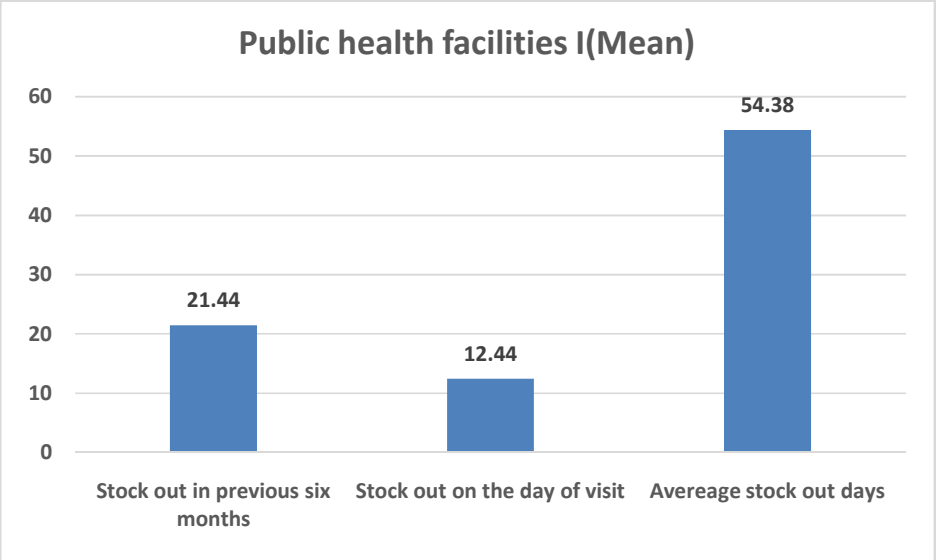


**Figure 7: Days of stock outs for selected essential and tracer drugs in this PHF of Mekelle - Tigray region in March 2021. (n=15).**

### 4.3.8. Product Wastage

In this study, the product waste was assessed by reviewing the value of waste of expiry, damaged, obsolete and pilferage (theft) products at these PHF.

As illustrated in the following table, the mean percentage wastage rate of health commodities due to expiry and damage was found to be ranged from 0.20% to 11%. Concerning the mean wastage of pharmaceuticals, it was 225778.552 Eth. birr per PHF for 9 months.

**Table 8: The value of financial loses of medicines per public health facility due to expired stock and damaged and wastage rate of these PHF in March 2021 (N=15).**

| code | Value of beginning inventory as of July 2020 EC | Total purchases value in 9 months of the current budget year | Stock available for sale (use) | Stock wasted in 9 months | Wastage rate in % |
|---|---|---|---|---|---|
| AHAHC | 4876402.19 | 6744997.89 | 11621400.08 | 347,728.77 | 3.00 |
| ASHHC | 3771321.34 | 3858729.97 | 7630051.31 | 189134.35 | 2.50 |
| AYHC | 2690329.94 | 10121113 | 12811442.94 | 856734.08 | 3.60 |
| DEHC | 1636120.5 | 7289389.38 | 8925509.88 | 201016.24 | 2.25 |
| KAHC | 5607049.65 | 8093945.66 | 13700995.31 | 393272.17 | 2.90 |
| QUHC | 2200846.95 | 5297438.41 | 7498285.36 | 97085.92 | 1.30 |
| LAHC | 942035.61 | 4923326.25 | 5865361.86 | 137670.71 | 2.35 |
| MEHC | 951000 | 6326183.85 | 7277183.85 | 509005.31 | 7.00 |

| | | | | | |
|---|---|---|---|---|---|
| SEMHC | 647532.74 | 3479334.71 | 4126867.45 | 8375.07 | 0.20 |
| SERHC | 623899.93 | 4505455.6 | 5129355.53 | 139540.38 | 2.72 |
| AHPH | 430150.91 | 867647.03 | 1297797.94 | 143576.62 | 11.00 |
| MEGH | 867546 | 534404.65 | 1401950.65 | 41033.78 | 3.00 |
| AYRH | 1426998.05 | 1421650.39 | 2848648.44 | 82480.24 | 2.90 |
| QUGH | 1078326.25 | 3623625.3 | 4701951.55 | 144302.64 | 3.00 |
| HEGH | 3623625.3 | 3829642.12 | 7453267.42 | 95872 | 2.40 |
| Total | 31373185.36 | 70916884.21 | 102290069.56 | 3386828.28 | 50.12 |
| Mean | 2091545.7 | 4727792.28 | 6819337.971 | 225778.552 | 3.341 |

### 4.3.9. Supplier related factors

***Order fill rate***

Supplying items which are actually filled according to ordered quantities and the correct product timely improves inventory management of pharmaceuticals. However, the results of this study show that, regardless of the type of product, the average order fill rate of these PHFfrom EPSS was 47%. In addition, the order fill rate of these PHF from private suppliers was 56.86%.

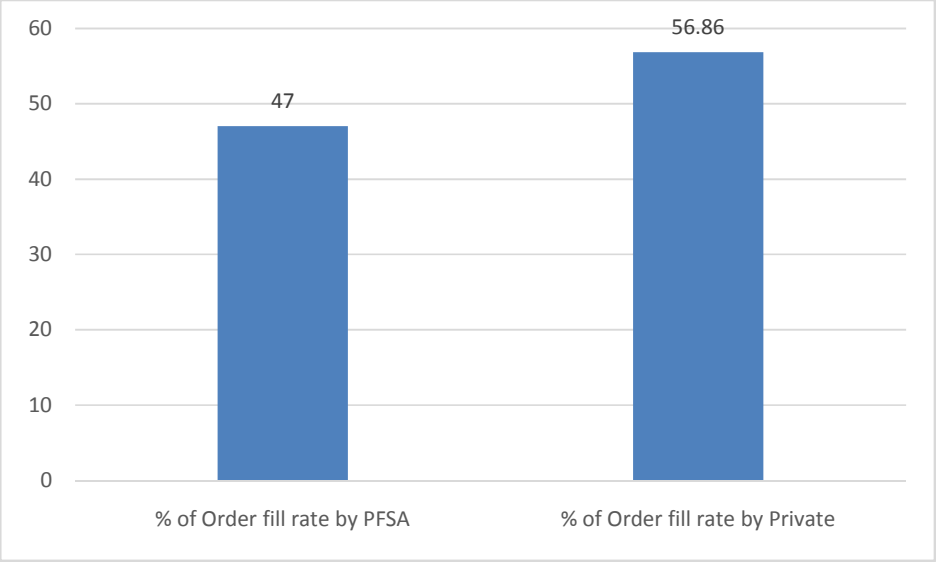


**Figure 8: Order fill rate by EPSA and private suppliers in Mekelle Tigray in March 2021 in PHF**

***Lead time***

Indicators such as average supplier lead time and percentage of key medicines in stock should be used to assess performance on a continuing basis. This study tried to assess the perceptions of facility staff on the lead time and the resupply of products, as per their request. Regardless of the type of product, 98.5 percent of studied PHF say they usually receive products requested within

less than 2 weeks from EPSS. The number of PHF supplied and the duration of time for resupplying pharmaceuticals from EPSS was 6 (40 %) within two weeks, 3(20 %) within 3 weeks and 6 (40 %) greater than 4 weeks respectively.

**Table 9: Lead time**

| Lead time | N | % |
|---|---|---|
| Within 2 weeks | 6 | 40% |
| 3-4 weeks | 3 | 20% |
| Greater than 4 weeks | 6 | 40% |

### 4.3.10. Availability of DTC, Formulary List and Standard Treatment Guidelines.

Availability of functional drug and therapeutic committee (DTC) in PHF plays great role in inventory management performances. In this study as described in the following table 14(93.33%) of the observed PHF have established Drug and Therapeutics Committees (DTCs), 13 (86.67%) have developed and approved PHF -specific medicines lists and 14 (93.33%) PHF have national standard treatment guides (STG.

**Table 10: Availability of DTC, drug list and STG in the study PHF N=15 March 2021 in Mekelle Tigray PHF.**

| S.N. | Inventory management performance indicator | #PHF`s | % |
|---|---|---|---|
| 1 | Availability of functional DTC | 14 | 93.33 |
| 2 | Drug list developed and approved by DTC | 13 | 86.67 |
| 3 | Availability of Standard treatment guideline (STG) | 14 | 93.33 |

### 4.3.11.Inventory Control and Efficient Budget Utilization

Since the allocated resource for drugs and medical supplies requires efficient utilization close monitoring and appropriate inventory control methods should be used. As shown in table 9, 13(86.67%) of the studied PHF have done VEN categorization on their drug list and this categorized list was used for procurement of pharmaceuticals. However in only one (6.67%) PHF was practiced ABC analysis and all study PHF never practiced ABC –VEN reconciliation.

**Table 11: Percentage of VEN, ABC analysis and ABC-VEN reconciliation at PHF in Mekelle Tigray in March 2021.**

| Ser No | Inventory management performance | # hospitals | % |
|---|---|---|---|

| indicator | | |
|---|---|---|
| VEN analysis | 13 | 86.67 |
| ABC analysis | 1 | 6.67 |
| ABC –VEN reconciliation | 0 | 0 |

### 4.3.12.Stock management of tracer drugs

The availability of specific essential (tracer) drugs is a measure of service availability. Accordingly, the assessment of this study of tracer drugs in 15 PHF shows 93.33%, 80% and 73.33% for availability, updating and record accuracy for bin cards respectively. As illustrated in figure 11, the overall inventory management of tracer drugs in the study PHF is summarized.

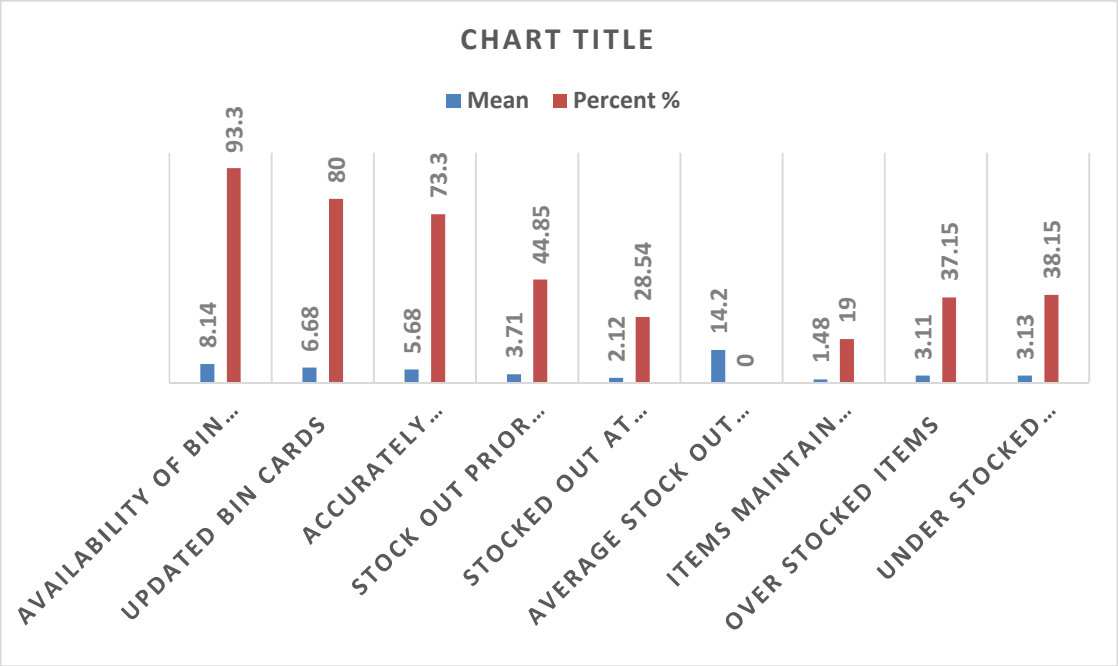


**Figure 9: Summary of tracer drugs management performances in hospitals at Mekelletigray in March 2021 (n=15)**

Stock out situation of specific tracer drugs during the visit and during the last 6 months was reviewed. As indicated in table below, stock out in the past six months of these tracer drugs was 8(53.33%), 11(73.33%), 10 (66.67%) and 10(66.67%) for Oral Rehydration Salt 20.5mg/liter, Ferrous Sulphate 300mg + Folic acid0.25mg tablet, Mebendazole 100mg tablet and Ergometrine 0.2mg/ml injection respectively during the last six months of the review period.

Those PHF, were able to avail 4 drugs fully [Amoxicillin 500mg capsule, Arthemether20mg +Lumfantrine 120mg, 14(93.33%) and 13(86.67%) for Gentamycin 80mg/2ml Injection and Tb kit (RHZE +RH).and the least available drug was Methyl ergometrine by 5(33.33%) PHF`s.

The average duration of stock outs (in days) in the last six months was found to be highest for methyl Ergometrine injection i.e. 82 days in these PHF. The lowest average stock out duration was observed for Tb kit (RHZE +RH) reagents i.e. (4 days) in these PHF.

**Table 12: Percentage of PHF. Describing the stock out, availability and record accuracy of tracer drugs from March 2021 - May 2021, (n= 15).**

| Tracer Commodities | Number of PHF`s with bin card updated | # of PHF`s With accurate records N(%) | # of PHF`s Stock out on the day of visit (%) | # of PHF`s With stock out any time in the past 6 months (%) | Mean # of days (range) of stock outs in the past 6months | # of PHF`s with availability of the tracer drug n(%) |
|---|---|---|---|---|---|---|
| Amoxicillin 500 mg | 10 | 9(60%) | 0(0%) | 4(25%) | 19(45-112) | 15(100%) |
| Oral Rehydration Salt 20.5g/Litre | 10 | 10(66.67%) | 3(20%) | 8(56.25%) | 50(15-180) | 13(81.25%) |
| Arthemether20mg +Lumfantrine 120mg | 13 | 9(60%) | 0(0%) | 7(43.75%) | 21(10-130) | 15(100%) |
| Ferrous Salt 300mg + Folic Acid0.25mg Tab | 12 | 10(66.67%) | 8(53.33%) | 11(75%) | 48(10-180) | 7(43.75%) |
| Gentamycine 80mg/2ml Inj. | 11 | 8(53.33%) | 1(6.67%) | 4(25%) | 26(40-150) | 15(93.75%) |
| Mebendazole 100mg Tablet | 14 | 13(86.67%) | 5(33.33%) | 10(68.75%) | 57(10-180) | 10(62.5%) |
| Medroxyprogestron Acetate 150mg/ml Injection (Depo-Provera | 12 | 11(73.33%) | 0(0%) | 2(12.5) | 8(0-60%) | 15(100%) |
| Methyl Ergometrine 0.2mg/ml Inj. | 13 | 9(60%) | 9( 60) | 10(68.75%) | 82(20-180) | 5(33.3%) |
| Paracetamol 500mg tab | 15 | 12(80%) | 0(0%) | 2(12.5%) | 6(10-82) | 15(100%) |
| Tb kit RHZE +RH) | 15 | 10(66.67%) | 2(13.33%) | 3(18.75%) | 4 (13-35) | 14(87.5%) |
| Tetracycline Eye Ointment 1% | 11 | 10(66.67%) | 4(26.67&) | 10(68.75%) | 42(10-162) | 12(75%) |
| Zinc acetate 20mg Tablet | 13 | 10(66.67%) | 3(20%) | 2(12.25%) | 10(10-90) | 15(93.75%) |

***ReportAccuracy of Tracer Drugs***

The report accuracy of tracer drugs in records was compared with bin card records. A significant difference was observed between the reported quantity and verified quantity of drugs of the six months' report.

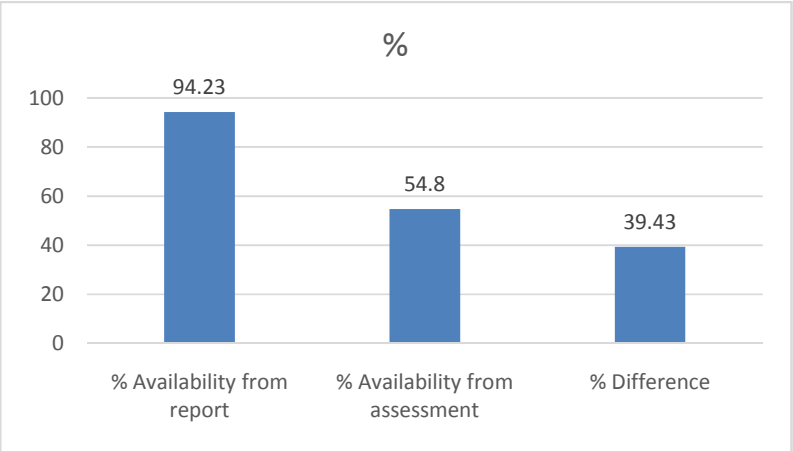


**Figure 10: Availability of tracer drugs in PHF during past six months in Mekelle, March 2021**

## 4.4. Inventory management performance

Good inventory management performances indicate an efficient and effective utilization of resources in health facilities. Accordingly, the study of this research show 35.25% PHF score good or best performances. However, neither of these PHF never meet the intended performances (80%).

Table14: inventory management performances of PHF in Mekelle Tigray in 2021.

| Variables | Inventory management performance levels of PHF`s N=15 | | | | |
|---|---|---|---|---|---|
| | Poor | Inadequate | Common | Good | Best |
| Availability of bin card | 0 | 0 | 0 | 3 | 12 |
| Updating of bin card | 0 | 0 | 10 | 0 | 5 |
| Record accuracy of bin card | 0 | 2 | 4 | 5 | 4 |
| Min-max stock level | 13 | 2 | 0 | 0 | 0 |
| Stock out 6 months* | 15 | 0 | 0 | 0 | 0 |
| Stock out on day of visit* | 15 | 0 | 0 | 0 | 0 |
| Storage condition | 0 | 0 | 0 | 12 | 3 |
| Order fill rate by private | 1 | 1 | 9 | 4 | 0 |
| Order fill rate by EPSS | 1 | 5 | 9 | 0 | 0 |
| work force | 0 | 6 | 6 | 2 | 1 |
| Wastage* | 13 | | | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Supervision frequency | [redacted] | 2 | 10 | 2 | 1 |
| Availability of tracer drugs on visit | 0 | 0 | 2 | 5 | 8 |
| Duration of stock outs | 15 | 0 | 0 | 0 | 0 |
| Total | 73 | 18 | 50 | 33 | 36 |
| IM Performances in % | 34.76 | 8.57 | 23.81 | 15.7 | 17.1 |

<2* is best for wastage rate.

0* is best for stock outs.

## 4.5. Challenges of Inventory Management

### 4.5.1. Qualitative Analysis

Six key informant interviews were conducted with focal persons at EPSS branch hub, Tigray regional state health bureau Pharmacy units, and CEO and pharmacy heads of 5 PHF in pharmaceutical logistics and pharmacy service units that were selected for the qualitative analysis.

Response from the key informants showed that the inventory management of pharmaceuticals has eventually minimized the level of expiry, recurrent over stock and stock outs from the previous time. In addition, better availability of tools for recording and reporting logistics data was reported from PHF.

Successive intervention through training on IPLS, health commodity management information system (HCMIS), drug and therapeutic committee (DTC) supportive supervision and on-the-job training has created an improved health facility capacity and ownership at operations and management level in the inventory management performances of pharmaceuticals. The level of institutional ownership by top managers and supportive supervision by higher levels done periodically improves relatively the inventory management performances of pharmaceuticals.

However, the result is weaker than what is ought to be exist. The level of trained/skilled professional turnover is concerning. In addition, the supply of pharmaceuticals by EPSS and private wholesalers is insufficient. The demand and supply of health commodity is not agreed. As mentioned by the respondent's availability of drugs is a sign of good governance, and equity of health care for citizens and lack of it compromises the health care service and the right of

citizens. Thus the responsible organizations must be concerned to solve the existing problems of inventory management of pharmaceuticals.

Standardization of warehouse is also another focus of inventory management at PHF. non acceptable storage condition hampers the stability, efficacy and potency of drugs. The majority of remarked ‘These issues require urgent interventions for quality health provision.’

In addition, most respondents remarked “Even if improvement in the inventory management performances of pharmaceuticals is emerging, the level of coordination among the different stakeholders involved in the supply system, monitoring and evaluation is not strong enough. Less developed accountability and system for monitoring and evaluation of performances and challenges in the system remains a concern.” Weak level of motivation and commitment to properly and timely conduct operations in the inventory management of pharmaceuticals, combined to the existing level of understanding and commitment by the health facility managers and pharmacy staffs towards enforcing the system seems to require urgent interventions.

As the human resource is one of the main factors affecting inventory management of pharmaceuticals, shortage could hamper performance with this regard and it calls for the need to improve the existing situation.

## 4.2. DISCUSSIONS

This study attempted to assess the inventory management performances of PHF located in Mekelle Zone. The indicators used to measure the inventory management performances were stock status analysis, stock outs, availabilities of logistic forms, updating, and recoding accuracy of logistic forms, wastage rate, tracer drugs management, order fill rate, storage conditions. This study also tried to identify challenges associated with inventory management performances.

This research examined the availability of logistic recording formats and reporting tools, including bin cards, RRF, and IFRR. . The study found that over 85% of PHF had bin cards, while nearly all PHF (93.3%) had reporting forms. These findings were slightly lower than those reported in previous studies conducted in East Showa zone and Addis Ababa, where all three types of documents were available in 100% of facilities(Gurmu& Ibrahim, 2017; Legese, Teshome&Gedif, 2022). It is important to note that these documents are essential for effective inventory management, as they enable tracking and control of the quantity of medicines ordered and issued.

In terms of inventory accuracy, it was found that 78.6% of the bin cards in the PHF were updated and accurate at a rate of 68.44%. This rate is higher than those observed in health facilities in South Sudan and Uganda (Okiria, Mwirumubi&Mpaata, 2016; Manyuat, Carasso&Makhado, 2021). The discrepancy in findings may be attributed to the selection of medication types and quantities for study, as well as the type of facility under examination.

In terms of the stock status of the analyzed PHF, 16.75% were found to maintain their stock levels within the established Min-Max range. However, upon further analysis of the overstocked and understocked items within these PHF, it was discovered that 35% were overstocked and 33.3% were understocked. Overstocking can lead to budgetary constraints, as holding excessive drug stocks incurs additional costs and can result in waste, expiry, and damage of medicines.

Whereas, under stocked level of pharmaceuticals lead to shortage of medicines when they are required. The consequences of under stocked level is frequent emergency orders and frequent direct purchases which increase the acquisition cost and results inappropriate limited budget utilization PHF. In proper inventory management performances, the Min-Max stock level policy

maintains 80% between the established stock levels. However, none of study PHF didn't met the acceptable limit of Min-Max stock levels (80%).

The finding of this study indicated that almost 30.73% of PHF were stocked out at the day of visit with an average stock out duration of 55 days. Stock outing of EMs and tracer drugs at the day of survey in this study (30.73 %) is higher than previous studies in Adama (23.6%), East Showa (27.25%) and Gondar (9%)(Fentie&Somasundaram, 2015; Gurmu& Ibrahim, 2017; Kefale&Shebo, 2019). This finding is also higher than a study conducted in Tanzania (20%)(Selemani, 2020).

The average stock out duration of EM and tracer drugs in the studies PHC was 55 days. This figure is higher when compared to the result in Gondar (30.5 days) and Adama (35.31 days). However, the average stock out day is lower than Uganda (72.9 days) and India (66.5 days)(Fentie&Somasundaram, 2015; Okiria, Mwirumubi&Mpaata, 2016; Kefale&Shebo, 2019; Iqbal, Ishaq Geer & Dar, 2015). The prolonged stock outs observed in this study could have significant implications for service provision and may result in excess costs, loss of revenue, increased morbidity and mortality, and loss of confidence in the PHF

The study determined that the average wastage rate in the PHF surveyed was 2.69 %, with no significant differences observed between facilities. This rate represents a decrease in wastage compared to the national survey conducted by the Federal Ministry of Health of Ethiopia, which found an average presence of expired medicines in health facilities at 8%(Efmhaca*et al.*, 2017). Furthermore, the findings were also lower than those of a baseline survey conducted in public health facilities in Kenya, which showed a mean of 13.3% expired medicines(Gurmu& Ibrahim, 2017).

The study found that only 46.67% of the PHF studied met the storage condition standard used in the research, highlighting concerns about health facility storage conditions. These findings are consistent with other studies conducted in Ethiopia, which revealed that 75%, 65%, and 80% of study health facilities in Eastern Showa, Addis Ababa, and Harar, respectively, did not meet the criteria for good storage condition(Kassie &Mammo, 2014; Gurmu& Ibrahim, 2017; Legese, Teshome&Gedif, 2022). Adequate storage conditions are crucial to maintaining the integrity of stored drugs, and these conditions should include suitable temperature, lighting, cleanliness,

humidity control, and shelving. Poor storage conditions can compromise drug quality, result in wastage, and ultimately impact the quality of care received by patients.

With regard to supplier related factors, one of the indicator is lead time. This study found that majority of the study PHF reported that the lead time to receive the requested item was within two weeks. This finding is in line with the lead time reported in Addis Ababa, which was 1-2 weeks. On the other hand, it is lower as compared with the lead time reported in Adama town which was longer that two months to receive requested items from EPSS(Kefale&Shebo, 2019; Legese, Teshome&Gedif, 2022). This might be due to the stock status of regional EPSS varies from region to region

In terms of supportive supervision, every studied PHF received medicine management support from higher levels, as found by a study in South West Shoa where all health facilities underwent supportive supervision(ET & TT, 2019). Staff supervision is a critical tool for ensuring the implementation of planned activities in accordance with set objectives, both in terms of time and quality. Therefore, it is essential for inventory managers to establish an appropriate schedule for staff engaged in inventory management activities at PHFs to receive supportive supervision.

This study also identified significant challenges associated with inventory management practices at the study facilities through qualitative methods. Key informants cited high staff turnover rates and a shortage of qualified professionals as major challenges. Additionally, there was a scarcity of health commodities among EPSS and private suppliers, and a lengthy procurement process from private wholesalers. The KIs also noted that inadequate budget allocations, a lack of commitment from pharmacy professionals, and insufficient recognition of the pharmacy department by upper hospital management were major reasons for these challenges. Another study conducted in Oromia regional state found that health facilities surveyed faced similar constraints, such as budgetary limitations and inadequate human resources in the pharmacy unit(Gurmu& Ibrahim, 2017).

## Limitation of the Study

This study focused only on performances of health commodity inventory management at hospitals and health facility level; it lacks variety of other facilities and regional mix. External

factors like suppliers, transportation, and internal factors like resource management, infrastructure and working environment can affect the inventory management performance and this study did not consider their impact; I recommend further study should be done on these issues.

# CHAPTER FIVE

# CONCLUSIONS AND RECOMMENDATION

*The chapter covers conclusion of the study, recommendations, andsuggestions for further research in this study area*

## 5.1. CONCLUSION

This research evaluated the performance of inventory management in public hospitals located in the northern part of Ethiopia's Tigray regional state. Various measuring indicators were used such as the availability and utilization of logistic forms and reporting formats, which were found to be moderate but unsatisfactory. The study also revealed a higher percentage of EMs and tracer medicines stock out on the day of visit, as well as a longer average stock out period in the last six months. Additionally, more than half of the studied PHFs did not meet the criteria for good storage practices. Overall, the findings suggested inadequate inventory management practices among the study PHFs, with major challenges including high turnover of skilled professionals, insufficient supply of health commodities from EPSS and private suppliers, and the absence of standardized warehouse facilities. Furthermore, the study identified other challenges such as poor coordination among stakeholders in the supply system, budget constraints, lack of a strong monitoring and evaluation system, and poor motivation and commitment among facility managers and pharmacy staff. However, these results also indicate opportunities for improving inventory management of pharmaceuticals in health facilities

## 5.2. RECOMMENDATIONS

The following recommendations are forwarded based on the findings of this study:

To public health facilities

- Effective inventory management should be supported by LMIS: health facilities should avail and regularly update bin card and stock cards at all times.
- Should avail, utilize and regularly monitor the recording accuracy of reporting formats at all times.
- It is recommended to implement and utilize the electronic stock management tool (HCMIS) in a more efficient manner to enhance transparency and information sharing, minimize wastage, reinforce stock recording practices, increase pharmaceutical availability, and elevate the quality of healthcare services.
- In collaboration with EPSS, RHB, and their partners, health facilities should work together to standardize and improve medication storage facilities. This will ensure sufficient space is available for storage and appropriate equipment, such as pallets and refrigerators, are provided to facilitate proper medication storage.
- Should follow good storage practices to upgrade their storage conditions and maintain the integrity of medical products stored.
- To enhance inventory management and warehousing activities, health facilities and RHB should work together and employ sufficient pharmacy staff (based on need) who can effectively handle the workload and ensure proper management of medication inventory.
- To minimize stock out of EMs and TDs, should regular monitor their stock status. In case of stock out both in the health facility and EPSS, should purchase the pharmaceuticals from private supplier timely i.e. health facilities should avoid bureaucratic procurement processes.
- Should proactively plan and allocate adequate budget for pharmaceutical procurement, inventory management, and warehousing operations based on patient flow, service level, and type.

To RHB and EPSS

- In collaboration with EPSS, to avoid stock out, it is better to allow and facilitate purchase of EMs and TDs from private suppliers only when unavailable in EPSS.
- Better to conduct regular monitoring and evaluation activities i.e. supportive supervision to promote effective and efficient management of pharmaceuticals and to minimize wastage and mismanagement. It is also one means of strengthening the capacity of pharmacy professionals responsible for medicine logistics in the health facilities.
- In collaboration with its partners, should regularly provide on job trainings to pharmacy professionals regarding inventory management and control.

Direction for future research

- To gain a comprehensive understanding of inventory management practices in the Tigray regional state, it is recommended to conduct further studies that include a larger number of facilities in different cities and towns.
- Future research should also consider using inferential statistics to identify factors that impact inventory management practices.
- Qualitative methods with a larger number of respondents could be used to fully explore the challenges faced in inventory management

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# Annexes

## English Version: Consent Form

Dear Sir;

This data collecting format is prepared to collect data on ***"Assessment of pharmaceuticals Inventory management performances in PHF".*** This study is conducted as part of my MSc thesis in collaboration with Addis Ababa University School of graduate studies**.** The aim of this study is to assess the effectiveness of inventory management performance in the PHF. The findings of this study will contribute to the existing knowledge of inventory management of ***pharmaceuticals*** by studying the performances in PHF. The results of this study will provide information to make decisions and to promote improvements in inventory

management performance in the health facility as well as in the region. The information extracted from the participants will be kept confidential and not exposed to other parties.

Are you willing to participate?

Yes: _____ No: _____

Data collector:

Name _____

Sign _____

Phone Number _____

Supervisor:

Name _____

Sign _____

Phone Number _____

**Instruction:**

Communicate the CEO of the hospital. Then being guided by head pharmacist, review secondary data from the hospital pharmacy documents; receiving and issuing documents, and ABC/VEN data, logistic documents, SSA, documents, and other required documents.

## Annex I: Questionnaires for Pharmacy Head

### 1. General

1. Name of the health facility _____
2. Region _____
3. Zone _____

4. Woreda _____

5. City/town _____

2. Type of facility

a) Health center b) General hospital c) Primary hospital d) referral hospital

3. What is the source of your health commodities? Multiple answers are possible

a) EPSS

b) Private wholesaler

c) NGO

d) Others specify _____

**2. Socio demographic Variables**

**Instruction**;

Circle the letters which is appropriate to the given questionnaires from the given choices and fill the blank spaces with appropriate answers.

1. **Sex:** a) Male b) Female

**2. Marital Status**

1. Married
2. Divorced
3. Single
4. Widowed

3. **Position in organization** …….

4. What is your level of education?

1. Diploma
2. Degree
3. MSC
4. PhD
5. Other

If other specify it_____

5. What is your role in the health commodity management in this health facility?

1. Inventory-Management officer
2. Store manager
3. Supervisor

6. How many years have you been working in this field?

a) < 1year b) 1 –3years c) 4 – 6years d) > 6 years

7. Have you ever received any training in health commodity management? a) Yes b) No

   1. If yes list the type of training_____

   2. If no write the reasons _____

8. How many staffs the facility has under the pharmacy unit? _____

12. What is the Educational qualification of pharmacy unit staff?

# of staff with Degree /_M=_____/ F=_____/

# of staff with Diploma /M=_____/F= _____/

Other # /M=_____/ F=_____/

**Instruction**: Place a check mark (√) in the appropriate column for Yes or No questions and give appropriate answers for the blanks provided below.

| S/N | Questionnaires / Description | Yes (1) | No(2) |
|---|---|---|---|
| 13 | Does the health facility have functional DTC? | | |
| 14 | Does the DTC have established criteria and authority concerning drug selection? | | |
| 15 | Are there documented criteria for addition to and deletion from the list and requests for the use of non-formulary medicines? | | |
| 16 | Has the DTC been involved in drug budget allocation? | | |
| 17 | Does the DTC have annual plan for performing some issues on inventory management of medicines? see the plan | | |
| 18 | Does the health facility have national essential medicines list? And hospital standard treatment guidelines? see the documents. | | |
| 19 | Does the health facility uses quantification method to determine the required quantity? | | |
| 20 | If yes what method do you use? multiple response is possible 1.morbidity method 2.population method 3.consumption method 4.adjusted consumption method | | |
| 21 | Does the health facility have visited by higher professionals to support your performances? | | |
| 22 | If yes how many times per year?_____ | | |

23. What are the challenges that hinder the performances of inventory management of pharmaceuticals in this hospital?

1._____

2._____

3._____

## Annex II: Questionnaires for Pharmacy Procurement Officer

**Instruction**; circle the letters which is appropriate to the given questionnaires from the given choices and fill the blank spaces with appropriate answers.

1. **Sex:** a) Male b) Female

**2. Marital Status**

1. Never married
2. Married
3. Divorced
4. Separated
5. Widowed

3. **Position in organization** ……

4. What is your level of education?

1. diploma (TVET)
2. Degree of BPharm
3. MSC in pharmacy
d. Other, if other specify it _____

5. What is your role in the health commodity management in this health facility?

1. Procurement officer
2. Inventory Management officer
3. Store manager
4. Supervisor

6. How many years have you been working in this field?

   a) < 1  b) 1 –3  c) 4 – 6  d) > 6

7. Have you ever received any training in health commodity management? a) Yes  b) No

   1. If yes list the type of training_____

   2. If no write the reasons _____

8. **Instruction:** Place a check mark (√) in the appropriate column for yes or no questions and give appropriate answers for the blanks provided below

| SN | **Questionnaires / descriptions** | Yes (1) | No (2) |
|---|---|---|---|
| 1 | **A. Resources Utilization:** Does the health facility identified drugs used to treat 10 top diseases of the catchment area? If yes how many are there? ---------- | | |
| 2 | Does the health facility have a medicines formulary or drug list that lists all drugs, medical supplies and consumable equipment that can be used in the facility?If yes how money are the drugs_____ M/supplies_____consumables_____ | | |
| 3 | Does the formulary or drug list have been reviewed and updated in the last two years? | | |
| 4 | Does the formulary or drug list share to hospital /health center staffs? | | |
| 5 | Does the formulary or drug list prioritized by VEN? | | |
| 6 | Does the health facility performed ABC value analysis on received stocks in the last 1-3 years? | | |
| 7 | Does the health facility performed ABC/VEN reconciliation analysis? | | |
| 8 | Does the **HF** use the ABC/VEN reconciliation analysis for procurement? | | |
| 9 | How many percent of drugs in monetary value fall in A category of ABC value analysis while they are V in VEN analysis _____? | | |
| 10 | How many percent of drugs in monetary value fall in A category of ABC value analysis while they are N in VEN analysis_____? | | |
| 11 | How many percent (in monetary value) of drugs fall in A category of ABC analysis while they are not available in the drug list-prioritized by VEN____? | | |
| 12 | How many percent (in monetary value) of drugs fall in B and C category of | | |

| | | | |
|---|---|---|---|
| | ABC analysis while they are not available in the drug list _____? | | |
| 13 | **B. Stock Status Analysis:**<br>Does the **HF** perform stock status analysis in the last six months to 1 year? | | |
| 14 | Did the **HF** take any measure based on the result of stock status analysis? | | |
| 15 | If yes to Q no 14, what measure did the **HF** took? You can choose more than one<br>A. Transfer to other health facilities<br>B. Selling to other organizations<br>C. Exchange with other medicines<br>D. Taking account in to quantification and limiting procurement of the same item in the consecutive procurements<br>E. Introducing and promoting medicines for prescribers<br>F. Other, please specify | [redacted] | |
| 16 | What is the cost of medicine saved due to stock status analysis? _____ | [redacted] | |
| 17 | How long does it take your facility to receive commodities once an order has been placed? a) Less than 1week b) 2 to 4weeks c) 5 to 8weeks d) 3 to 4months e) 5 months and above | [redacted] | |
| 18 | Have you ever experience Stock-Outs? | | |
| 19 | If yes to question 18, how did you deal with the situation?<br>a)borrow from other health facility b) making emergency order<br>c)remains until the next purchase d) purchasing by using direct purchase | [redacted] | |
| 20 | What do you do if your ordered quantities are not met?<br>a)borrow from other health facility b) making emergency order<br>c)remains until the next purchase d) purchasing by using direct purchase | [redacted] | |

9. 21. What problems did you face in procuring pharmaceuticals?

_____

_____

_____

## Annex III: Stock Status (Stock Out, Stock Level and Stock Control)

### Assessment tool for selected drugs based on 10 top diseases

**Instruction to the data collector**

1. Specify a full six-month period prior to the survey; and the day of visit
2. Name of all authorized products that will be counted
3. Specify the Unit of count for the product.
4. Record whether or not the product is managed at this facility, answer Y for yes or N if no.
5. Check if the bin card is available, answer Y for yes or N for no.
   Note: Check if the bin card has 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.
6. Record the balance on the bin card.
7. Record if the facility has had any stock out of the product during the 6-month period from _____to_____ answer Y for yes or N for no.
8. Record how many times the product stocked out during the 6-month period from September _____to _____according to bin cards, if available.
9. Record the total number of days the product was stocked out between, _____ to _____
10. Record the quantity of product issued from the storeroom between _____to _____
11. Record the number of months the issued data represents (may be 6 months or less); record the months for which there is any data available, including 0.
12. Record the physical count in the store room.
13. Record if the facility experiencing a stock out of the product on the day of the visit, answer Y for yes or N for no. If products are available outside the storeroom there is no stock out. Visually verify that usable products are in stock.
14. Record if the facility has expired products.

Maximum months of stock_____ Minimum months of stock _____ Order interval_____

Note: For any product that experienced a stock out in the last six months (including the day of the visit) please note reasons (by product).Stock status (stock out, inventory control, and record accuracy)

Table 13:**Stock status summary sheet at store (of six months prior to study date and at the study time)**

| S/n | Product | Units of count | Managed at this facility?(Y/N) | Bin card Available?(Y/N) | Bin card updated? (Y/N) | Balance on bin card | Stock out most recent 6 months (Y/N) | Number of stock outs | Total number of days stocked out | Total issued (most recent 6 months) | Number of Months of data available | Physical inventory — Store room | Stock out today? (Y/N) | Availability of expired product (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1 | Amoxicillin 250mg capsule | | | | | | | | | | | | | |
| | Amoxicillin 500mg capsule | | | | | | | | | | | | | |
| | Amoxicillin 250mg/5ml Suspension | | | | | | | | | | | | | |
| | Amoxicillin 125mg/5ml Suspension | | | | | | | | | | | | | |
| 2 | Oral Rehydration Salt 20.5g/Litre | | | | | | | | | | | | | |
| 3 | Arthemether-20mg +Lumfantrine 120mg | | | | | | | | | | | | | |
| 4 | Co-trimoxazole 480mg tabs | | | | | | | | | | | | | |
| | Cotrimoxazole 240mg/5ml susp | | | | | | | | | | | | | |
| 5 | Benzyl Benzoate Lotion 25% | | | | | | | | | | | | | |
| 6 | Ceftriaxone With Diluents 500mg inj | | | | | | | | | | | | | |
| | Ceftriaxone With Diluents 1gm inj | | | | | | | | | | | | | |
| 7 | Ciprofloxaciline 500mg | | | | | | | | | | | | | |
| 8 | Clarithromycin 250mg Caps | | | | | | | | | | | | | |
| | Clarithromycin 500mg Caps | | | | | | | | | | | | | |
| 9 | Cloxaciline 125mg/5ml | | | | | | | | | | | | | |
| | Cloxaciline 250mg/5ml | | | | | | | | | | | | | |
| | Cloxaciline 250mg Caps | | | | | | | | | | | | | |
| | Cloxaciline 500mg Caps | | | | | | | | | | | | | |
| 10 | Doxycycline 100mg Caps | | | | | | | | | | | | | |
| 11 | Ferrous Salt 300mg + Folic Acid0.25mg Tab | | | | | | | | | | | | | |
| 12 | Gentamycin 80mg/2ml Injection | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Hydrocortisone Ointment 1% | | | | | | | | | | | | | |
| 14 | Insulin Zinc Suspension 100u/Ml ScInjec | | | | | | | | | | | | | |
| 15 | Lente Insulin 10iu/Ml | | | | | | | | | | | | | |
| 16 | Magnesium Sulphate 10% Injection | | | | | | | | | | | | | |
| 17 | Mebendazole 100mg Tablet | | | | | | | | | | | | | |
| 18 | Medroxyprogestron Acetate 150mg/Ml Injection (Depo-Provera) | | | | | | | | | | | | | |
| 19 | Memontsone 0.1 Cream | | | | | | | | | | | | | |
| 20 | Methyl-Ergometrine 0.2mg/ml Injection | | | | | | | | | | | | | |
| 21 | Metronidazole 250mg Caps | | | | | | | | | | | | | |
| 22 | Omeprazole 20mg | | | | | | | | | | | | | |
| 23 | Oxytocine 10 Units /ml Injection | | | | | | | | | | | | | |
| 24 | Paracetamole 500mg Tablet | | | | | | | | | | | | | |
| 25 | RHZE-Tablet-150mg/75mg/400mg /275mg | | | | | | | | | | | | | |
| 26 | Spectinomycine 2gm injecti | | | | | | | | | | | | | |
| 27 | Tramadole 50mg caps | | | | | | | | | | | | | |
| 28 | Sulpher Ointment 10% | | | | | | | | | | | | | |
| 29 | Tetanus-Anti-Toxin 1500units/ml Injec | | | | | | | | | | | | | |
| 30 | Tetracycline Eye Ointment 1% | | | | | | | | | | | | | |
| 31 | Zinc Sulphate 10mg Tablet | | | | | | | | | | | | | |

**Annex IV: Store Management and Storage Conditions**

1. Store management

1. **Instruction;** circle the letters which is appropriate to the given questionnaires from the given choices and fill the blank spaces with appropriate answers. **Sex:** a) Male b) Female

2. Marital Status
    1. Never married
    2. Married
    3. Divorced
    4. Separated
    e) Widowed

3. Position in organization…….

4. What is your level of education?
    1. diploma (TVET)
    2. Degree of BPharm
    3. MSC in pharmacy
    4. Other

    If other specify it _____

5. What is your role in the health commodity management in this **HF**?
    a) Procurement officer
    b) Inventory Management officer
    c) Store manager
    d) Supervisor

6. How many years have you been working in this field?
    a) < 1 b) 1 –3 c) 4 – 6 d) > 6

7. Have you ever received any training in health commodity management? a) Yes b) No

If yes list the type of training_____

If no write the reasons _____

_____

_____

8. What are the main challenges in the store to perform inventory management properly and effectively?

_____

_____

_____

**Instruction**: Place a check mark (√) in the appropriate column for Yes or No questions and give appropriate answers for the blanks provided below.

| SN | **Questions /descriptions** | Yes (1) | No (2) |
|---|---|---|---|
| | **A /general**<br>Is the following facilities avail in the pharmacy store? | | |
| 1 | 1. Operational telephone (land line or mobile) | | |
| 2 | 2. functional Computer | | |
| 3 | 3. Internet Access | | |
| 4 | 4. HCMIS soft ware | | |
| 5 | What is the source of your health commodities? Multiple answers is possible | | |
| | 5. a) EPSS b) Private wholesaler c) NGO d) Others specify | | |
| | Are the following LMIS Formats, Job Aides and SOPs are available at the store? (Ask for documents to verify) | | |
| 6 | 1. Bin Cards | | |
| 7 | 2. stock record card | | |
| 8 | 3. Facility Report and Requisition Form (RRF) | | |
| 9 | 4. Standard Operation Procedure (SOP) for store | | |
| 10 | Do you establish Maximum, Minimum, and Re-order levels for the health commodities? | | |
| 11 | If yes to question 10 how often do you update these levels? | | |
| | A) Monthly B) Bimonthly C) Bi Annually D) Annually E) Other | | |
| 12 | 9. If No to question 10. How do you control your stock levels? | | |
| | | | |

| | | | |
|---|---|---|---|
| | | [redacted] | |
| 13 | What LMIS forms do you use for reporting/ordering? multiple answer is possible | | |
| | A. RRF B.IRRF C letter of reporting /requesting | | |
| 14 | Do LMIS report forms include the following? | | |
| | A. stock on hand B. quantity consumed C. losses and adjustments | | |
| 15 | How many emergency orders for _____ (product of interest, e.g., contraceptives, STI drugs, etc.) have you placed in the last 3 months? | | |
| | A. 1 time B 2 times C 3 three times D>4 times E. NA | | |
| 16 | Do you do physical count for health commodities? | | |
| 17 | If yes to question 16, how often do you do it? | | |
| | A) Monthly B) Quarterly C) Bi-Annually D) Annually | | |
| 18 | How often is the quantity of health commodities needed ordered? | | |
| | a) Monthly b) Quarterly c) Bi-annually d) As the need arises | | |
| | **B / wastage** | [redacted] | |
| 19 | Have you experience expiry of medicines? | | |
| 20 | Do you have obsolete/ unusable health commodities? | | |
| 21 | Have you experience losses other than damaged or expiry? | | |
| 22 | If the answer to questions 19-21 is yes determine the value in monetary values._____ | | |
| | **C/ Receiving and issuing of health commodities** | [redacted] | |
| 23 | Are all medicines received in the store uses standard receiving? | | |
| | Vouchers? see | | |
| 24 | Are all medicines issued to all wards, laboratory sections and dispensing outlets use standard issuing vouchers? name it_____ | | |
| 25 | By which method are commodities stored and issued in your facility? | | |
| | a) First In, First Out (FIFO) b) Last In, First Out (LIFO) c) First Expiry, First Out (FEFO) | | |

| | | | |
|---|---|---|---|
| | **D/ reporting** | | |
| 26 | Do you have schedule for reporting store management performances the following conditions? | | |
| 27 | Requisition report | | |
| 28 | Quantity received | | |
| 29 | Quantity issued | | |
| 30 | Quantity on hand | | |
| 31 | Discrepancy | | |
| 32 | Losses due to expiry ,damage | | |
| 33 | Does the **HF** have adequate number of pharmacy staffs for store activities? | | |

34. Anything you can add_____

You can ask _____

## 2. Storage conditions

**Instruction**: Items 1 -13 should be assessed for all facilities for products that are ready to be issued or distributed to clients. Place a check mark (√) in the appropriate column based on visual inspection of the storage facility; note any relevant observations in the comments column**.** To qualify as "yes," all products and cartons must meet the criteria for each item.

Table 6: Storage condition questionnaires

| S N | Questionnaires /description | Yes (1) | No (2) |
|---|---|---|---|
| 01. | Pharmaceuticals are arranged & organized according to a logical categorization, e.g. zoning ,alphabetical ,pharmaco- therapeutically or pharmaceutical form | | |
| 02. | Products are stored at the appropriate temperature according to product temperature specifications. check thermometer functionality | | |
| 03. | Are unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from the usable stock? | | |
| 04. | Products are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible. | | |
| 05. | Products are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO). | | |
| 06. | Products are protected from direct sunlight and high heat at all times of the day/during all seasons. | | |
| 07. | The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well-organized). | | |
| 08. | The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future). | | |
| 09. | Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel. | | |

| | | | |
|---|---|---|---|
| 10. | Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings or insects].) | | |
| 11. | Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation | | |
| 12 | Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered). | | |
| 13 | Products are stored separately from insecticides and chemicals. | | |

## Annex V: Product Wastage

Instruction to the data collector:

1. Product Wastage (Specify a full six months' period prior to the survey; and the day of visit) _____.

2. Identify Model numbers of pharmaceuticals received in the specified years

3. Calculate total cost of pharmaceuticals for the specified year for all drugs (RDF and program) from Model 19

4. Record the quantity of pharmaceuticals expired/damaged in the specified year

5. Take the unit price of each expired product from model 19; if not available, take the current price

6. Calculate cost of pharmaceuticals lost due to expiry, damage and loss for all pharmaceuticals

Note: The total value of pharmaceuticals expired in the specified year can obtain from disposal registration form if expired drugs were disposed

**Table 7:** Wastage summary sheet at health facility level (6 months prior to the current study)

| Date | Cost of pharmaceutical purchased for the specified year | Cost of pharmaceuticals lost due to expiry, loss/ damage | Remark |
|---|---|---|---|
| | | | |
| | | | |

## Annex VI: Order Fill Rate

**Instruction**

1 obtain the requisition /orders to supplier within the 3 months

2. Obtain the received items from the supplier's voucher /model 19

3. Make tally for the orders and receipts and add them in terms item only

Note: **line fill rat**e= the number of items supplied by the supplier

**Order fill rate** =the number of items supplied by the supplier which is equal to the order by name and quantity.

4. Record the results in the following table.

**Table 14:**order fill rate

| S/N | Requisition date | Letter number | Total items requested | Total items supplied | Total items correctly supplied | Supplied date |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

**NB.** The same format but different page can be used for private supplier.

## Annex VII: Information Sheet for Interview of CEO, and Pharmacy Head

Hello, my name is Kiflom Solomon. I am MSC student of pharmaceutical supply chain management in the school of Pharmacy, Addis Ababa University. The purpose of this study is to assess the inventory management performance of pharmaceuticals in northern part of Ethiopia in mekelle zone Tigray regional state PHF. This will be helpful in improving the availability of essential medicines and decreasing wastage with regard to pharmacy service and identify challenges towards it.

If you agree to participate in my research, I will conduct an interview with you at a time and location of your choice. The interview will involve questions about the title mentioned above. It would last about half an hour. With your permission, I will audiotape and take notes during the interview. The recording is to accurately record the information you provide, and will be used for transcription purposes only. If you choose not to be audio taped, I will take notes instead. If you agree to be audio taped but feel uncomfortable at any time during the interview, I can turn off the recorder at your request. Or if you don't wish to continue, you can stop the interview at any time. Your participation is completely voluntary. You can refuse to answer any questions and/or withdraw from the study at any time without a problem to you.

There is no direct personal benefit to you from taking part in this study. It is hoped that the research will give input about the inventory management performance in the public hospitals and challenges towards it. This helps to design strategies for better implementation and help to improve the service that is given to the society.

All your responses will remain strictly confidential, your name will not be recorded on the Interview guide and your responses will not be linked to your identity at any time. The results of this study will be presented collectively and no individual participants will be identified

## Annex VIII: Consent Form for interview of CEO, and Pharmacy Head

I have been informed of and understand the purpose and procedures of this study and the purpose and procedures of this interview/these interviews. I understand that I am free to withdraw my consent and discontinue my participation in this interview at any time. I understand that I can choose to answer only the questions that I wish to answer. I understand that the interview will be audio taped or digitally recorded and then transcribed.

**I agree / not agree (circle one) to be audio taped.**

By signing this consent form, you are indicating that you fully understand the above information and agree to participate in this study.

Participant's signature _____

Date: _____

Researcher's signature: _____

Date: _____

If you have any questions about this study, please contact principal investigator:

Kiflom Solomon (Mobile: 0914-735483); e-mail: kiflomsb@gmail.com

## Annex IX: Guide for Key Informant Interview with CEO and Pharmacy Head

**A.Questions to gather demographic and practice information of CEO and Pharmacy head**

**Back ground of the informant**

1.sex ----------

2.Profession…….

3.Highest level of education……

4.Total Work experience……

5.Current position in the health facility----------

6.Work experience in your current position of the health facility……

**B. Questions prepared for discussion**

1. Opening question: -How do you manage the overall pharmacy service in this facility in general?
2. How do you describe the overall achievement in terms of inventory management of pharmacy or improving services in pharmacy?
   Probing: is there pharmacy implementation plan? Is there performance indicator for pharmacy plan measurement?
3. How do you assess /measure/ the inventory management performance of pharmacy?
   Probing: -Is there physical inventory schedule, record of inventory management either paper or computer based, does the hospital ensures all types of drug transaction availability? If no, why?
4. How do you control stock out /overstock /wastage of medicines in your facility?
   Probing: -is there hospital based list of essential drugs? Is there category of ABC/VEN analysis methods? Is there a scheduled time for measuring and reporting pharmacy performances to the health facility management?
5. What are the challenges or problems in improving inventory management of medicines in your health facility?
6. What do you recommend for proper inventory management of pharmaceuticals?

**Thank you for your time and cooperation!**

**Table 15:**socio demographic characteristics of pharmacists' professionals

| S/N | Demographic characteristics | category | frequency | Percentage % |
|---|---|---|---|---|
| 1 | Sex | Male<br>Female | | |
| 2 | Marital status | Married<br>Never married<br>Separated<br>Divorced<br>Widowed | | |
| 3 | Level of education | B pharm<br>Diploma<br>(TVET) | | |
| 4 | Work experience | < 1 year<br>1-3 years<br>3-6 years<br>>6 years | | |

**Table 16:**Logistics management forms and tools Availability in health facilities in mekelle zone

| S/N | Type of format or job aid | # HF's N=15 | | | |
|---|---|---|---|---|---|
| | | Yes | No | Total | Percent |
| 1 | Stock card | | | | |
| 2 | RRF | | | | |
| 3 | IFRR | | | | |
| 4 | SOP | | | | |
| 5 | HCMIS | | | | |
| 6 | Functional computer | | | | |
| 7 | Internet accesses | | | | |
| **Total** | | | | | |
| | **proportion** | | | | |

**Table 17:** Record Accuracy and completeness of data on RRF and IFRR at health facilities in Mekelle zone in Tigray in 2019 (N =15)

| Variables | PHF N=15 | | |
|---|---|---|---|
| | Yes | No | % |
| **Checking record Accuracy of RRF and IFRR** | | | |
| Calculated Consumption indicated on the RRF(CC ) | | | |
| Maximum stock quantity indicated on the RRF(CC*x2) | | | |
| QO* indicated on the RRF (Max SLQ*–EB quantity) | | | |
| QR* of RRF Vs quantity in receiving voucher /model 19 / | | | |
| EB* of RRF Vs EB* of bin card | | | |
| Loss/adjustment of RRF Vs loss/adjustment of bin card | | | |
| CC* of RRF Vs Quantity issues of bin card | | | |
| IFRR calculated consumption | | | |
| Loss/adj. of IFRR Vs Loss/adj. of bin card | | | |
| IFRR quantity ordered | | | |
| **Completeness of RRF** | | | |
| RRF includes beginning Balance | | | |
| RRF includes Stock on Hand data | | | |
| RRF includes quantity loss/adjustment data | | | |
| RRF includes quantity received data | | | |
| **Completeness of IFRR** | | | |
| IFRR includes beginning balance | | | |
| IFRR includes stock on hand data | | | |
| IFRR includes loss/adjustment data | | | |
| IFRR includes quantity received data | | | |

**Table 18:** Stock status analysis of essential drugs in PHF of Mekelle zone in Jan 2019 Gc.

| Seri no | Variable | Mean | % |
|---|---|---|---|
| 1 | Stock out in the last six months | | |
| 2 | Stock out on the day of visit | | |
| 3 | Average Stock out days in the six months | | |

**Table 19:**The value of financial loses of medicines due to expired stock and damaged and wastage rate of PHF in Jan 2019 (N=15)

| Code | value of beginning inventory as of Jan 2011 EC | total purchases value in 9 months in the current budget year | Stock available for sale (use) | stock wasted in 9 months | wastage rate |
|---|---|---|---|---|---|
| AHAHC | | | | | |
| ASHHC | | | | | |
| AYHC | | | | | |
| DEHC | | | | | |
| KAHC | | | | | |
| QUHC | | | | | |
| LAHC | | | | | |
| MEHC | | | | | |
| SEMHC | | | | | |
| SERHC | | | | | |
| AHPH | | | | | |
| AYRH | | | | | |
| HEGH | | | | | |
| MEGH | | | | | |
| QUGH | | | | | |
| Total | | | | | |
| Mean | | | | | |

**Annex 3. Facility Storage Condition Observation Check List**

Facility Name: _____ Facility type: _____

District: _____ Name of the Data Collector: _____

Date: _____

**Table 20:** Facility Storage Condition Observation Check List

| S/n | Questionnaires /description | Yes (1) | No (2) |
|---|---|---|---|
| 1 | Pharmaceuticals are arranged & organized according to a logical categorization, e.g. zoning ,alphabetical, pharmacotherapeutically or pharmaceutical form | | |
| 2 | Products are stored at the appropriate temperature according to product temperature specifications. check thermometer functionality | | |
| 3 | Are unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from the usable stock? | | |
| 4 | Products are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible. | | |
| 5 | Products are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO). | | |
| 6 | Products are protected from direct sunlight and high heat at all times of the day/during all seasons. | | |
| 7 | The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well-organized). | | |
| 8 | The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future). | | |
| 9 | Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel. | | |
| 10 | Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings/insects].) | | |
| 11 | Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to | | |

| | | | |
|---|---|---|---|
| | heat/radiation | | |
| 12 | Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered). | | |
| 13 | Products are stored separately from insecticides and chemicals. | | |

**Table 21:**availability of DTC, drug list and STG in the study PHF n=15 Jan 2019 in Mekelle zone Tigray public hospitals

| Seri No | Inventory management performance indicator | # HF's | % |
|---|---|---|---|
| 1 | Availability of functional DTC | | |
| 2 | Drug list developed and approved by DTC | | |
| 3 | Availability of Standard treatment guideline (STG) | | |

**Table 22:**percentage of VEN, ABC analysis and ABC-VEN reconciliation at PHF in Mekelle zone Tigray in Jan 2019

| **S/N** | **Inventory management performance indicator** | **# HF's** | **%** |
|---|---|---|---|
| | VEN analysis | | |
| | ABC analysis | | |
| | ABC –VEN reconciliation | | |

**Table 23:** Percentage of PHF describing the stock out, Availability and record accuracy of tracer drugs from September 2019- October 2019, (n = 15).

| Tracer drugs | # of Public **HF**'s with bin card updated | # of public **HF's** with accurate records i.e. n (%) | # of public **HF's** Stock out on the day of visit (%) | # of public **HF's** With stock out any time in the past 6 months (%) | Mean # of days (range) of stock outs in the past 6months | # of public **HF's** with availability of the tracer drug n (%) |
|---|---|---|---|---|---|---|
| Amoxicillin 500 mg | | | | | | |
| Oral Rehydration Salt 20.5g/Littre | | | | | | |
| Arthemether20mg +Lumfantrine 120mg | | | | | | |
| Ferrous Salt 300mg + Folic Acid0.25mg Tab | | | | | | |
| Gentamycin 80mg/2ml Inj. | | | | | | |
| Mebendazole 100mg Tablet | | | | | | |
| Medroxyprogesterone Acetate 150mg/ml Injection (Depo-Provera | | | | | | |
| Methyl Ergometrine 0.2mg/ml Inj. | | | | | | |
| Paracetamol 500mg tab | | | | | | |
| Tb kit( RHZE +RH) | | | | | | |
| Tetracycline Eye Ointment 1% | | | | | | |
| Zinc acetate 20mg Tablet | | | | | | |

Table 24:**supportive supervision frequency in PHF at Mekelle zone Tigray in 2019 GC**

| Frequency of visit | N=15 | |
|---|---|---|
| | frequency | % |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

**Table 25:**inventory management performances of PHF in Mekelle zone Tigray in 2019 GC

| Variables | Inventory management performances levels n=15 | | |
|---|---|---|---|
| | Poor | Inadequate | Common |
| Availability of bin card | | | |
| Updating of bin card | | | |
| Record accuracy of bin | | | |
| Min-max stock level | | | |
| Stock out 6 months* | | | |
| Stock out on day of visit* | | | |
| Storage condition | | | |
| Order fill rate by private | | | |
| Order fill rate by EPSS | | | |
| work force | | | |
| Wastage* | | | |
| Supervision frequency | | | |
| Availability of tracer drugs | | | |
| Duration of stock outs | | | |
| **Total** | | | |
| **IM Performances in %** | | | |

<2* is best for wastage rate

0* is best for stock outs