



**ASSESSMENT OF THE EFFECT OF INVENTORY
MANAGEMENT PRACTICE ON OPERATIONAL
PERFORMANCE OF TRACER DRUGS IN PUBLIC HEALTH
CENTERS.
THE CASE OF ADAMA TOWN.**

BY

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THE CASE OF ADAMA TOWN, OROMIA.

By

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Advisor

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December, 2021

Addis Ababa, Ethiopia

Declaration

I hereby declared that this research paper entitles “Assessment of the Effect of Inventory Management Practice on Operational Performance of Tracer Drugs in Public Health Centers of Adama Town” represents my own work which has been done after registration for the degree of Masters at Addis Ababa University, and has not been previously included in a thesis or dissertation submitted to this or any other institutions for a degree, diploma or other qualifications.

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ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

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The researcher

List of Abbreviations/Acronyms

AIDS	Acquired Immune Deficiency Syndrome
NLEM	National Lists of Essential Medicines
EPSA	Ethiopia Pharmaceutical Supply Agency
PFSA	Pharmaceuticals Fund and Supply Agency
HIV	Human Immune Virus
HC	Health Center
IFRR	Internal Facility Report and Request Form
IPLS	Integrated Pharmaceutical Logistics System
IMAT	Inventory Management Assessment Tool
LMIS	Logistic Management Information System
RRF	Report and Requisition Form
RRUC	Record for Returning Unusable Commodities
STI	Sexually Transmitted Infections
TB	Tuberculosis
TD	Tracer Drugs
WHO	World Health Organization
ART	Antiretroviral Therapy
TDF +3TC+DTG	Tenofovir + Lamivudine + Dolutegravir
HCMIS	Health Commodity Management Information System
FMHACA	Food, Medicine and Health Care Administration and Control Authority
USAID	United States Agency for International Development
RHZE	Rifampicin, Isoniazid, pyrazinamide, Ethambutol
RH	Rifampicin, Isoniazid
DU	Dispensing Unit

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Abstract

This research was conducted to assess the inventory management practices (namely measured by LMIS implementation, accuracy of stock keeping records, Supportive Supervision, and storage condition) and its effect on operational performance of tracer drugs in health centers of Adama Town, Oromia, Ethiopia. Tracer Drugs are pharmaceutical products that satisfy the priority healthcare needs of clients which must be available in the health facilities at all times in adequate amounts with affordable price by the community. The descriptive aspect of the research design was used in establishing the health centers inventory management practices and the analytical research design was used to establish the relationship between inventory management practices and operational performance of tracer drugs. The target population for this study was 8 public health centers of which 6 were included for the study. Two health Centers excluded from the study because of incomplete documents. Proportionate Stratified Random Sampling technique was used to get representative respondents from each health centers to quantitatively and qualitatively assess the supposed relationship between the independent and dependent variables. Semi structured-questionnaire, check lists and in-depth interview questions were used as the formal instrument of data collection. A total of 106 questionnaires were distributed and 99 of them were filled and returned which made the response rate 93 percent and of which all of them were complete and qualified for being processed. The study findings show that inventory management practices of Adama Town health centers need improvement. It has also revealed that supportive supervision and LMIS system for inventory management practices have statistically significant predicting power on operational performance of TDs (adequate availability) with Beta values of (β 0.765, P .00) and (β 0.254, P 0.00) respectively. It is recommended that all health centers of Adama town are required to review their existing inventory management practices. In addition, Adama town has to follow and support LMIS implementation, inventory control system and lean inventory system at all units stocking pharmaceuticals in order to benefit from the performance improvements in terms of adequate availability, minimized stock out days and avoid over stock.

Keywords: *inventory management, tracer drugs, availability, overstock, shortage*

CHAPTER ONE

INTRODUCTION

This research was focused on examining the effect of inventory management practice on Operational Performance of Tracer Drugs in Public Health Centers of Adama Town, Oromia. It consisted five Chapters. Chapter 1 Introduction contains Background of the study, statement of the problem, Objective, Research question, Scope of the study, Operational definitions, Importance of the study and organization of the study.

1.1 Background of the Study

Medicines are vital items in patient care. Tracer Medicines are drugs that fulfill the priority healthcare needs of clients and which must be available in the health facilities all the time in adequate quantity with affordable price for the community. They are selected based on certain criteria which includes consideration of outpatient morbidity, priority treatment options, inclusion in the National List of Essential Medicines (NLEM) of a country, and representation of pediatric dosage forms (WHO, 2019).

Availing Tracer Drugs is an important factor to address patients' need and improve their health seeking behavior. Most leading causes of death like malaria, infectious diseases, and HIV/AIDS can only be prevented or treated effectively by having appropriate medicines consistently available (WHO, 2019). According to WHO recommendation availability of Tracer Drugs should be 100 percent but it is estimated that about one-third of the world population does not have access to these essential drugs particularly in Africa and Asia (WHO, 2004). Availability of medicines at public health facilities was less than 60 percent across WHO regions especially in Africa region (WHO, 2004). In developing countries availability and affordability of Tracer Drugs was taken as one of Millennium Development Goal (FMHACA, 2017).

The stock out of essential Medicines is common problem in Ethiopia although the degree varies from facility to facility, ranged from 26 to 91 percent (Mudzteba, 2014). In addition, poor inventory management practices is challenge for adequate availability of Tracer Drugs in the country.

Research done in Rwanda indicated that for ten tracer drugs assessed, only one tracer drug, Mebendazole, had no recorded stock-outs in any health center in 2013.

The most stock-outs was Quinine (66.6 percent) with 10 health centers experiencing an average of 10.5 months of stock-outs, often lasting for the entire month (Marshall Makuza, 2015). To ensure availability of tracer drugs all the time, holding stocks is very important.

According to the study conducted in health centers of East Shawa Zone, Oromia Regional State, on inventory management performance of key Tracer Drugs in-terms of measuring indicators revealed that out of 400 bin-cards selected 162 (40.50 percent) of them were not updated. Only 28.50 percent of bin-cards were accurately filled. This survey also showed that stock out rate of the Tracer Drugs was around 27.25 percent with average stock out duration of 35.31 days (Tadesse Gudeta Gurmu, 2017).

The assessment carried out in Primary Public Health centers of Gondar Town, North West Ethiopia, showed the average length of days of stock out for the Tracer Drugs over the six months was 30.5 days with mean stock out frequency of 0.8 (Adane Teshome Kefale, 2019). Almost similar days of stock out (26.5 days) were reported from Sudan (WHO, 2010).

The Infectious diseases such as TB, HIV, STI, diarrheal diseases, pneumonia and malaria are major health problem of African countries. Provision of basic health services in the country mostly remains to be the responsibility of the public health sector. Availing the most cost effective drugs that satisfy priority healthcare needs of the population in adequate amount, appropriate dosage forms and of assured quality at all times is another factor (EFMHACA, 2010).

Ethiopia has developed National Essential Medicines List primarily based totally at the common health problems in the country beginning from 1985 (EFMHACA, 2010) . In 2012, the United States of America has additionally published list of drug treatments specifically for primary public health facilities to ease making available of the needed medicines at this facility level (FMHACA, 2017).

Integrated Pharmaceutical Logistics System (IPLS) was developed to monitor the transaction of all pharmaceuticals throughout the country at all level. These include Inventory Control System, Logistics Management Information System and Storage condition.

The implementation of these features of IPLS were monitored through continuous supportive supervision conducted by concerned stakeholders and good improvements were seen in many health facilities across the country.

Inventory management system is vital for pharmaceutical supply system which includes the management of routine pharmaceutical ordering process. It allows to hold a regular supply to patients, therefore avoiding product shortages, at the same time as minimizing the expenses of keeping stock (FMHACA, 2017). Accurate and up to date inventory keeping cards are essential for correct stock control considering the fact that they're input to calculate exact needs.

An inventory control; the manner of ordering, storing and the usage of inventories of the health facilities; that is a part of supply chain management and may be assisted with automated Logistics Management Information System (LMIS) that permits smooth recording of all drugs transactions and connects all tiers of deliver chains, is likewise practiced in health sectors of the country.

Despite the importance of LMIS in improving efficiency of the overall inventory management process (Ventola, 2011), it is underutilized in developing countries including Ethiopia (EPSA, 2015). Inventory management plays a major role in providing efficient healthcare in relation to three vital aspects of drug supplies used in the health centers; availability, safety, and affordability which are important determinants of quality of care and patient satisfaction with services provided in public health centers (EFMHACA, 2010). Poor inventory management might lead to overstocking or under stocking of Tracer Drugs which subsequently results wastage of resource and increased morbidity and mortality due to shortage of life saving drugs (MSH, 2012).

In Ethiopia, Adama Town assessment of availability of essential medicines and pharmaceutical inventory management practice at health centers was undertaken to document inventory management practice and availability of essential medicines at health centers of the town (Shebo, 2019). The evaluation found out that the general common availability of TDs at the day of the survey was 76.3 percent. Average length of stock out days for TDs during the past 12 months from each HC was 40.6 days.

Among the TDs assessed at HCs, oral rehydrating salt became stocked out for one hundred forty four days at the same time as Paracetamol became stock outed simply for 1.4 days.

The discrepancy of TDs among actual count and on bin card for which actual stock much less than the balance on bin card degrees from zero to 33.3 percent.

The major reason of those issues at that point was absence of automated software device and shortage of sufficient pharmacy experts on the health facilities (Adane Teshome Kefale, 2019).

This study collected data on inventory management practices of tracer medicines (LMIS utilization, stock out duration, stock accuracy rate, storage condition of stores of the health facilities) and assessed the effect on performance of tracer drugs (Adequate availability, Overstock/Wastage, Shortages). Additionally, the main inventory management challenges with in that health facilities was also examined. So, this research was to fill the insufficient information at the status, effect of inventory management practices on operational performance of tracer drugs in those public health facilities located in Adama Town, Oromia.

1.2 Background of Inventory Management of Health Facilities in Oromia Region

Ministry of Health - Ethiopia developed Integrated Pharmaceuticals Logistics System (IPLS) and standardized inventory management tools anticipated to be used by public health facilities all through the country whether or not operated manually or use HCMIS. Implementation of this system is anticipated from all Health Facilities in the region. All health facilities need to make use of bin card, stock card, Internal Facility Request and Resupply form, Report and Requisition Form (EPSA, 2015).

The bin card is stored with the product inside the store and up dated in each transaction at the same time as stock card is just like the bin card however is used to track stock based on issuing and receiving orders. Internal Facility Report Resupply form is a voucher used to document internal transfer of drugs among the facility's pharmaceutical store and dispensing units.

The RRF is used to order health commodities from EPSA while RRUC is used to track the transfer of supplies returned to EPSA. The Ministry highly recommends physical inventory and updating of bin cards and stock cards on normal basis. It is was hoping that health facilities in Oromia

Region are using these LMIS formats to monitor inventory management of pharmaceutical in the health facilities.

The Health Centers need to additionally monitor Storage Guidelines those encouraged for correct storage conditions that are additionally anticipated from Health Facilities of Adama Town. Utilization of BCs, IFRR, RRF, and different LMIS tools for control of essential medicines is expected from public health facilities of Adama town.

1.3 Statement of the problem

Pharmaceuticals inventory management system is a complex but critical process within the healthcare delivery system. Without appropriate pharmaceuticals inventory management practices, health centers run the risk of not being able to provide patients with the most appropriate medication when it is most needed (Wijayawickrama, 2015). Pharmaceuticals management practice has different components which are organized in the logistic cycle form, however the present study focused on the inventory management part.

Although drug treatments are effective weapons that could assist society to prevent, alleviate and treatment illnesses, more than one 1/3 of the World population lacks access to vital medicines, a situation that directly contradicts the fundamental principle of health as a human right (Ali, 2011) (Mathaba S, 2011).

Infectious illnesses deprive the lifestyles of thirteen million peoples globally whereas the prevalence is higher developing countries (Woo-Miles, 2015).

For instance, study carried out in Ghana, 2008 indicated that malaria accompanied through HIV/AIDS, diarrheal illnesses, lower respiratory infections and prenatal conditions accounted for 50 percent of all deaths (Malaysia, 2011). Most of early deaths and complications related to the diseases, specifically opportunistic infections associated with HIV/AIDS may be overcome if the needy had access to vital drug treatments via proper management of medicines with appropriate stock control (Woo-Miles, 2015). The main consequence of stock outs of ARV medicines is poor adherence to treatment. For example, HIV/AIDS poor adherence to treatment can be associated with ineffective viral suppression, resistance to medication, increased morbidity and low survival rates (Schaecher, 2013).

Every year, Oromia Finance Bureau allocates 300,000 ETB, as revolving drug fund, for pharmaceutical purchase for every public health facilities in the Region (ORHB, 2021). Despite 24 hours and seven days availability of tracer drugs is suggested by WHO, consecutive Pharmaceuticals Supply Chain Management and Pharmacy Service Monitoring and Evaluation Report of Adama Town showed that there has been frequent stock out of the tracer drugs.

The inventory management is a key element of logistics and supply chain management. It decides on when to order, how much to order and how much inventory to maintain (MSH, 2012).

Although LMIS is very critical in enhancing efficiency (optimal availability, minimized scarcity and averted overstock) of the overall inventory management system, it's far underutilized and limited research had been performed concerning effect of inventory management practice on operational performance of tracer drugs (EMOH, 2010) (EPSA, 2015) (Ventola, 2011).

Determining operational performance of TDs and an in-depth understanding of logistic management information system implementation will empower public health governors and decision-makers' attempt to enhance access, develop human resources required to manage TDs and improve inventory management system. Previous researchers have targeting carrying out only descriptive studies on availability of tracer drugs, effective Inventory control procedures, importance of Inventory control management on organization performance, leaving out an evaluation of the effects of Inventory Management practices on an operational performance of tracer drugs. This problem has therefore caused the researcher to perform the studies on an assessment of effects of Inventory management practices on performance of tracer drugs. Based on this, it's been aimed to investigate inventory Management practices and its effects on operational performance of tracer drugs within public health facilities of Adama Town, Ethiopia.

Moreover, this study aimed at investigating this phenomenon and establishes the assessments on practice of Adama Town public health centers towards inventory management variables such as adequate availability, stock out, Inventory record accuracy, customer service and Inventory control system.

1.4 Research Questions

- 1) What is the effect of inventory management practice on operational performance of tracer drugs in Public Health Centers of Adama Town?
- 2) How is inventory management practiced in health centers of Adama Town?
- 3) How acceptable is the Tracer Drugs storage conditions in the public health center with respect to good storage practice?
- 4) What are the challenges of implementing inventory management practice of tracer drugs in Public Health Centers of Adama Town, Oromia?

1.5 Objectives

1.5.1 General Objective of the study

The general objective of the study is to assess the effect of inventory management practice on Operational performance of tracer drugs in Public Health Centers of Adama Town, Oromia, Ethiopia.

1.5.2 Specific objectives of the study

- I. To examine the effect of inventory management practice on operational performance of tracer drugs in Public Health Centers of Adama Town.
- II. To study the inventory management practice in Adama Town health centers
- III. To assess the storage conditions of Tracer Medicines in Public Health Centers of Adama Town, Oromia, Ethiopia.
- IV. To examine the challenges in implementing inventory management practice for Tracer Drugs in Public Health Centers of Adama Town, Oromia Ethiopia.

1.6 Significance of the study

The study may be very substantial to the different stakeholders that include; management, the Researcher, EPSA, Consumers and Adama Town Public Health facilities in the following ways;

- i) The study can be very enormous to clients of the district services and authorities organizations in that the study will help the EPSA management to increase an organized questioning on the importance of inventory management practices in Health Centers.
- ii) The study in the process seeks to uncover many potentially omitted areas in inventory management literature. For instance, the study can also be seen as a solution to the call for studies in search of extra research into the connection of inventory management with supply management concepts.
- iii) The study is of paramount significance to academicians and practitioners because the proposed framework is anticipated to discover many omitted relationships which are of hobby to managers in the nearby authorities.
- iv) In addition, unique styles of inventory management practices might additionally be discovered which might similarly inspire Public Health Centers managements to enforce this approach and likely enhance their organization's performances. Other stakeholders who want understanding approximately inventory management can use the Research as a reference.
- v) The studies will advantage the management and the people of Public Health facilities to realize why there are demanding situations of their inventory management system and what to do to enhance inventory management for the reason that studies could be performed amongst them.
- vi) The study goes to feature to the prevailing literature concerning the effect of inventory management.
- vii) The study will offer similarly insights into the know-how of inventory control measures.
- viii) Through the use of Public Health facilities as a reference point, the study will make a thrilling contribution to the know-how of the overall and unique results of stores control in different public utilities.

1.7 Scope of the Study

This survey was to assess the effect of inventory management practices on Operational performance of tracer drugs in public health centers of Adama Town, Oromia.

The Tracer Drugs have been acquired from the list of essential medicines developed by FMHACA (FMHACA, 2017). The study was not included Hospitals and non-governmental health centers due to time and budgetary constraints.

1.8 Limitation of the Study

The six public health centers namely Adama, Gada, Boku, Anole, Biftu and Hawas health facilities found in Adama town have been included. The purpose to select those health centers was that the town is highly populated and there are many public health facilities relative to different towns found in Oromia. It was predicted that the health centers are providing quality service to communities in the town. Good inventory management of the tracer drugs is essential to deliver quality health service for the people.

Some of the restrictions that the researcher confronted in an attempt to examine effect of inventory management practices on operational performance of tracer drugs was lack of sufficient literature directly associated with inventory management practices of the health centers.

Another limitation was, for the reason that study was best restricted to Public Health Centers in Adama Town because of cost and time constraints, the findings won't provide a general picture of the inventory practices in the whole vicinity of Oromia.

In addition to this, concerning the study design, which was cross-sectional and assessed availability in a determined period, and therefore does not allow concluding whether the lack or existence of medicines were constant or limited to that determined period.

Finally, this study focused best on 25 Tracer Drugs and consequently the findings won't be generalized to the inventory management practices of different health commodities along with different reproductive health commodities, vital drugs, laboratory commodities, vaccines and medical supplies.

However, no matter those limitations, the study would provide big insights into the weaknesses of Tracer Drugs management in the Public Health Centers in Adama Town.

In this regard, the study was of significance to pharmaceuticals Supply Chain Management Officers of the Town and decision makers.

1.9 Organization of the study

This study with the title of Assessment of effect of inventory management practice on Operational performance of tracer drugs in Public Health Centers, the case of Adama Town, Oromia have 5 chapters that prepared into Chapter one that introduces the studies Topic, Scope and Objectives, Chapter gives a comprehensive evaluation of associated literature on Inventory management concept, Chapter 3 illustrates the research Methodology design of the studies methods, Chapter 4 concentrates on data presentation, interpretation and analysis, and Chapter 5 provides Discussion, Summary, conclusion and recommendations on the general study based at the analysis of data collected.

1.10 Definition of Terms

1.10.1 Conceptual definition

- Logistics Management information system: is a system to collects, organizes, and reviews data that allows people to make logistics decisions (EMOH, 2010).
- Inventory Control System: is a system designed to tell employees when and how much of a pharmaceuticals to order and to maintain the perfect inventory level to satisfy the desires of patients (EPSA, 2015).
- Customer services: customer service is the resupply the store manager provide customers (service providers) operating at delivery units. These units will collect tracer drugs reporting IFRR LMIS primarily based totally on schedule set via way of means of the health center. They are service providers operating in out-patient pharmacy, ART Pharmacy, Laboratory Room, family planning and TB Clinic (EPSA, 2015).

1.10.2 Operational definition

- Availability: availability may be described as the presence of as a minimum one pharmaceutical unit of the medicine, seen at the time of data collection, according to direct observation of the field researcher (WHO, 2020).

- Adequate availability of Tracer Drugs: is being capable of meet a need of HFs satisfactorily by amount and quality, Tracer Drugs are drugs which ought to be constantly available bearing in mind a properly functioning health system all of the time. They must be available in the right dosage, good enough quantities and at confident quality as designed in max-min inventory control system (EPSA, 2015).
- Perceived availability: the possibility that a tracer drug is available over a duration of time, as visible via way of means of a user of that tracer drugs (Kulchaitanaroaj, 2018).
- Operational Performance of Tracer Drugs: the state of being accomplished as good enough availability, extent of stock-out, over stock and wastage of tracer drugs at health centers.

Performance measurement is usually described as the technique of quantifying the performance and effectiveness of action, wherein effectiveness is supposed to gauge the quantity to which customer's necessities are met, whilst efficiency measures how economically firm's assets are applied to gain a predetermined level of client satisfaction (Nedaa Agami, 2012)

- Public health centers: those are health facilities owned by the government of Ethiopia and controlled under FMOH or regional health bureaus (Health-Ethiopia, 2017).
- Inventory management Practice: is how health centers track and manage the tracer drugs. It is the technique of tracking and controlling stock level and making sure good enough replenishment with a view to meet client demand. It governs the whole flow of tracer drugs—from purchasing proper through to dispense— making sure that the health centers constantly have the proper quantities of the right item in the proper vicinity on the right time (Argyropoulos, 2018).
- Updating bin-card: includes registering a change in inventory status as products are issued or received, and bodily counts are carried out (EPSA, 2015).
- Public health centers: those are health centers owned by the government of Ethiopia and controlled under FMOH or regional health bureaus (Health-Ethiopia, 2017).
- Pharmaceuticals: any drugs, medical supplies, medical equipment's and laboratory reagents used for health care services within the center, in this study for ten top diseases (WHO Definition).
- Tracer drug: Is the representative of essential drugs and fulfill the priority healthcare desires of the population. They are drugs, medical supplies & equipment's identified as Essential, Vital and used for life saving purpose within the Health facilities, they needs to be available within the health facilities 24 hours a day and 365 days in a year (WHO,1977).

- Stock out: unavailability of usable stocks in the store or a balance of 0 at the bin cards at store (EPSA, 2015).
- Inventory accuracy: It is a degree of a discrepancy among stock on hand recorded in a bin card, or computerized device and physical counts. A record is assumed to be accurate if 0 variation is measured (Assaf Avrahami, 2019).
- Dispensing Units: are departments within the health facilities those dispense drugs and deliver health service for clients (EPSA, 2015).
- Acceptable storage conditions: while medical stores meet as a minimum 80 percent of the necessities for suitable storage conditions (EPSA, 2015).
- Stock status: is a report of what's handy, what's due in, and what's owed to customers (Logistics Handbook, pp43).

CHAPTER 2

RELATED LITERATURE REVIEW

This chapter was targeted on offering the precise of associated literature reviewed on theoretical and empirical literature reviews.

2.1 Theoretical Review

2.1.1 Inventory Management

Inventory management practice is all about the activities involved in handling the inventory levels of raw materials, semi-finished materials and finished commodities in order that adequate supplies are available and the cost of over or under stocks are low (Kotler, 2000). The important goal of inventory management involves having to balance the conflicting economics of now no longer looking to maintain an excessive amount of stock (Adeyemi S, 2010). The inventory management can deliver out widespread improvement not only in patient care however additionally in the optimal use of resources. Continuous management can provide the value added services to the patients in the health facilities (Dakhale G, 2012).

2.1.1.1 Importance of Inventory Management

Inventory management practice is concerned with every aspect of the movement or flow of products in an organization. This is to be completed:

- a. To minimize holding of stock
- b. To minimize travelling distance
- c. To minimize losses from waste, breakage, spoilage, and theft.

An organization including public institutions incur costs every time an object is handled. Since handling usually adds no value to a product or service, it must be saved to a lowest minimum. By cautiously studying material flows, inventory control can save a public organization large amount of money.

Inventory is a major use of capital and for this reason; efficient inventory management is to boom organizational profitability, to predict the effect of organizational policies on inventory levels, and to reduce the total cost of logistics activities.

Therefore, inventory's role is to increase the amount of demand that may be satisfied through having the services or products ready and available while the client needs it.

2.1.1.2 Approaches of Inventory Management Systems

Inventory management pertains to the monitoring and control of commodities which includes the tracking of commodities moved into and out of store and the reconciling of the stock balances. Some of the strategies utilized in dealing with inventories had been mentioned below:

i. ABC Analysis

This technique assigns items to three groups in line with the relative effect or values of the items that makes up the group. Those thought to have the greatest effect, or price, for example, constituted the 'A' group, while those items thought to have a lesser effect or price had been contained in the 'B' and 'C' businesses respectively (Yılmaz, 2018).

ii. Economic Order Quantity

Economic Order Quantity is described as an accounting method that determines the factor at which the aggregate of order costs and inventory costs are the least (Senthilnathan, 2019).

This concept is applicable to this study in that it indicates that the perfect or ultimate degree of inventory or stock that an organization need to preserve or store should assist to reduce the cost of doing business.

Economic Order Quantity strategies have validated to be powerful inventory management technique while the demand and lead time are relatively stable, as well as while tremendous variability and uncertainty exist.

iii. Just –In –Time (JIT)

JIT System is described as an inventory control system that tries to lessen stock levels through coordinating demand and supply by the time wherein the preferred product arrives simply in time for use. Just-in-Time is an inventory management technique of having the exact quantity of stock items arriving at the precise time while needed (Mukwakungu, 2018).

The Just-In-Time System indicates that inventories need to be available while an organization needs them, not any earlier, nor any later. Ideally, products need to arrive precisely while a company needs it, and not using a tolerance for past due or early deliveries.

iv. Lean inventory system

Lean inventory is all about getting ride off the fat out of our business and locating simply the proper balance between max-min inventory control systems. That method no greater hoarding products simply due to the fact we can get them inexpensive through buying them in bulk, and no greater guessing how many products to hold in inventory. A Lean inventory management system lets in a distributor to satisfy customers' expectations of product availability with the quantity of every item with a purpose to maximize the distributor's net profits.

v. Max -Min Stock Level

A max-min inventory control system is a system designed to make sure that the quantities in stock fall within an established range. Most successful inventory control systems used for coping with health commodities are max-min systems of one kind or another. A max-min inventory control system that is relevant to health commodity logistics systems are categorized in to three types. This includes forced-ordering, continuous review, and standard system. The major distinction among the structures is the trigger for ordering or issue, i.e. while the order must be placed or an issue made.

All those stock management strategies mentioned above reveals that carrying needless inventory of tracer drugs provides to the operational value of the health facilities and consequently reduces its health service delivery. Therefore, the solution to lowering overall cost of holding inventory lies with adopting efficient techniques to manage and control physical stock level of tracer drugs. Thus, the health facilities have to make investments very well in making sure that the proper inventory is to be had when and where it is needed. This allows to lessen the stock out and thereby enhance upon the availability of the tracer drugs (Anon., 2021).

2.1.1.3 Pharmaceutical Inventory Management

Inventory management is the heart of pharmaceutical supply system. Inventory control for pharmaceutical supply is all about to order, receive, store, issue and reorder limited list of items.

Lack of accurate stock cards, and systematic overall performance techniques and guidelines to guide staff, lack of awareness of basic problem of proper inventory control system are directly related to ineffective management (WHO, 2004).

Medicines play a crucial role in public health care programs, saving lives and drawing humans to health facilities, wherein they also can receive preventive treatment. Medicines also can assist keep health care costs down. Despite this important role of drug treatments in the health care delivery system, access to vital drug treatments has remained a big challenge to many populations across the world. Survey done by WHO/CHAI estimates that in approximately 40 developing countries, availability of medicines in the public sector is only one third (WHO, 2008).

The motive of inventory management system at health facility level is to tell when to order or issue, how much to order or issue, and how to maintain appropriate inventory level of all product to keep away from scarcity and over supply (WHO, 2004). In different way, the purpose help to prepare orders, hold enough safety inventory, maintain records accurately, modify inventory level to new health problems and changes, offer appropriate, safe and secure storage, prevent expiry of drugs which needs management comply with up, skilled and devoted pharmacy expert for the system implementation (MSH, 2012).

The foremost areas of interest of this study while evaluating inventory management practices in health facilities was storage conditions, adequate availability, LMIS implementation, supportive supervision, accuracy and up to dated ness of inventory keeping records. Stock keeping records are the number one source of information in stock control and might both be manual or electronic. Whether stock record is manual or electronic, information recorded in them need to be correct and up-to-date. There are some of reasons that could result in a stock record not having accurate information, most of that are preventable. They include: theft, infrequent physical counts, poor training of inventory management staff, expired or damaged commodities being withdrawn however now no longer struck off the inventory records and storing stocks of one item in different locations due to poor warehousing practices (Dias, 2012).

Inventory management is all about ordering, receiving, storing, issuing and reordering of items. It isn't a smooth task; certainly critical and complex. It hosts storage, distribution and correct record keeping. It is a system of transaction and healthful inventory keeping practice of commodities (USAID/Deliver, 2011). It ultimately calls for morally and legally sound recording practice.

Inventory control and recording are as a consequence inseparable. Thus, stock records are the core records in the inventory management system. They can be either manual or computerized (USAID/Deliver, 2011).

Common stock recording and documentation formats are Internal Facility Report and Resupply Form (IFRR) and Report and Requisition Form (RRF), Bin Card (BC), Stock Record Card (SRC) (USAID/Deliver, 2011). These records are together referred to as inventory or stock records. Stock records are sources of basic and number one information for inventory management in that they contain all transactions of individual units. They offer information on stock receipts, issues, losses, orders and balances, suppliers, clients and prices. The information they contain is used to collect and generate overall performance reports and numerous reordering formulas respectively. The information inferred from them is vital for making plans distribution and quantification. They are consequently on the center of inventory management system; they're mandatory, now no longer optional (USAID/Deliver, 2011).

Identifying the underlying reasons of poor documentation or recording practices is vital to well-timed interfere the problem and encouraging if positive practice towards recording accuracy is there. For instance, in regards to manpower adequate number of staffs is accountable to manipulate the stock decrease errors because of extent of work and fatigue. The common inventory taking is likewise critical to check on surplus, from the store to help in matching the physical and record balances for efficient running situation and additionally in harmonizing the discrepancies to mirror the real function in the store. The computerized recording systems additionally limit mistakes and enhance recording accuracy, save time and may effortlessly retrieve the durable key important data (James, 2013).

2.1.2 Concept of Tracer Drugs

The first-rate breakthrough in health care, began out in 1977 while World Health Organization posted its first Essential Medicines List (EML). The listing has been revised every year since then (WHO, 2017).

Appropriate use of Tracer Drugs is one of the maximum cost-effective components of present day health care (Dipika Bansal, 2013).

Tracer drugs incorporate one of the tools needed to combat ill health. By growing access to tracer drugs and their rational use, we may want to enhance health status and stable development gains.

Tracer drugs are those that fulfill the health care needs of the majority of the population; they need to consequently be available at all times, in good enough quantities and in the correct dosage forms (Asmamaw, 2021). This idea became brought to boost up the positive influences of drugs on health status, in particular for developing countries.

2.1.3 Need for Inventory control in Public Health Centers

Health Facilities are complicated organizations providing large number of services of patients, physicians and workforce. In the current scenario of increasing health care costs, systems stock should be optimized without sacrificing the extent of service provided. Good stock control is important to the successful operation of any fitness care organization, for a number of reasons. One of the most important is the proportion of the organizations' budget that represents money spent for stock. Although the quantities and dollar values of the inventories carried through different forms of health care providers vary widely, in a typical health center's budget 50 to 90 percentage is going for medical supplies and their handling. As medicines are being highly-priced and resources limited, it will become vital to enhance their deliver, increase the use, and reduce the cost via a pharmaceutical management system to be efficiently installed place. There are a few 2000-3000 pharmaceuticals at any factor in time, registered in any country; of which nearly 70 percent are non-important (WHO, 2010). Ideally, a National listing of important drugs need to have 300-400 pills; a health facility needs a few 300 to 500, whilst a health center can control with 200-300 pills. Shorter the listing, it's far less difficult to control, procure and provide to the patients in the resources available.

2.1.4 Dispensing Units within the health centers

Pharmaceuticals utilized by a facility need to be stored in the pharmacy storeroom. When pharmaceuticals are issued from the storeroom to Dispensing Units (DU) .i.e. ART Pharmacy, Out Patient Pharmacy, Family Planning, Laboratory Room, Delivery Room, Emergency Room and TB Clinic, the dispensing unit's workforce will provide important logistics information on the Internal Facility Report and Resupply Form (IFRR).

After finishing the record phase of the form, the health worker will take the IFRR to the drugstore keep to gain the needed pharmaceuticals. The store manager will use the data in the report section to decide re-supply quantities and issue the pharmaceuticals.

When issuing the pharmaceuticals both the provider working at dispensing units receiving the pharmaceuticals and the pharmacist or pharmacy store manager sign the Internal Facility Report and Resupply Form (IFRR),and the store man provides model 22 for service provider receiving the products (EPSA, 2015).

2.1.5 Supportive Supervision in inventory management practices

Supervision at the health facility level can alert program managers of potential problems within the inventory management system, which, once addressed, help strengthen the system and better ensure commodity. It is carried out in a respectful and non-authoritarian way with a focus on using supervisory visits as an opportunity to improve knowledge and skills of health staff. Supportive supervision encourages open, two-way communication, and building capacity of health workers.

Lack of supportive supervision for health facilities from Woreda Health Office, Zone Health Department, and PFSA concerning on availability of TDs and their implementation of LMIS worsen challenges of inventory management practices in the health facilities (Belete, 2020).

2.1.6 Common Inventory Management Challenges

- a. Changing Demand: Customer demand is constantly shifting. Keeping too much could result in obsolete inventory you're unable to sell, while keeping too little could leave you unable to fulfill customer orders. Order strategies for core items, as well as technology to create and execute an inventory plan, can help compensate for changing demand.

- b. **Manual Documentation:** Managing inventory with paperwork and manual processes is tedious and not secure. And it doesn't easily scale across multiple warehouses with lots of stock.
- c. **Poor Communication:** Communication and collaboration are key. When departments are apathetic about sharing information, it makes identifying inventory trends and finding ways to improve much more difficult.

2.2 Empirical Review

2.2.1 The Inventory Management Practice

Inventory control is the core of pharmaceutical supply system. It is all about ordering, receiving, storing, issuing, and once more reordering of limited listing of commodities (Veeqo, 2020). Studies carried out in the area of inventory management practices discovered that, poor pharmaceutical inventory management system has led to wastage or blockade of monetary resources, scarcity and overage of important drugs, increase in out-of-pocket expenditure and decline in quality of healthcare services at the same time as well-organized inventory management system reduces the problems of over stock, out of stock and additionally lower the time spent in collecting and looking after drug inventory control.

According to a study in a hospital found in Thailand, after inventory management system were adopted, rate of correctly received products was improved, rate of destroyed or expired products was decreased and rate of product shortages for all observed times was decreased (Chaowalit Monton, 2014).

I. Logistics Management and Information system/LMIS

LMIS allows logisticians to gather the data to make knowledgeable choices that will finally enhance customer service though it is difficult to practice.

Survey carried out in in Nigeria indicated that, lack of standard operating procedures, lack of power supply, lack of computer and internet, lack of training, inadequate store, and poor record-keeping were among major constraints of LMIS (Kingston, 2017).

Research done in Public Health Facilities of East Gojjam Zone, Northwest Ethiopia revealed that LMIS recording and reporting tools such as stock keeping records and RRF reports were available and utilized at all, 20 (100 percent) health facilities but IFFR was fully available and utilized at 14 (70 percent) health facilities (Azmeraw Bekele, 2021).

II. The Inventory Accuracy

Inventory accuracy can be defined as any inconsistencies between the real amount or form of physical stock and what's recorded or is meant to be.

In most cases, it is the difference between what's recorded in an stock control system and what you have available for dispensing/sale in a store, warehouse, or storage location. It is nearly not possible to keep a 100 percent stock accuracy rate, regardless of what calculation approach and technology you employ however it shouldn't be too far from it. Most of the time, the common inventory accuracy is 99.6 percent, in which the 0.4 percent is mainly because of human mistakes that is inevitable for big institutions. The more transactions you have, the higher the chance of a discrepancy in stock records, and the occasional mishap isn't something to fear much about (Lopienski, 2020).

The survey carried out by Tilahun in 2014, shows that 84.6 and 82.3 percent of health facilities in Addis Ababa completed and reported IFRR and RRF. The discrepancy in ending balance record between RRF information and bin card record became seen in 60 percent of health facilities (Tilahun, 2016). While in East Wollega, 97 percent of facilities report RRF with 64.6 percent accurate (Kefyalewu and Tadesse, 2018). Study carried out in Addis Ababa found out that, 16 (14.81 percent) orders fulfilled above 80 percent with an average order fill rate of 52.9 percent (EPSA, 2015).

III. Order Refill Rate

A powerful stock control system absolutely satisfies client orders in the right quantities and type. In Ethiopia, the fulfillment of orders of as a minimum 80 percent is acceptable (EPSA., 2017).

Study done in Addis Ababa revealed that, 16 (14.81 percent) orders fulfilled above 80 percent with a mean order fill rate of 52.9 percent (Tadesse Gudeta, 2020). The finding is similar with the Benin countrywide supply chain assessment (Benin, 2016).

2.2.2 Operational Performance of Tracer Drugs

The adequate availability of Tracer drug is found to significantly reduce morbidity and mortality; and impact of procurement system on price and availability of these drugs is heavy and wider, therefore it needs to be addressed (WHO, 2004).

Availability of high-satisfactory tracer drugs in the public health facilities could be very essential for the effective implementation of health care policy.

To make it happen, procurement of those drugs and its supply management system might be taken into consideration as one of the maximum important factors. It became argued that the vital drugs procurement mechanism isn't always appropriate. Operational performance of tracer drugs consists of adequate availability or scarcity and over stock of the products.

Evaluation of those real-global data recommend that pharmacists and physicians are capable of lessen drug wastage with the aid of using optimizing vial mixtures and sharing vials amongst patients. Even small quantities of discount in wastage might be beneficial in decreasing healthcare prices in the US; however, caution is wanted with drug rounding efforts to make sure patients do now no longer receive a sub-optimal dose of medication (Hess, 2018).

Wastage of drugs is a critical issue and has implications on healthcare costs in every country including Ethiopia. Progress on plans to reduce pharmaceuticals wastage rate to much less than 2 percent and increase the contribution of nearby manufacturers in supplying EPSA to 60 percent are a long way because of 2020 targets, however there's a project in last-mile delivery of medical supplies (MOH, 2021).

Frequent stock-outs and inventory overstock is common stock management challenges in Ethiopia wherein demand uncertainty is the most factor (Menebo, 2017).

i. Availability

Availability is a critical and challenging aspect, especially in publicly funded universal health systems. It is described as the connection among the kind and amount of commodities required and people offered.

Under the angle of public and universal health care systems, the evaluation of availability is frequently taken as a proxy for the assessment of the access to vital drugs. The availability of drugs in the global is a big issue.

For example, it's been anticipated with the aid of using exclusive sources that 50-80 percent of the Indian population aren't capable of access all of the drugs they need. Despite having decrease expenses of drugs in India in comparison to the worldwide expenses, the availability and affordability is poor (Bhatia, 2015).

Study carried out in Brazil determined a mean availability of 52.9 percent, which was better than a mean availability of 44.9 percent found by Mendes (Mendes LV, 2014) for critical drugs in Brazilian number one health care, and just like the common of forty growing nations determined via way of means of Cameron (Cameron A, 2011).

In Ethiopia, the situation is comparable with that of different developing nations. Previously national surveys have assessed the availability of essential drugs in the country. A countrywide survey of Ethiopia estimated that most effective 70 percent of key essential drugs have been available in the public sector (EFMOH, 2013). Even though, the wide variety of medicine in quantity and range required is different for a referral hospital, district hospital, health center, and dispensary. The wide variety of pharmaceuticals have to clearly rely on the level and size of the health facility. A referral hospital have to have more medicines than a district hospital, a district hospital have to have more than a health center, the health centers more than a dispensary units including health posts; and so on (EMoH, 2015).

ii. Stock Outs

A survey conducted in health facilities of East Shawa Zone, Oromia Region, Ethiopia revealed that the fundamental reasons recognized for stock out rate had been insufficient supply of drugs (27.7 percent), stock out at refill time (30.9 percent), due to drugs expiration (26.8 percent) and order changed at the refill time (18.9 percent) (Tadesse Gudeta Gurmu, 2017).

Similar reasons had been identified by the study carried out in South Africa which indicated that receiving in close to expiry date was the primary reason (61.1 percent) and the survey performed by Yasmin Chandani et.al on factors affecting availability of essential medicines in Ethiopia,

Malawi and Rwanda identified that stock out at resupply point in the three countries was one of the cause for stock out at health facilities and also one of the survey conducted in Malawi to assess the deficient supplies of drugs for life threatening diseases in an African community reported that the main reason for the shortage of drugs at the health centers was insufficient deliveries from the regional medical store (Kagashe GAB, 2012) (Chandani Y, 2012).

Study done in Adama Town revealed that Stock outing of EMs at the day of survey was (23.6 percent) which is higher than previous studies in Tanzania (20 percent) and Gondar, that indicated better availability of TDs than Jimma and Amhara region but, lower compared to Gondar and Addis Ababa (Shebo, 2019).

2.2.3 Customer Service

According to the countrywide IPLS survey, 68 percent of hospitals and 43 percent of health facilities are at minimum emergency order in the three months previous the survey (EPSA, 2015).

75 percent of health facilities had one or greater and all hospitals placed more than 3 instances an emergency order of HIV test kits in the past 6 months (Eyerusalem, 2014).

Study carried out at Jimma Hospital, 2010, additionally suggests that one of the factors for dissatisfaction became loss of medicine (only 30 percent obtained) from health center pharmacy that's identical end result with study performed earlier than ten years (Fekadu, 2011). At Yekatit 12 hospital medical college, one of the most common identified issues was loss of adequate drugs and supplies (Fekadu, 2011).

Study carried out in cities of Oromia including Adama shows that everyone the respondents of customer service (intermediate) agree on quality HIV Rapid Test Kits, its availability on time while customer need, the staff operating on distribution of HIV RTK available while had to issue, and the respondents obtain voucher of issue (Addisu, 2019).

Study carried out in towns of Oromia which include Adama suggests that everyone the respondents of customer service (intermediate) agree on quality HIV Rapid Test Kits, its availability on time while customer need, the workers operating on distribution of HIV RTK available while needed to issue, and the respondents obtain voucher of issue, mean ,4.01.

However, the Laboratory department whom is accountable to do quality of HIV test kits disagree (mean = 3.33), and of overall respondents (N=70), only 62.85 percent agree and strongly agree with quality even as 83.60 percent of respondents have been agree and strongly agree with availability whilst customer needs (Jara, 2019).

2.2.4 Pharmaceutical Store Management

According to the survey carried out by Tanzania's Ministry of Health and Social Welfare in 2008, from the assessed health facilities, only 33 percent of the health facilities had adequate storage area.

In another study done on public health facility found in Uganda by country's Ministry of Health in 2008, it has identified that the adequacy of storage practices and handling of drugs in dispensaries and warehouses have been 63.6 percent.

A study conducted in Nigeria revealed that, most of the National Level Medical Stores, 8 of them have moisture, leaking roofs/ceilings, drains and/or taps, insufficient cold storage capacity and absence of assigned areas for reception, delivery, and quarantined commodities.

Assessment of pharmaceutical and commodity control of ART, PMTCT, VCT and programs in Ethiopia, Namibia, and Rwanda showed that Warehousing and distribution systems for PMTCT products on the crucial stage have been missing in Ethiopia. Moreover, pharmaceutical and laboratory systems at the facility level have been confined in terms of space, storage, and dealing with capacity, thereby compromising product safety and protection and patient confidentiality (MSH, 2012).

A study carried out on store management of pharmaceutical commodities in woreda health offices of the West Hararghe Zone, Ethiopia showed that most of the assessed health facilities 80 percent of they haven't any adequate storage area for different warehouse activities (Kassei Gizat Molla, 2014).

According to the Ethiopian standard, warehouses ought to satisfy at the least 80 percent of the storage condition criteria ((EPSA., 2017).

Regarding storage condition, a study carried out in health facilities of West Walaga Zone showed that on average, about 71 percent of the health facilities met suitable storage conditions (Oliyad, 2021).

2.2.5 Challenges Confronting Inventory Management of Tracer Drugs

Though it varies from one medical institution to another, challenges that face dealing with inventory exists in all cases. Below are a number of the research performed on this area.

An indicator based assessment of drugs storage and inventory control practices in diverse public hospitals in India found out that, insufficient storage space, inadequate availability of storage equipment and absence of human resource are many of the main challenges identified (Iqbal, 2015).

Study carried out in Ghana for evaluation of health commodities management practices in selected hospitals in Ashanti vicinity confirmed that counterfeit and/or substandard commodities, irrational/wrong use, delays in approving medicines and non-medicines, undermined distribution, transportation, loss of good enough storage facilities, unavailability of professional labor, inner bureaucracy, loss of funding, and logistical issues are the primary challenges that face managing inventories (Emelia Darko Adzimah, 2014).

Survey conducted in Ethiopia on the aspect of experience, the highest percent of 46.6 percent had worked in their current jobs for greater than eleven years. However; majority 57.1 percent had now no longer gotten any associated training in the last 6 months (Shewarega A, 2015).

Different stakeholders including USAID have reported that storage condition and inventory control is a challenge in health facilities across the country. Many drugs expire earlier than they may be used, or they reach the service delivery point, which is probably a health facility, laboratory, or community health worker (USAID, 2017).

2.2.6 Relationship between Inventory Management Practices and Operational performance of tracer drugs

Study carried out in Dessie Town confirmed that the common availability of EMs in the public health facilities of the town become 74.7% and this study revealed that not all TDs in the store had bin cards. Transportation hassle was additionally stated on this study as a cause for stock-outs of TDs. The study reported that 7 of 9 health facilities did not have their Vehicles to move TDs after which PFSA had not been delivering the medicine at a wanted time to the health facilities.

Confirming availability of tracer drugs and an in-depth understanding of their logistic management information system implementation will empower public health governors and decision-makers' attempt to enhance access, develop human resources required to manage TDs and improve supply chain (Belete, 2020).

Therefore, this study will measure the effect of inventory management practice at the availability of TDs and the implementation in their logistic management information system in public health centers of Adama Town, Oromia.

2.3 Conceptual Framework

The conceptual framework provides the link between the research title, the objectives, the study methodology and the literature review. The conceptual framework adopted for this study shows that good inventory management practice at health facilities result in timely refill, adequate availability and accurate inventories of tracer drugs where as poor pharmaceutical store management and inadequate inventory management practice such as lack of use of scientific inventory control techniques like max-min inventory control system and lean inventory system, lack of LMIS leads to poor tracer drugs performance, wastage i.e. both under stocking and over stocking of medicine that results expiration, spoilage and deterioration of medicine and unavailability of tracer medicines perhaps life savings which influence the quality of health service as effect.

The conceptual framework includes independent variables identified, LMIS implementation, and supportive supervision, accuracy of stock record, and storage condition, and operational performance of tracer drugs as the dependent variable which is predicted by inventory management practices. The problem under investigation is operational performance of tracer drugs inventory management as it is affected by the identified independent variables.

Operational performance of tracer drugs with its constructs is shown on the right side while the independent variables are shown on the left hand side in figure 2. 1.

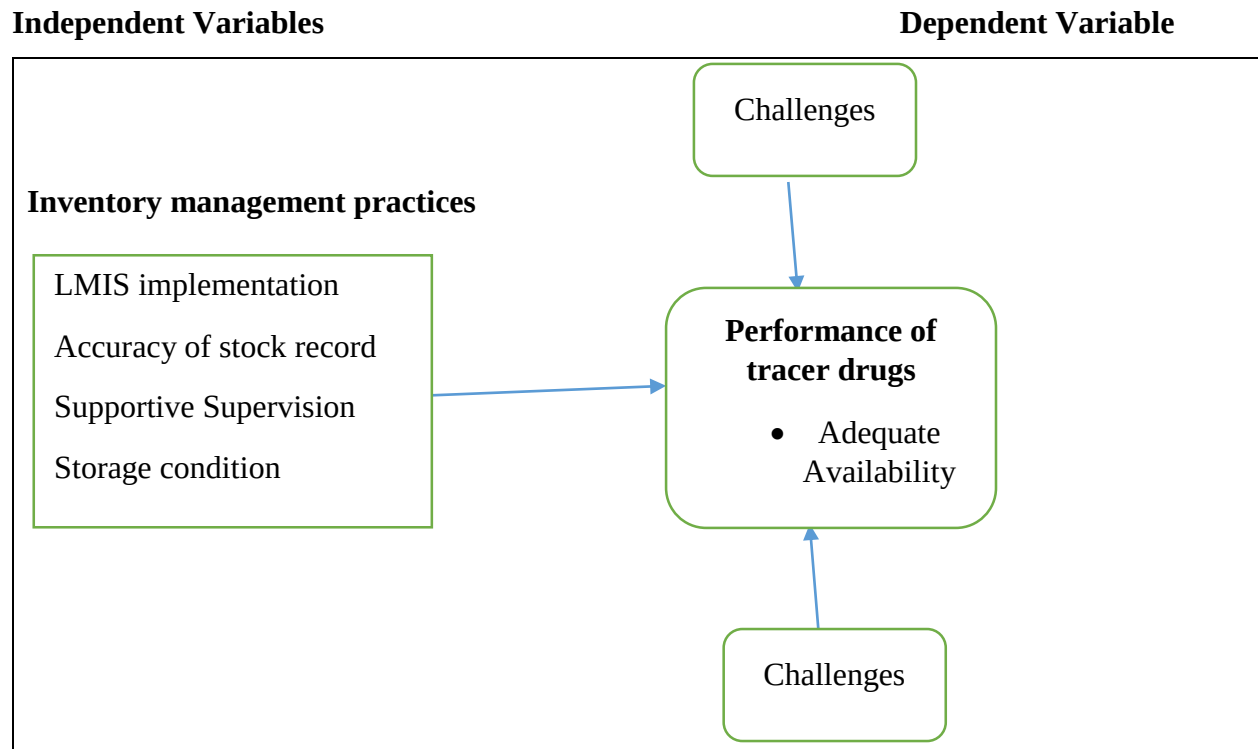


Figure 2. 1 Conceptual Frame Work for the study.

Source, Adapted from: (Khalid, 2018).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter described the research design and methodology that was used in carrying out the research. It was stated the description of the study area, the research approach, the research design, the population and sampling of the study. Furthermore, it deals with the data source and type, the data collection procedures, validity of instrument, reliability, ethical consideration and data analysis.

3.2 Study area

The study was conducted at Public Health Centers of Adama Town, one of ten top towns found in Oromia region , Ethiopia; located 100 km East of the capital, Addis Ababa. According to the 2019 national Ethiopia Population Projections conducted by United Nations population estimates and projections, Adama has a total population of 324,000 (World Population, 2021). The town has one Public Hospital and eight functional public health centers.

3.3 Research approach

Mixed research approaches, qualitative and quantitative, was employed in data collection. Qualitative data was gathered through observations and interviews & Quantitative data was gathered through semi-structured questionnaires and checklist.

3.4 Research design

The research design used in this survey was descriptive cross sectional survey and explanatory design. Descriptive survey was preferred in this study since this research design was effectively used to obtain information concerning the current status of inventory management practice in public health centers of Adama Town and its effect on the availability of tracer drugs.

Data was collected using semi-structured questionnaires for each category; medicine dispensers at service units in public health centers, store departments, Facility heads and purchasing units.

These departments were selected as they are directly or indirectly involved in inventory management of tracer drugs. Face-to-face in depth interviews were held with store departments of the health centers.

The Key informants from the store departments were selected using purposive sampling. The availability of tracer drugs on the day of survey was assessed using observational checklist. A group of experts working in different health organizations of Ethiopia has selected 25 tracer medicines based on parameters established by the World Health Organization to enable researches on availability of essential medicines including those indicated for the treatment of epidemiological relevant conditions in the Country within primary health care (WHO, 2016).

Then, availability of tracer drugs was also assessed using an observation script. A handbook and a glossary of technical terms was elaborated for each survey instrument.

Interviewers were trained, a pretest was carried out in Mojo Town health centers, Hachaltu Gudina and Mojo health centers, involving with different population size to improve and validate the instruments. The data was collected between September 1, 2021 to October, 2021.

3.5 Population and Sample

3.5.1 Population of the Study

The population of the study was included all public health centers of Adama Town. The population size of the study was 8 Public health centers in the town namely; Gada, Dambala, Adama, Hawas, Biftu, Anole, Angasu and Boku health centers. Out of 8 health centers in the town six were included in the study. Proportionate Stratified Random Sampling technique was used to get respondents from the health centers. The study was targeted on inventory management practices of tracer drugs in the health centers that include Store Departments, health facility heads, Purchasing departments and service providers in dispensing units working in the health centers. The major dispensing units more related with inventory management of Tracer Drugs are ART Pharmacy, Out Patient Pharmacy, Family Planning, Laboratory Room, Emergency Room, Delivery Room and TB Clinic.

3.5.2 The Sample size and sampling technique

All the public health centers found in the town was considered. Therefore, census sampling method was used. The study involved people from the staff of public health centers in Adama town. All this helped the researcher to generate critical data important for the study.

As data obtained from Adama Town Profile of Health Professionals indicated a minimum of two health care providers were assigned to one service delivery unit which result in 112 (8*2*7) total service providers at selected dispensing units. The total population was 144 staffs of public health centers and the sample size was 106.

Accordingly, the respondents were 106 which includes Health Facility heads, Store departments, Purchasing Units and health professionals those working at seven dispensing units. Due to the nature of their positions in the various departments, the researcher have been able to get reliable information necessary for the research.

Table 3. 1 Target Population

[1] Department	[2] Target population	[3] Total percentage (%)
1. Store Departments	[4] 8	[5] 6
2. Facility heads	[6] 8	[7] 6
3. Service providers in dispensing units	[8]112	[9] 78
4. Purchasing units	[10]16	[11] 10
[10] Total	[11] 144	[12] 100

To collect the actual data from the health professionals working in health facilities stratified sampling technique was used so as to obtain representative sample of the workers.

Different types of health professionals (nonhomogeneous group) participated in management of tracer drugs inventory management in the health facilities. Health professionals were selected from each stratum by stratified random sampling.

To come up with a precise sample size, Yamane (1967) simplified formula was used to calculate the size at 95% confidence level and $p=0.05$.

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

The formula produces an effective method of determining sample size as shown below:-

Where n represents the sample size, N represents the population size, and e is the level of precision.

When this formula is applied to the above sample, we get Equation as:-

$$n = \frac{144}{1 + 144 (0.05)^2} = 106$$

Then Proportionate Stratified Random Sampling is used to select random elements from each stratum to form the sample.

$$n_h = (N_h / N) * n$$

Where n_h represent the sample size for stratum h , N_h represent the population size for stratum h , N is total population size, and n is total sample size.

From this approach, each stratum sample size is directly proportional to the population size of the entire population of strata. This means each strata sample has the same sampling fraction. Categorization of employees' respondents is as per table 3.2 below:

Table 3. 2 Sampling and sample size

[13] Department	[14] No. of Staff	[15] Sample Size
		[16] $nh = (Nh / N) * n$
[17] Store departments	[18] 8	[19] 6
[20] Facility heads	[21] 8	[22] 6
[23] Service providers in dispensing units	[24] 112	[25] 82
[26] Purchasing units	[27] 16	[28] 12
Total [29] Total	[30] 144	[31] 106

Accordingly, data was collected from 6 Public health centers having functional store and dispensing units, Essential Medicines and health professionals working at the site for at least 6 months.

3.5 The Inclusion and Exclusion criteria

3.5.1 The Inclusion criteria

- Public Health Centers with more than 3 years' service
- Standard forms (Bin card, RRF) for essential medicines recorded and reported in the year 2012 E.C

3.5.2 The Exclusion criteria

- Staffs who were on annual leave / sick leave during the study period were excluded
- 2 health centers were excluded because of incomplete documents/ absence of all recorded and reported essential medicines in the year 2012 E.C

3.6 Data Source and Types

3.6.1 Data Source

In this study, the sources of data was self-administered questionnaires, review of records mainly bin cards of tracer drugs in the health facilities store and observation of the health facilities storage conditions as well as stock availability of tracer drugs.

The data collection tools that were used in this study are:

1. Tool for Inventory Management practices assessment
2. Storage condition observation checklist
1. Tool for Inventory Management assessment

Measurements: The following key performance indicators adopted from the logistics indicators assessment tool will be employed to measure the inventory management performance of the public health centers.

- **LMIS implementation:** the following inventory recording tools will be assessed for their availability and application in the public health centers using checklists. They are essential tools used to preserve inventory details in public facilities in Ethiopia.
 - Internal Facility Report and Requisition Form (IFRR) is a tool used to move items within a facility (Dispensing Units).
 - Report and requisition forms (RRFs) help to report consumption patterns and request the required amount from suppliers.
 - The use of stock record cards is to maintain information about the products in the stock, and it is kept at the pharmacy head office for monitoring purposes and they can be stock card or bin card.
 - Lean inventory system
 - Inventory management system
 - Model 19 is a receiving voucher from supplier
 - Model 22 is an issuing voucher to dispensary units
- **Record update practice:** helps to evaluate whether hospitals continuously record transactions during the receipt and issuance of items or when physical counts carried out.

- **Physical inventory:** the health centers' physical counting of items to determine the status of products in the store like stock on hand, near expiration date products, damaged products, slow/fast/medium moving commodities.
- **Inventory accuracy rate:** used to determine whether physical count and balance on the bin-cards match. It's calculated by dividing the difference between physical count and balance on the bin-card by physical count. And then multiply the dividend by 100 percent
- **Stock out rate:** is an indicator that helps to assess the status of tracer drugs availability retrospectively and also on the day of the visit. It's calculated by dividing the number of items out of stock in a specified period by the total number of items expected to be available in the same period and multiplying the output by 100 percent.

2. Storage condition observation checklist

To assess the storage condition of the health centers 13 storage guide lines checklist was used. A health center with a positive response to at least 80 percent of the indicators was deemed to have appropriate storage condition (EPSA, 2015).

3.6.2 Types of Data

Both quantitative and qualitative data was collected for assessment of inventory management practice of tracer drugs in public health facilities of Adama Town.

3.7 Procedures for Data Collection

The steps and processes that was used by the researcher while collecting data using the data collection instruments was stated below.

Two pharmacy Technicians were employed and trained on how to collect all important data for the assessment.

All data was collected by these two trained investigators. Semi-structured questionnaires, check lists and in-depth interviews were used based on respondents in the stratum.

The data accuracy of stock record was collected by reviewing of store ledger and/or bin card and comparing it with the physical counts on the day of visit using observational checklist.

The data on product availability on the day of survey was collected based on physical count of the products in the store on the day of visit.

The data on days out of stock was collected by counting the number of days each product was out of stock within the assessment period (the last 180 calendar days). For each product, the investigators reviewed the transactions on the stock card during the last 180 days. For each stock-out during the 180 days period, the number of days the product had a 0 balance was add up.

The data for analysis of storage condition of health facilities was collected though observing the general storage condition in the facilities' store area and marking against the specific storage criterion on the check list.

Quantitative data

Semi-structured questionnaires and checklists which was adapted from the Inventory Management Assessment Tool (IMAT) was used to assess inventory management practices and observational checklist was used to assess actual availability of tracer drugs on day of visit in public health centers of Adama Town.

Qualitative data

In-depth face-to-face interviews conducted with Key Informants (KIs) who are responsible for the decision-making of tracer drugs practices.

The number of Key Informants depends on information saturation, i.e., the interviews ended as soon as the new interviewee reiterated what had already been said. In addition, the selection of the participants was taken into account the year of service of the respondent and the roles in the inventory management process.

Accordingly, pharmacy store managers of the 6 health centers were purposively selected (purposive sampling method) for the interviews. The interview started randomly from one health center pharmacy store manager and proceed to others until information saturation reached.

Open-ended and probing questions were designed to explore the complexities of tracer drugs inventory management. The principal investigator conducted the in-depth interview which lasted for 15 minutes in average for each.

Before beginning the interview, oral informed consent was received from each respondent, and their confidentiality was kept private. The records was stored in separate place protected with a password.

The analysis of qualitative data collected was carried out manually using a thematic technique. Codes assigned to variables and drawn together in a tabular format.

The variables with a similar code were arranged together to formulate appropriate themes.

3.8 Validity of Instruments

To ensure data validity, the data collection tools were subjected to the following validity test. The data collection tools were pretested prior to commencing the study for its content, and any ambiguity of the tools. Pretesting was carried out at 2 public health centers in Mojo Town. Data entry was made the same day as data collection to avoid errors. Busy days at the facility were also excluded from days of data collection to avoid errors due to unrecorded data as a result of high workload.

3.9 Reliability

To measure reliability of the gathered data Cronbach's Alpha was applied. The Cronbach's Alpha is a coefficient of internal consistency. The Cronbach's Alpha values varies between 0 – 1.

A high value of Cronbach's alpha coefficient suggests that the items that make up the scale are internally consistent and measure the same underlying construct. A value of Cronbach's Alpha above 0.70 can be used as a reasonable test of scale reliability (Ritter, 2010). The Cronbach's Alpha has been evaluated for all items in likert scale employed in the questionnaire, and found to be 0.829 which means the questionnaires were reliable.

Use of adapted data collection tool does also improved reliability. The two investigators were oriented on each questionnaires so that data collection and entry improved reproducibility since inter investigator variability was minimized.

Table 3. 3 Reliability Test Results

Dimensions	No. of Items	Cronbach's Alpha
Inventory management practices for Store department	24	0.916
Facility head	6	0.771
Dispensing unit	4	0.800
Overall reliability	34	0.829

3.10 Ethical Consideration

Prior to launching the survey, ethical committee of Public Health Emergency Management and Health Research Directorate at the Oromia Regional Health Bureau was informed about the study and wrote letter to Adama Town.

This study was aimed at identifying the challenges in targeting and acquiring the right applicant pool and all of the participants are employees who are directly or indirectly attached to Inventory management activity of the health centers. Therefore, they are the ones to be benefited from the findings and recommendations of the study.

The researcher briefly explained the purpose of the study to the employees and then participants were included in the research after they gave full consent of their willingness to participate in the study. The researcher assured that confidentiality of the recordings of the interview and no record to be kept about the identity of the participants.

The correct reporting of the final study is another ethical issue. The researcher has analyzed the data based on the explicit response of the participants, the notes from observation and finding from the secondary data. Therefore, it is minimal to report a finding that is not supported by the analysis.

3. 11 Data Analysis

Data was analyzed and presented through descriptive statistics and regression analysis with the help of SPSS (Version 20) and Ms Excel.

Data was entered in Epidata version 3 for cleaning and exported to SPSS version 20 for analysis. Excel spreadsheet version 16 used to calculate Percentage of Tracer Drugs available on the day of assessment, Tracer Drugs storage conditions, inventory accuracy and stock out rates.

And then, the outputs were transferred to SPSS for further analysis. The results are then displayed using charts, graphs, and texts. To analyze the collected data the following descriptive statistics were applied: frequencies, percentages, mean scores, standard deviation and multiple linear regression analysis.

The Descriptive and Explanatory aspect of the research design was used in establishing the institutions tracer drug inventory management practice and the analytical research design was used to establish relationship between inventory management practice and operational performance of tracer drugs.

Explanatory research was used to investigate inventory management practices of the health centers that results in shortage of TDs. It used to understand the patterns and trends in inventory management systems of the health centers.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND ANALYSIS OF FINDING

INTRODUCTION

This chapter has focused on presenting the findings of the study and analyzing the findings so as to enable the user of the survey to understand at an in-depth level of the results regarding the research topic, that is, Assessment of Effect of Inventory Management Practices on operational performance of tracer drugs in health facilities of Adama Town.

The chapter focuses on providing the demographic data regarding the respondents in the first section while the second section provides the findings of the specific objectives of the research study. Based on SPSS version 20, the data was analyzed based on descriptive statistics, including graphic presentation methods, as well as tables, frequencies, mean, standard deviation and multiple regression analysis was also done to estimate the level effect of the independent variables on dependent variable.

The research objectives established at chapter one and which are to be met in this chapter, include:

- i. To examine the effect of inventory management practice on Operational performance of Tracer Drugs in Public Health Centers of Adama Town.
- ii. To study the inventory management practice in Adama Town health centers
- iii. To assess the storage conditions of Tracer Medicines in Public Health Centers of Adama Town, Oromia, Ethiopia.
- iv. To examine the challenges in implementing inventory management practice for Tracer Drugs in Public Health Centers of Adama Town, Oromia.

4.1 The response rate of the study

The total of 106 respondents were targeted in the study which included Store department, Dispensing units, Facility heads and purchasing departments in public health centers of Adama Town of which only 99 respondents able to return questionnaires, which were deemed sufficient to carry out analysis on the data. This resulted in the response rate of 93 percent. This response rate was considered sufficient to establish conclusions regarding the research study.

Table 4. 1 Response Rate of Respondents

Rating	Frequency	Valid percent
Non-respondent	7	7
Respondent	99	93
Total	106	100

4.2 Respondents' Demographic Information

The demographic data is crucial in understanding whether the given sample of the respondents in the specific research study represents sufficiently the target population. The demographic data also enables the researcher to find out the suitability of the respondents in providing the answers to the research questions for the purpose of generalizing the results of the study. In this research, the demographic data consisted of gender, age, level of education and work experience.

The respondents were asked to indicate their gender in the questionnaire. According to Table 4.2, there were more male (54.5 percent) than female (45.5 percent) respondents in the study. Table 4.2 emphasizes the fact that the Dispensing units, Store departments, Facility heads and Purchasing departments are dominated by male employees. However, given that both genders were involved in the study, it is arguable that the results of the research study did not experience gender biasness. Based on Table 4.2, most of the respondents were aged between 18-30 years (64.6 percent) and 31-40 years (28.3 percent). The number of respondents for age between 41-50 and age above 51 was 7.1 percent and 0 respectively. This can be an indication that a majority of personnel working in the inventory management of tracer drugs at public health centers of Adama Town are concentrated in the age group of between 18-30 years. It can be an indication that public health centers in Adama Town are currently embracing a relatively young age group as this age group seems to be well equipped with up-to-date knowledge with respect to the aspect of managing inventories, especially inventory management systems associated with the Integrated Pharmaceuticals Logistics System in the country. However, given the fact that all age categories were represented in this study, the results of the study are considered to be significant for generalization purposes as individuals who were recently educated in the field of inventory management and those with a high level of experience were able to participate in the study.

Table 4.2 indicates that majority of the respondents are nurses (55.6 percent) and clinical officers (12.1 percent). Druggists and Pharmacists are 10.1 percent and 8.1 percent respectively, and implementation of inventory management system is expected more from where these professionals are concentrated as their routine duty is pharmaceuticals inventory management at health facilities. Both Accountants and Laboratory Technologists accounts 6.1 percent of the respondents which represents purchasing departments and dispensing units in the strata respectively.

Table 4.2 indicates that a majority of the respondents have first Degree 57.6 percent followed by college diploma 42.6 percent. Considering the fact that those respondents with Degree represented 57.6 percent of the total respondents, it is apparent that a majority of the respondents were well educated and able to respond to the questionnaires without difficulties.

As provided by Table 4.2, a majority of the respondents in the population had worked 5-10 years 45.5 percent. They were followed by those who have worked for a period of 1-5 years 42.4 percent. Those with working experience of less than 1 year 3.0 percent while respondents who have worked for more than 10 years in the health center is 9.1 percent. This leads to the conclusion that 45.5 percent of the respondents had a working experience of 5-10 years in the facilities and it shows that they are more experienced, and had adequate knowledge regarding the inventory management practices practiced in the health center; it is arguable that this level of knowledge enabled them to respond to the research questions in a more sufficient way.

Table 4. 2 Profile information of respondents

Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Male	54	54.5	54.5	54.5
	Female	45	45.5	45.5	100
	Total	99	100	100	
Age	18-30 years	64	64.6	64.6	64.6
	31-40 years	28	28.3	28.3	92.9
	41-50 years	7	7.1	7.1	100
	51- 65 years	0	0	0	
	Total	99	100	100	
Educational Qualification	Nurse	55	55.6	55.6	55.6
	Clinical Officer	12	12.1	12.1	67.7
	Druggist	10	10.1	10.1	77.8
	Pharmacist	8	8.1	8.1	85.9
	Lab. Technologist	6	6.1	6.1	91.9
	Accountant	6	6.1	6.1	98
	Other	2	2	2	100
	Total	99	100	100	
Level of Education	Masters	0	0	0	0
	Bachelor	57	57.6	57.6	57.6
	Diploma	42	42.4	42.4	100
	Certificate	0	0	0	
	Total	99	100	100	
Work Experience	< 1 year	3	3	3	3
	1-5 years	42	42.4	42.4	45.5
	5-10 years	45	45.5	45.5	90.9
	>10 years	9	9.1	9.1	100
	Total	99	100	100	

Source: Research Data (2021)

4.3 Descriptive Statistics

Descriptive Statistics deals with collecting, summarizing and simplifying data. It seeks to achieve this in a manner that meaningful conclusions can be readily drawn from the data. In this study, the descriptive statistics specifically sought to gauge the level of the independent variables (LMIS, Accuracy of stock record, Inventory variation, Stock out days, Supportive Supervision, Storage Condition, Timely Refill, and Training) and dependent variable, operational performance of tracer drugs. The responses were captured on a categorical data which was a 5-point Likert scale ranging from 1-Strongly disagrees to 5-strongly agree and 1 for Yes and 0 for No numerical values. The mean of these responses were calculated to gauge the mean level of the variable.

Of the eight health centers of Adama town, six health centers were included in this study. Two of the health centers were excluded due to lack of enough records to assess inventory management practices of tracer drugs in the health centers.

According to the involvement of respondents of 4 strata, feedback of concerned respondents from store department were captured along the 52 items corresponding to 7 dimensions, six dimensions with 41 items for quantitative data and one dimension with 11 open ended questionnaires for interview in order to capture qualitative data were introduced to measure the study constructs. Respondents from dispensing units were asked 22 questionnaires corresponding to 3 dimensions, whereas purchasing departments were asked 16 items corresponding to 3 dimensions and facility heads were asked 31 items corresponding to 4 dimensions. Similar items were computed and analyzed accordingly. Statistical package SPSS 20 was used. The statistical methods used were descriptive statistics and multiple regression analysis. The composite mean scores has been also computed for all likert scale measurements.

4.3.1 Performance of Tracer Drugs from respondents perception

Inventory management practice highly influence the performance of tracer drugs which can be adequate availability, over stock and shortage of the products. Proper pharmaceuticals inventory management helps to avail adequate quantity of products, prevent overstock, understock and expiry of products. The availability of tracer drugs largely influence quality of healthcare and patient satisfaction.

4.3.1.1 Perceived Availability of Tracer Drugs

During this study, the perceived availability of tracer drugs were assessed to evaluate respondents on their attitude towards availability of the products. This questionnaire is designed for all strata of health facilities in the town. The response is summarized for all strata found in the health centers with their respective percentage and mean for the question.

About half (52.5 percent) of the respondents replied that tracer drugs were adequately available in the past 6 months. Others replied that there was no adequate availability of tracer drugs in their health centers in the past six months (47.5 percent).

As assessment done on availability of essential medicines in primary health care of the Brazilian Unified Health System from the perspective of patients, physicians, and medicine dispensers showed, 58.8 percent of physicians considered very good/good availability of essential medicines which is greater than that of this assessment result (52.5 percent) and when there is lack of medicines, the most frequent action analyzed by these professionals was the possibility of replacing the medicine prescribed for therapeutic alternatives (77.4 percent), followed by referral to the Popular Pharmacy (75.4 percent) (NascimentoI, 2017) whereas in this study 77.2 percent of respondents replied as they replace to other alternative drugs and 13.9 percent of them referred to popular pharmacy.

Study conducted in health facilities of Oromia region on supply chain management of HIV test kits indicated that only 83.6 percent of respondents agree on availability of medicines when customer needs, and assume products received has quality ,mean = 3.56 (Jara, 2019) which is greater than result obtained by this assessment, mean = 3.29.

4.3.1. 2 Perceived shortage of Tracer drugs

The study revealed that there was shortage of tracer drugs in the past 6 months. Many respondents (55.6 percent) replied that there was shortage of tracer drugs in the facilities in the past six months. Inventory availability is the most important aspect of customer service.

Majority of respondents from all health centers working at store department responded the interview question by *“in order to fulfill the challenges on stock out of some tracer drugs we directly refers to the Popular Pharmacy found in the town.*

Although it will be not affordable the clients buy and use the tracer drugs from private pharmacies during shortage occurs at health centers.”

If there is stock out of tracer drugs, clients are enforced to use more costly alternatives. Tracer Drug availability is affected by efficiency of inventory management practice of health facility.

4.3.1.3 Overstock of tracer drugs

According to response from participants 6 percent of the health facilities experienced over stock of tracer drugs. Overstocking puts products in increased risk of expiration or damage before they are distributed (Bunde, 2007).

Although 50 percent of respondents from stores claimed as max-min inventory control system was defined and practices based on the finding 56% and 8% of tracer drugs were overstocked and in critical level (shortage) respectively. About 36% of the tracer drugs were in normal level in the past six months. These results were better than that of findings in health facilities of Gondar town, which showed 12% were in critical level, 15% were in safe (normal) stock level and 73% were in overstock level (Mulugeta Fentie*, 2015).

Not being able to quantify correctly the amount of medicines required; demand uncertainty; can lead to both overstocking and under stocking of medicines.

Overstocking may lead to medicines piling up at the health facility and eventually expiring while under stocking of life saving medicines may lead to loss of lives. This study also assessed customer service related activities and identified that only 53.2 percent of respondents get all tracer drugs whenever they need from the store. Similar survey done in public health facilities of Nigeria shows that 33 percent of respondents dissatisfied due to stock out of drugs in the facilities (Ogbeyi OG, 2018).

Sustainable supply of adequate quantities of appropriate health commodities is crucial for health services to be effective and credible. Robusting inventory management of pharmaceuticals enables health institutions to reconcile budget requirements’, adhere to regulatory requirements, maintain sufficient stock of products, and reduce risks related to patient safety.

Table 4. 3 Summary of perceived response on adequate availability, shortages and over stock

Perceived availability of tracer drugs in the past six months

	Frequency	Percent	Mean	Std. Deviation
no	47	47.5	0.5253	.50190
Valid yes	52	52.5		
Total	99	100.0		

**Perceived over stock of tracer drugs occurred in the past 6 months
in health facility**

	Frequency	Percent	Mean	Std. Deviation
no	93	93.9	0.0606	.2398
Valid yes	6	6.1		
Total	99	100.0		

**Perceived shortage of tracer drugs occurred in the past 6 months in
health facility**

	Frequency	Percent	Mean	Std. Deviation
no	44	44.4	.5556	.49943
Valid yes	55	55.6		
Total	99	100.0		

4.3.2 Inventory Management Practices of tracer drugs: A Quantitative Observation

The availability of different logistic formats like stock record cards, RRF and IFRR is fulfilled in almost all facilities assessed even if consistent utilization of stock record cards and IFRR implementation as some problem at dispensing units.

Logistics Management Information System

The Manual Logistics Management Information System (LMIS) is practiced in all health facilities visited whereas only 2 (33 percent) of the facilities have been using the automated records (software) to manage their pharmaceutical transaction.

Stock record cards, Internal Facility Report and Resupply Form (IFRR), and RRF were available in the six HFs to manage Tracer Drugs. In addition to manual recording, two out of six health facilities used Health Commodity Management Information System (HCMIS) software to manage TDs. In terms of availability, all health facilities have and also used RRF to order TDs from health facilities pharmaceutical stores to Adama PSA but IFRR was not properly utilized by dispensing units to request TDs from health facilities pharmaceutical stores. Receiving and issuing of Tracer Drugs were also made using receiving voucher/model 19 and issuing voucher/model 22, respectively.

The composite mean scores and standard deviations have been computed for all the dimensions of the independent and dependent variables. The rule of thumb pertaining to the intervals for breaking the range in measuring variables that are captured with five-point scale (that ranges from strongly disagree to strongly agree) is 0.8, which is actually found by dividing the difference between the maximum and minimum scores to the maximum score (Kidane Assefa, 2012).

Hence, a calculated composite mean value that ranges from 1 to 1.80 implies strong disagreement, whereas the remaining ranges of 1.81 to 2.6, 2.61 to 3.4, 3.41 to 4.2 and 4.21 to 5.00 representing respondents' perceptions of disagreement, neutrality, agreement and strong agreement respectively.

Table 4. 4 Bin Card Availability and Up-to-dateness

S/N	List of Tracer Drugs	Number of HFs that have Bin Card for the Tracer drugs	Percentage of HFs that have Bin Cards for each Tracer drugs	Bin Card up dated n (%)
1	Adrenaline injection	6	100%	6(100%)
2	Albendazole tablet	6	100%	6(100%)
3	Amlodipine tablet	6	100%	3(50%)
4	Amoxicillin dispersible tablet	6	100%	3(50%)
5	Artemether + Lumefantrine tablet	6	100%	6(100%)
6	Ciprofloxacin tablet	6	100%	6(100%)
7	Co-trimoxazole 240mg/5ml suspension	6	100%	6(100%)
8	Furosemide tablet	6	100%	1(17%)
9	Gentamycin injection	6	100%	5(83%)
10	Glucose 40%	6	100%	6(100%)
11	Hydralazine injection	6	100%	4(67%)
12	Iron + folic acid tablet	6	100%	5(83%)
13	Magnesium Sulphate injection	6	100%	6(100%)
14	Medroxyprogesterone Injection	6	100%	6(100%)
15	Metformin tablet	6	100%	5(83%)
16	Metronidazole capsule	6	100%	5(83%)
17	Normal Saline 0.9%	6	100%	6(100%)
18	Omeprazole capsule	6	100%	6(100%)
19	ORS+/- Zinc sulphate	6	100%	5(83%)
20	Oxytocin injection	6	100%	6(100%)
21	Pentavalent vaccine	4	67%	4(67%)
22	RHZE Tablet	6	100%	6(100%)
23	TDF/3TC/DTG * tablet	5	100%	5(100%)
24	Tetanus Anti Toxin (TAT) injection	3	50%	4(67%)
25	TTC eye ointment	6	100%	6(100%)
Average availability of BC for each TDs			96%	84%

Note: *TDF/3TC/DTG is not applicable at one health center;

Availability, updating status of bin cards, and accuracy of keeping logistics records were assessed for the TDs. As shown on the above table, Bin cards were available for the majority of TDs. On average, 96 percent of the TDs had bin cards of which 84 percent were updated. Stock keeping records of Tracer Drugs those frequently stock out were not updated and their transactions were also forgotten of which that of Furosemide tablets was the least in having updated BC at health centers (17 percent).

Table 4. 5 Percentage of Stock Records that were accurate

S/N	Name of HFs	Percentage of Stock Records that are accurate
1	Gada HC	92%
2	Adama HC	88%
3	Anole HC	79%
4	Hawas HC	76%
5	Biftu HC	68%
6	Boku HC	84%
Average inventory accuracy		81%

On average, 81 percent of stock records were accurate as shown on the above table; i.e. the physical count and amount on stock record card was accurate for 81 percent of tracer drugs although it is far from ideal average inventory accuracy which 99.6 percent (Lopienski, 2020). Stock record accuracy was the highest at Gada health center and the least at Biftu health center, which is because of availability of man power especially pharmacy personnel at Gada health center. Pharmacy personnel is mandatory especially at medical store for proper inventory management of pharmaceuticals.

The variance of stock keeping records and physical stock in this study was high, 81 percent, when compared to one of the public hospitals in Tanzania, 45 percent (Kagashe, 2012) and Gondar town, which was 50 percent, (Mulugeta Fentie*, 2015). This survey found that 4 out of the 6 health facilities did not have computerized LMIS in the store which is similar with study done in public health facilities of Dessie that identified only 3 out of 9 health facilities use HCMIS Software (Belete, 2020). This could be due to a lack of awareness about how HCMIS simplifies works.

Use of HCMIS and manual stock cards can prevent stock imbalances, by updating both sources of data and cross checking their content.

From the store keeper's response, although there is guideline to use LMIS in this HC, the absence of computer software system and lack of training on logistic forms result poor record keeping practice in Biftu and other three health centers.

Inventory Management Practices at Store departments

Inventory Control System, LMIS implementation and Lean Inventory System were inventory management practices assessed in health centers of Adama town. Accordingly, lean inventory management concept of the health facilities was assessed to examine perception of workers towards lean inventory management concept and the grand mean value was 3.500, and which indicated that respondents agree on the inventory control system practice in the health centers.

Lean inventory management system is a systematic approach to enhance value in an organization by identifying and eliminating wastage of drugs, effort and time through continuous improvement in pursuit of perfection.

Study conducted in United States on Drug Wastages and Costs to the health care system in the care of patients indicated that vial sharing at site level slightly reduced waste to 3.74 percent over two years (Hess, 2018).

LMIS implementation was another dimension of inventory management practices examined. The respondents' perception on LMIS implementation at their health facilities was indicated on below Table 4.6, which indicated the respondents agree on the LMIS implementation practices in their health facilities, mean value of 3.4167.

One of LMIS implementation is utilization and continuous update of Bin Cards for all pharmaceuticals in the health facilities and from this assessment the result indicated that on average, 96 percent of the TDs had bin cards of which 84 percent were updated. This result is similar with study done in Public Health Facilities of Dessie, North-East Ethiopia, on availability of tracer drugs and implementation of their Logistic Information System which is 77.8 percent and 86 percent (Belete, 2020). An effective LMIS collects essential data about stock status and consumption so that it ensures accountability and cost effectiveness for all products in supply chain.

Inventory control System was assessed as one of inventory management practice dimension grand mean value of 3.1667, which indicated that facility heads were neutral on practice of inventory control system in the health centers. Min- Max inventory Control System is one item among the dimensions of inventory control system which puts minimum and maximum levels of stock to maintain specific items in inventory. The health centers use a maximum- Minimum system and a maximum inventory the health centers can hold is 4 months' with minimum stock level of 2 months (EPSA, 2015). As the average availability and average stock out duration of tracer drugs were 87.9 percent and 29.16 days respectively, and this indicates that max-min inventory control system was not fully implemented at the health centers although the results are better than study done on tracer pharmaceuticals availability and distribution trends prior to and during Covid-19 pandemic at EPSA, Ethiopia which was 60 percent and 34.68 days (Gizaw, 2022) respectively.

Although 50 percent of respondents from stores claimed as max-min inventory control system was defined and practices based on the finding 56% and 8% of tracer drugs were overstocked and in critical level (shortage) respectively. About 36% of the tracer drugs were in normal level in the past six months. These results were better than that of findings in health facilities of Gondar town, which showed 12% were in critical level, 15% were in safe (normal) stock level and 73% were in overstock level (Mulugeta Fentie*, 2015).

Table 4. 6 Mean and Std. Deviation of inventory management practices at Medical Store of the health centers (N=6)

Variables	Mean	Std. Deviation
LMIS Implementation	3.4167	.97040
Pharmacy has a formalized stock management system based on stock keeping cards or a computerized inventory control system	3.3333	1.21106
The store man uses LMIS-based inventory management system for real-time monitoring	3.5000	0.54772
Lean inventory system	3.5000	.94281
There is minimal waste ,less overstock and under stock, very minimal surplus inventory and absolute inventory	3.3333	1.21106
On time refill or Operation of Just In Time purchasing system –where no safety stocks are kept is the practice	3.3333	1.21106
Store of the health center is Providing inventory when requested by the user for effective demand management,	4.3333	.51640
Drugs with shorter expiry dates are exchanged and documented.	3.3333	1.21106
Inventory Control System	3.1667	.76920
Max-Min stock level is defined/demarcated in the health center	3.5000	.54772
Information recorded on stock keeping card at the time of movement of drug	3.5000	.54772
Physical count is made at regular intervals (at least once a month) and regularly.	3.3333	1.21106
Replenishing is practiced when the minimum level is reached.	2.3333	0.51640

NB: Mean is calculated using a 5 point likert scale frequency data

4.3.3 Facility heads respondent on inventory management practices of their HFs

According to the heads working in these facilities perception, follow of proper procedures when receiving tracer drugs mean 3.000, condition of boxes at the time of delivery is checked by a health workers during receiving was moderate, mean = 3.800, expiry dates of all items are checked before receiving supplies was mean = 4.000.

The respondents agreed that there was regular inspections to determine if there is any deterioration of drugs during receiving, mean = 3.600, SD = 1.14018, prompt and proper action was taken if the deterioration of tracer drugs received is suspected, mean = 3.800 and SD = 1.30384, and discrepancies are being documented and reported, mean = 3.400 and SD = 1.8659.

Generally, health facilities heads agreed that there was inventory management practices at health centers, grand mean = 3.600, SD = 0.66249.

Table 4. 7 Mean and Std. Deviation on inventory management practices (facility heads, N=5)

Variables	Mean	Std. Deviation
Proper procedures are followed for receiving supplies	3.000	1.22474
Condition of boxes at the time of delivery is checked by a health worker	3.800	1.30384
Expiry dates of all items are checked before receiving supplies	4.00	1.41421
There are regular inspections to determine if there is any deterioration of drugs	3.600	1.14018
Prompt and proper action is taken if the deterioration of drugs received is suspected	3.800	1.30384
Discrepancies are being documented and reported: unacceptable expired drugs or drugs of poor quality are identified	3.400	1.81659
Average composite mean	3.600	.66249

NB: Mean is calculated using a 5 point likert scale frequency data

4.3.4 Response of dispensing Units on Customer Service

Customer (intermediate) service was measured using four sub-variables and findings tabulated in Table 4.8. The item scales measured services given for intermediate customers at medical store were five point Likert type scales with 5= Very satisfied, 4= somewhat satisfied, 3= neither satisfied nor dissatisfied, 2= somewhat dissatisfied, 1= Very dissatisfied.

The findings computed on Table 4.8 below indicated that the intermediate customers 58.2 percent of them were neutral with quality (mean = 3.2911 and SD 0.94938), and 53.2 percent with available of tracer drugs received from store. These results are similar with that of study done on supply chain management practices and HIV rapid test kits in selected public hospitals and health centers in Oromia region which was 3.56 and 4.00 mean scores (Jara, 2019). 46.8 percent of respondents (mean = 3.2911) were neutral on availability issues. Almost all of the respondents (97.5 percent, mean = 4.4810 and SD = 0.74869) were strongly satisfied with documents related to TDs they got from store.

Table 4. 8 Mean and Std. Deviation of Dispensing Units on Customer Service (N=79)

Variables	Mean	Std. Deviation
Tracer drugs received from store have quality	3.2911	.94938
All tracer drugs are always available at store	3.4684	.65702
Store man is available when need to refill	3.5570	.76371
Documents related to the trace drugs received from store (Voucher-model 22)	4.4810	.74869
Average composite mean	3.6994	.38684

NB: Mean is calculated using a 5 point likert scale frequency data

The service providers were asked what they do in case they encounter stock out of TDs in their HFs. As indicated on Table 4.9 below they respond that majority of them (77.2 percent) replace the prescription and order other alternative drugs available in the HFs. About 13.9 percent of the respondents respond that they refer the clients to Popular Pharmacy when there is stock out of these products within the health centers.

Table 4.9 Percentage of Dispensing Units on situations of lack of TDs (N=79)

Variables		Frequency	Percent
Valid	Replacing the medicine prescription	61	77.2
	Refers to the Popular Pharmacy	11	13.9
	Recommends the purchase	7	8.9
	Total	79	100.0

4.3.5 Percentage of Tracer Drugs available on the day of survey

The reason for holding stock in pharmaceuticals supply management system is to ensure availability of tracer drugs almost all the time. Stock outs and overstocks in any system are important indicators of the logistics system lack of effectiveness and efficiency. Stock outs may result into unavailability of life saving medicines, disrupt course of treatment and ultimately patients and health service providers may lose trust to the health system.

Overstocking on the other hand puts products in increased risk of expiration or damage before they are dispensed to users (Shebo, 2019).

This study found that all facilities visited had experienced stock out of a number of tracer products in the past 180 days and all had stock outs of a number of products on the day of assessment except Adama health center. Average percentage of time that tracer products are out of stock in the surveyed health facilities was 3.5 percent.

These results show that inventory management practice of Adama Town was not performing well even though this result is better than that of study done in health facilities of South Wollo Zone which is 14 percent.

Stock Status of the health centers also shows that, averagely there are only 9 tracer drugs among 25 which are adequately available based on max-min inventory control system designed in the health centers.

In this study, tracer drugs was assessed based on percent of tracer products available on the day of visit.

Stock level monitoring was assessed to determine the health centers system's capacity to maintain a range of tracer drugs in stock. To measure the physical availability essential drugs, 25 TDs were selected.

In this study, stock level monitoring was assessed based on stock out duration during the last 180 days and tracer drugs availability on the day of assessment. The survey collected data on stock from stock record ledger and physical count, stock outs on the day of visit and stock outs during the last 180 days.

Accordingly, stock out is measured as average percentage of time that tracer drugs are out of stock which indicates the system's capacity to maintain a constant supply of the products over time by minimizing the duration of stock outs.

Availability of tracer drugs, measured as Percentage of products in stock and which measures the system's effectiveness in maintaining a range of products in stock (at the time of the assessment), was assessed by interviewing store managers and observation with checklist.

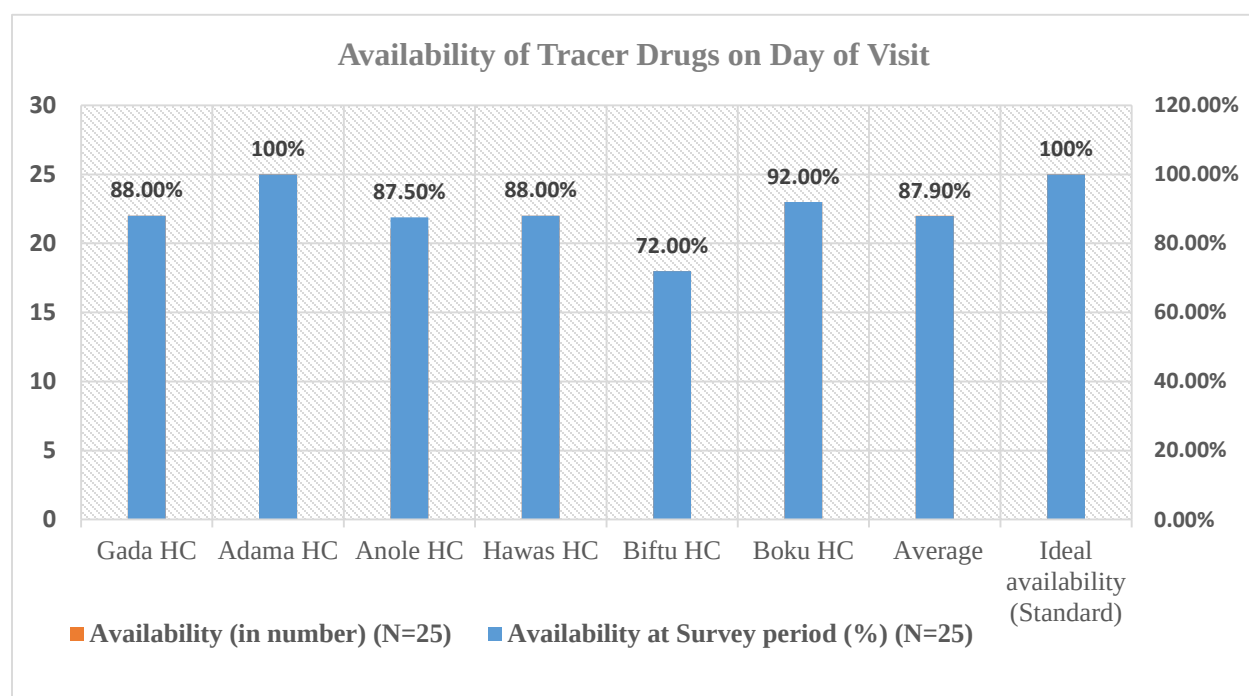


Figure 4. 1 Average percent of tracer drugs availability

Based on above figure 4.1, the highest percentage of tracer drugs available is 100 percent which is in Adama health center which may be due to experienced man power including pharmacy personnel available at the health center. Averagely, 87.9 percent of tracer drugs were available at day of survey at each health center visited. The general availability of tracer drugs in Ethiopia was reported to be 91 percent in 2009, but the study conducted at different part of Ethiopia after 2009 showed big variation on the availability of tracer drugs ranged from 26 percent to 91 percent (Mulugeta-Fentie, 2015). The availability of tracer drugs documented in this study (87.9 percent) is better than health facilities in South Wollo Zone which was 76 percent (Belete, 2020) and it is also greater than a study done in Dares Salaam, Tanzania to evaluate stock out and inventory management problems in public hospitals indicated that average percent of tracer products available on the day of survey in three district hospitals as 80 percent but, lower compared to Gondar which was 91 percent (Mulugeta-Fentie, 2015), (Kagashe GAB, 2012). This result was also better than that obtained in the assessment done in the same facility before three years which was 76 percent (Shebo, 2019). This improvement may be due to the stock status of Adama EPSA, as this hub was selected as center of Excellency for the past 2 years and the budget allocated from the Town which varies from region to region across the country. However, the overall availability of TDs in this study was not the same with that of WHO recommended target point which is 100 percent (WHO, 2002).

The lowest percentage of tracer drugs available is 72 percent which is in Biftu health centers. In the six health centers visited, logistics records were available, but all health facilities didn't use and stock keeping records for updating transactions.

4.3.6 The average percentage of time that the tracer drugs that are out of stock

Stock out within the last 180 days was expressed as the average percentage of time that the products were out of stock in a particular facility.

The study has found that all facilities visited had experienced stock out of a number of tracer products in the last 180 days except in Adama health center.

Adama health center has adequate pharmacy professionals who closely monitor the availability of pharmaceuticals at the health center. Days out of stock of tracer drugs in the past six months of tracer drugs was estimated from stock records of tracer drugs.

The most commonly out of stocked TDs was Furosemide tablets and was encountered in four out of six health facilities (66.67 percent) whereas stock out of Metronidazole capsule, ORS+-Zinc, Hydralazine injection and Amlodipine tablets in only two out of six health facilities. 8 out of 25 tracer drugs frequently stock out in different health facilities.

Figure 4.2 shows that the average percentage of time that tracer products were out of stock in the visited health centers.

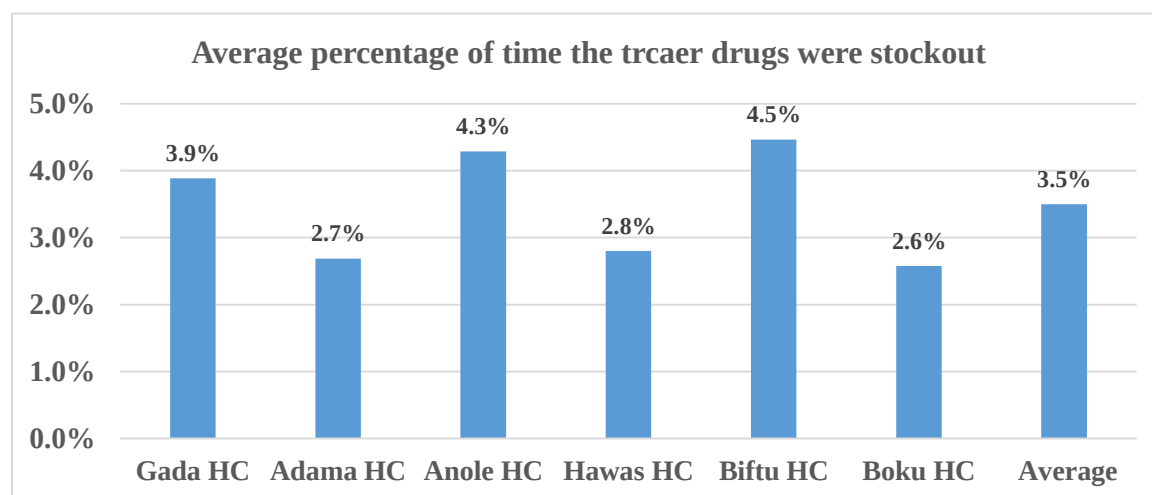


Figure 4. 2 Average percentage of time that tracer products were out of stock

The study has found that all health centers (100 percent) visited had stock out of a number of tracer drugs in the past 180 days. Twenty five Tracer Drugs were managed by the health facilities.

The study found that the average percent of time out of stock was 3.5 percent in health centers of Adama Town.

The results also show that the health facilities such as Anole and Biftu health centers, have the highest stock out rate whereas Boku health center has the lowest stock out rate which is 2.6 percent. In ideal situation, the stock out rate of tracer drugs is expected to be 0 percent (WHO, 2002).

An assessment for inventory management system done in Malawi found that average percentage of time out stock for medicines to manage malaria in the surveyed facilities was 33.3 percent (Anon., 2007) whereas it is better, 3.5 percent, in this study. Study conducted on stock status and logistics conducted in 2006, in Kenya, found that average percent of time out of stock for malaria products was 51.7 percent in district stores, 40 percent in health centers and 36 percent in dispensaries (Bundle, 2006).

All these studies highlight the fact that performance of many pharmaceutical logistics systems especially in sub-Saharan Africa is not good. However, the performance of pharmaceuticals inventory management system for facilities can be improved and minimize the duration of stock out. A survey conducted in 24 health centers of Addis Ababa reported that majority of health centers, 18 (75.0 percent) often stocked out non program tracer drugs while 9 (37.5 percent) of the health centers often over stocked with some non-program tracer drugs (Mudzteba, 2014).

In the six health centers visited about 12.10 percent of tracer medicines were out of stock at the time when this study was carried out and this result was better than that of survey finding result from Dessie, North East Ethiopia which was 24 percent (Belete, 2020). This result was better than that of result reported from assessment done in health facilities of Tanzania, which was 20 percent (Massawe2, 2012).

4.3.7 Inventory management practice: A Quantitative Observation

Inventory Management Practice at Medical Store

Availability of LMIS formats like bin cards, IFRR and RRF is fulfilled (100 percent) in all Medical Store of the health centers assessed even if consistent updating of bin card has some problem.

Most of the health centers 83.3 percent report their tracer drugs request (RRF) on monthly basis while 16.7 percent of them report on bimonthly basis. The result showed that 66.7 percent of the health centers were implementing only paper based LMIS while 33.3 percent were using both paper and computer for inventory management of tracer drugs in the health facilities.

Inventory Management Practice at Dispensing Units

The study showed that 83.5 percent of the service providers at dispensing units responded that there is no LMIS at service delivery units while 16.5 percent of them are responding that they are using the system for inventory management of their pharmaceuticals, 48.6 percent of the dispensing units use IFRR only while 13.9 percent of dispensing units utilize both IFRR and bin cards for tracer drugs inventory management. The results show 53.2 percent of the dispensing units use the IFRR format for report and resupply of tracer drugs while 46.8 percent of the respondents replied that they use order book for requesting pharmaceuticals from the medical store and 39.2 percent of respondents replied that they do not use any of LMIS formats at their dispensing units.

4.3.8 Tracer Drugs storage conditions in the surveyed health facilities

Storage condition in storage areas in the visited facilities was measured using guidelines for proper storage. The public health facilities storage condition were assessed based on thirteen (13) principles. Table 4.9 shows the percentage of public health facilities that complied with the specific storage condition criterion established in the Standard Storage Condition manual.

These findings therefore indicated that storeroom is maintained in good condition in 67 percent of HFs visited, pharmaceuticals are stored in a dry, well-lit, well-ventilated store room 83 percent, the store room is protected from water penetration 100 percent, latex products are stored away from electric motors and florescent lights 100 percent, cartons and products are protected from humidity during all seasons 100 percent, cold storage is maintained as required 50 percent, storage area is secured with a lock and key 100 percent, cartons are not stacked at least 10 cm off the floor, 30 cm away from the wall and other stacks, and no more than 2.5m high in all HFs visited (0 percent).

Medical supplies are stored away from insecticides, chemicals, old files, office supplies and other materials in 83 percent of HFs, unusable pharmaceuticals are separated from usable pharmaceuticals and dispose of damaged or expired products were practiced in 50 percent of HFs visited. There were no Fire safety equipment available in all health centers visited.

Table 4. 9 Storage condition of health facilities

S/N	Description of Storage principles	Complaint of health Facilities %(n) (N=6)
1	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).	67%
2	Pharmaceuticals stored in a dry, well-lit, well-ventilated storeroom – out of direct sunlight.	83%
3	Protect storeroom from water penetration	100%
4	Fire safety equipment is available, accessible, and functional, and trained employees to use it.	0%
5	Latex products are stored away from electric motors and fluorescent lights.	100%
6	Cartons and products are protected from water and humidity during all seasons.	100%
7	Maintained cold storage, including a cold chain, as required.	50%
8	Storage area is secured with a lock and key but is accessible during normal working hours;	100%
9	Cartons are stacked at least 10 cm off the floor, 30 cm away from the wall and other stacks, and no more than 2.5m high.	0%
10	Medical Supplies are stored away from insecticides, chemicals, old files, office supplies and other materials.	83%
11	Pharmaceuticals are arranged to facilitate FEFO procedures and stock management.	83%
12	Cartons are arranged with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible	100%
13	Unusable pharmaceuticals are separated from usable pharmaceuticals and dispose of damaged or expired products,	50%

Table 4. 10 Health Centers and their percentage of storage conditions

Code of Health Centers	HC001	HC002	HC003	HC004	HC005	HC006
Percentage of Storage conditions fulfilled	85%	85%	69%	62%	54%	69%

Storage condition is important to maintain purity, potency, safety and effectiveness of pharmaceuticals for a longer period of time. Proper storage condition, therefore, is one of the strategies to help ensure that only high quality products reach the clients. Storage conditions for pharmaceutical are critical and it is, therefore, important to maintain the temperature at the required levels. In the survey, storage condition of public health facilities were assessed based on security and access, conditions of storage site, availability and organization of medicines and packaging of medicines. The findings showed that all the public health facilities complied the Security and Access criteria. Storage site were securely locked and Access to storage and pharmacy is limited to authorize personnel only. In health facilities, some were performing well while some hand unacceptable storage conditions. Some of the health facilities only fulfill the Conditions of Storage area.

In general, the results of this study showed that majority of the public health facilities practiced unacceptable storage condition (66.67 percent of health centers) and only 33.33 percent of the health centers had acceptable storage conditions. This result was greater than that of the findings of the case of public health facilities found in South Wollo Zone, Amhara Region which showed 55.6 percent and 44.4 percent respectively (Mulugeta-Fentie, 2015). Stacking cartons at least 10 cm off the floor, 30 cm away from the wall and other stacks, and no more than 2.5m high and availing fire safety equipment at storage area were totally not practiced at all health centers visited because of lack of storage space.

4.3.9 Challenges in implementing inventory management practice for Tracer Drugs

Challenges of inventory management practices of tracer drugs: Quantitative

This section of the study was designed to examine the challenges of applying inventory management practice in the organization and designed to meet the fourth research objectives. The respondents were requested to state the extent to which they agree with parameters testing provided in the questionnaire within a scale of one to five.

Accordingly, the health centers were neutral on changing demand as challenge for inventory management practices of the health centers, grand mean = 2.9000, while they agreed on lack of communication and manual documentation as challenges for inventory management practices of the health centers, mean = 3.1000, SD = .41833 and mean = 4.5000, SD = .000 respectively. This mean result of manual documentation, lack of technology, in this study is greater than that of comparative study done on Supply Chain Management Practices & Operational Performance of Key Tracer Drugs in Private and NGO's Maternal and Child Health Centers in Addis Ababa (Biniam, 2018) which was 3.51 and implies higher number of respondents agree that lack of technology affects inventory management of tracer drugs.

Table 4. 11 The challenges of Inventory Management Practice (Facility Heads, N=5)

Variables	Mean	Std. Deviation
Changing Demand	2.900	.8258
Demand uncertainty is the challenge of inventory management practice in the health center	3.600	1.14018
Inefficient internal process is the hindrance to inventory management practice in the health center	2.200	0.83666
Lack of Communication	3.100	.41833
Lack of information use on inventory management is the challenge	3.400	1.14018
Lack of Management support on inventory management is the challenge	2.800	.83666
Manual Documentation	4.500	.0000
Lack of budget for inventory management systems support of the HFs	4.600	.54772
Lack of infrastructure like internet is challenge for inventory management systems of the HFs	4.400	.54772

NB: Mean is calculated using a 5 point likert scale frequency data

Challenges of Inventory Management practices from Purchasing Unit View (N=9)

Table 4.8 below shows that both lack of LMIS format and budget were challenges for inventory management practices of the health centers. The respondents from purchasing units agreed that these two factors were challenges for inventory management practices of pharmaceuticals in the health centers, mean = 3.67 and SD = .37268.

Table 4. 12 Mean and Std. Deviation of Inventory Management Practice challenges

Descriptives		Statistic	Std. Deviation
Lack of LMIS formats	Mean	3.6667	.37268
	Median	4.0000	
	Variance	1.250	
Lack of budget	Mean	3.6667	.37268
	Median	4.0000	
	Variance	1.250	

4.4 Qualitative Analysis

4. 4.1 Challenges of Inventory Management practice: A Qualitative Observations

A qualitative data was collected by a key informant interview of key informant. These interviews were held with store managers working in those selected health facilities based on the reason specified in the methodology part. There were 6 key informants participated on the interview of which 2 were female and 4 male. Most of them were bachelor degree with 1 to 5 years of experience.

The data obtained by interviewing the key informants were transcribed immediately after interviews, then thoroughly analyzed and categorized into three thematic areas based on the nature of the data as Stock management related problems, intermediate customer and storage condition related problems.

Stock management related challenges

Most of key informants said that majority of the dispensing units in the health facility do not use and update bin cards for pharmaceuticals they receive from medical store, and also come to the store at irregular times to fill their products. The problem affects the health facilities' attempt to determine their accurate consumption data. The main cause of this problem was lack of focus, wrong attitude that pushes doing this activity is the job of pharmacy personnel and lack of commitment from staff and the management of the facility.

One of the key informants replied that:

“Frankly speaking most of our dispensing units do not regularly use and update bin cards. When they want to refill their pharmaceuticals from the store, they just put simply certain numbers mostly zero on IFRR and request the quantity they need. I inform the head of the facility most often in order to solve the problem. However, as I do not have the power to enforce them to keep such records accordingly, I just simply give them what they have asked.”(Pharm.06)

As a result of lack of adequate man power, skilled staff turnover and lack of regular supportive supervision in this area; almost half of the key informants said that they do not classify medicines based on VEN analysis and do not give due attention for tracer drugs.

With regards to other stock management problems, owing to shortage of man power the pharmacist/druggist/ work in other places besides the position they were assigned. Due to this reason, they have no adequate time to update bin cards regularly, monitor if the stock level is between min-max and trigger order accordingly.

One key informant explained that:

“Although there is position and our health facility also needs five pharmacy professionals, currently only two pharmacy professionals were working. For example, I am the store manager but I also work as OPD pharmacy dispensary and/or ART pharmacy dispensary. Hence, I do not have adequate time to conduct a real-time bin card update as well as computer of all stocks, monitor stocks regularly and other important store activities.”(Pharm. 04)

Some of the key informants complain frequent stock out, overstocking and medicine expiry due to improper quantification during medicines procurement as it was done with the rush and without passing through the necessary steps like involving the drug and therapeutic committee.

This may be primarily due to the lack of commitment of the staff and a little emphasis given to the quantification science by the management of the health facility. This can be demonstrated by one of key informant saying that:

“ When EPSA become unable to supply some essential drugs the quantification was done swiftly without taking time to calculate the correct amount needed as our health center has a very high load clients. Instead, it was conducted by depending only on personnel judgment with a few or no utilization of past consumption data generated and also without involving concerned committees that exposed us to frequent stock out, overstocking and medicine expiry.” (Pharm. 03)

Customer (intermediate) related challenges

Most of the key informants mentioned that service providers working at dispensing units, those called intermediate customers in this study, are not filling IFRR properly and do not report all important data needed for resupply decision.

The providers simply report the format filling zero (0) when they need the products from store. These providers do not use stock keeping records. They do not want to stick to the schedule set by the health facility. Some service providers visit the store room with simple order book to collect tracer drugs.

There is no data reported concerning beginning balance, quantity received, stock on hand and loss adjustment essential data items which enable the store man to calculate consumption and then decide on the resupply.

The service providers (intermediate customers) simply complain lack of training on IPLS. One of the respondent explained this saying:

“one of the service provider working at dispensing unit said that you as store man have got hotel based training of IPLS for three days but you enforce me to update and report IFRR giving me few minutes orientation, No! No! I will not update bin cards and report IFRR with 30 minutes on job training.” (Pharm. 01)

It is challenging that service providers do not get quantity of tracer drugs they need because of demand uncertainty at dispensing units. They always complain availability of essential medicines. Data generated from service unit is very important because it is actual dispensed data that enable the store man to request right quantity of items for the health center.

Unfortunately, intermediate customers do not generate this dispensed to user essential item that helps the supplier to resupply the right amount of items the health facility needs. Generally, LMIS implementation is very poor at dispensing units in almost all health facilities as key informants explained on the interview.

Another challenge mentioned by key informant was on time delivery of essential drugs from EPSA. One key informant said that:

”EPSA delivers pharmaceuticals at the time they collected all the items they requested from central warehouse; not based on refill schedule set based on max-min inventory control of the health facility. This makes shortage and enforce us to order emergency especially program drugs”.

Storage condition related Challenges

The inadequacy of storage space was the main challenge of health centers stated by all of the key informants. Medicines were kept in inappropriate places and conditions like piling of a large number of medicines without leaving adequate space in between, keeping them on the floor due to lack of adequate storage space. On top of that, some of the key informants said that because of inadequate storage area unusable medicines (obsoleted and expired products) were kept in within the usable pharmaceuticals in one room. Lack of adequate resource and not giving due attention by the higher officials that govern the health centers may be the reason for this problem.

One of the respondents among the key informants described as:

“Medicines are stored inappropriately due to inadequacy of storage space and lack of different storeroom equipment like pallets and shelves. It is difficult to move easily in the store to perform different storeroom activities like updating bin cards, assessing stock status, conducting physical inventory. In addition to that, we also store the expired medicines in the room that is not convenient. (pharm. 5)

Few of the key informants said that the store room was built for another purpose, it's through time that it was changed to the storeroom in search of wider area, i. e. initially it was not built for pharmaceuticals store room. Because of this the rooms lack features of pharmaceuticals storeroom like height of the roof that has its own standard, smooth and strong floor, adequate light (well lit room) with enough ventilation. Because of budget constraints and lack of attention given to the store by the directors of the health facilities; the store room has no adequate shelves, pallets, refrigerators, wall thermometers and fire extinguishers was another problem mentioned by the key informants. These types of equipment are very important tools that enhance the quality of the storage condition of the pharmaceuticals. One of the key informant elaborated this problem saying that:

“I put all heat sensitive medicines in OPD dispensary pharmacy in bulk amount because our store room has no refrigerator and this exposes me to risk of medicines loss and also make overstock the refrigerator. (Pharm. O4)

Accumulation of unusable medicines in the store room was the other commonly raised challenges by the respondents.

Due to the Ethiopian Food and Drug Administration proclamation which prohibits the routine removal of unusable medicines through open filled burning practices, large amount of unusable pharmaceuticals are stored and occupied in the store room space. The waste medicine disposal methods prescribed by Ethiopian Food and Drug Administration was much cost and beyond the health centers' capacity to implement. Some of the methods include:

Highly engineered sanitary landfill, return of expired medicines to supplier, medium-temperature incineration (850-10000 °C) and high-temperature (>12000 °C) (FDA, 2011) which was installed by EPSA hubs and failed soon.

Almost all of the key informants complain that there is no public service structure for porters in the health center so that there are no daily laborers that help in unloading, storing, picking and arranging the pharmaceuticals during receiving and issuing of the products. Furthermore, other key informant stated that in the facilities that use HCMIS software there is shortage of IT professionals that help in maintaining the computer as well as feeding data into the computer and it is difficult to work both manual and electronic LMIS parallel. HCMIS needs additional man power for proper implementation of the system in the health facilities.

4.5 The Statistical Relationship between Inventory Management Practices and Operational Performance of Tracer Drugs

For the purposes of determining the extent to which the explanatory variables predict the variance in the explained variable, multiple linear regression analysis was conducted. Multiple Regression analysis is a statistical method through which one can analyze the relationship between a dependent or criterion variable with the set of independent or prediction variable/s. Unlike correlation, however, the primary purpose of regression is prediction (Marczyk, 2017).

Multiple regression is a statistical tool that is often used to achieve best predictive relationship for a given set of both dependent and independent variables with the aim of evaluating the contribution of specific variables or set of variables and find structural connection and provide explanation for multiple relationship (Robert, 2017). Therefore, in this particular study multiple linear regression method was used to determine the unique contribution of each dimension of the independent variable to the dependent variable.

The following model summary table shows how much of the variance in operational is performance of tracer drugs explained by the explanatory variables considered in the model.

Table 4. 13 Model Summary independent variables (a) as predictor to operational performance of tracer drugs

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.924 ^a	.853	.849	.19514

a. Predictors: (Constant), Availability of LMIS system in your facility , Receive enough support to do your job effectively

b. Dependent Variable: Adequately available in the past six months

The Adjusted R Square value on the model summary table is a representation of the correlation between the observed values of the dependent variable, i.e. performance of tracer drugs, and the values of the same dependent variable predicted by the multiple regression models. Hence, the Adjusted R Square value obtained indicates that 84.9 percent of the variation in the availability of tracer drugs operational performance; adequate availability can be explained by the combined variance in the dimensions of the independent variable mentioned above.

Table 4. 14 Results for ANOVA with Operational Performance as Dependent Variable

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.069	3	7.023	184.426	.000 ^b
	Residual	3.618	95	.038		
	Total	24.687	98			

a. Dependent Variable: adequately available of TDs in the past six months

b. Predictors: (Constant), Availability of LMIS system in your facility, Receive enough support to do your job effectively

ANOVA test shows the acceptability of the model from statistical perspective. Accordingly, the regression row indicates the extent of variation explained by the model, whereas the residual row indicates information about the variation that is not accounted for the model, i.e. variation on the dependent variable explained by factors not included in the model.

On the above table it is clearly indicated that the computed F statistic is 184.42 with an observed significance level of 0.00, implying the statistical fitness of the regression model to the data.

Based on the Table 4:17, the ANOVA test shows that the regression model has a significant impact on operational performance since the p-value (0.00) is less than 0.05. This shows that the regression model is statistically significant. Since, the regression model, which explains the relationship between the operational performance (dependent variable) and the inventory management practices (independent variable), is statistically significant.

Table 4. 15 Coefficients of Regression Model with Operational Performance as Dependent Variable

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.069	.028		2.451	.016		
	Receive enough support to do job effectively	.765	.081	.765	9.393	.000	.233	4.296
	LMIS system available in facility	.259	.054	.257	4.811	.000	.541	1.847

a. Dependent Variable: All tracer drugs adequately available in the past six months
Based on the above results table 4:16 the following general formulas of regression model has been generated. The regression equation is for the operational performance of tracer drugs (Adequate tracer drugs availability). The Following is generated:

X1=Receive Supportive Supervision, X2 =LMIS, and e, represents for error terms

Operational Performance of TD (availability) = $\alpha + \beta_1(X_1) + \beta_2(X_2) + e$

Operational Performance of TD (availability) = $\alpha + \beta_1 (RSS) + \beta_2 (LMIS) + e$

$$= 0.069 + \beta_1 (0.765) + \beta_2 (0.257) + e$$

As far as the predictive power of the dimensions of the independent variable is concerned, a closer look at the coefficients of the independent variable shows that three of the dimensions of the independent variables, supportive supervision and LMIS availability.

Among these variables, Supportive Supervision and LMIS system have relatively statistically significant beta values.

The standardized coefficients (beta values) of these two dimensions indicate the relative importance of all the two dimensions in predicting the dependent variable, namely operational performance of tracer drugs. As far as the strength of the predicting power of the one statistically significant dimensions are concerned, it is revealed that Supportive supervision and LMIS system have positive predicting power on the dependent variable with standardized coefficient of beta value 0.765 and 0.257 respectively.

The result indicates that it is possible to predict, poor implementation of LMIS directly affects availability of tracer drugs with required amount in the health centers that will impact quality of health care.

The finding of this research is aligned with the research finding of Derrick Mwenda Kenyua (KINYUA, 2014) who found out that inventory management practices impact significantly the operational performances of consumer goods manufacturing companies in Kenya. The implementation of an effective inventory management leads to many benefits in health facilities including ensuring adequate availability of medicines and minimizing overstock and shortages. While there are different inventory management practices, the findings of this research study establish that public health facilities are more likely to benefit from supportive supervision and Logistics Management Information System for the inventory management practices of TDs.

The finding is similar with the research finding of analysis of supply chain management practices & Operational Performance of Key Tracer Drugs and Supplies in Private and NGO's Maternal and Child Health Centers in Addis Ababa (Biniam, 2018). The finding indicated that Supportive Supervision and LMIS in inventory management practices have statistically significant beta values and they do have significant predictive power on the dependent variable.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents a summary of key data findings of the study, the conclusions drawn from the findings and the recommendations for stakeholders to ensure effective and efficient management of inventory in health facilities. The chapter is structured as follows: Summary, conclusion, recommendations, and suggestions for further research.

5.1 Summary

This research was conducted towards an attempt to investigate the effect of inventory management practice on operational performance of tracer drugs in public health centers of Adama Town. The following Summary have been drawn on the bases of the findings of the data analysis effort.

A total of 99 respondents have filled and returned the survey questionnaire making the response rate about 93 percent and of which 79 of them from dispensing units of the health centers, 6 from store departments, 5 of them facility heads and 9 of them from purchasing departments of 6 sample health centers and all are found to be complete and hence qualified for being processed. 54.5 percent of the respondents are males while females constituting the remaining 45.5 percent of the total respondents. About 45 percent of the respondents have served between five to ten years in their current position implying that the major portion of the response is obtained from respondents who had relatively better information regarding the collaborative inventory management practices of their respective health centers have with their performance of tracer drugs.

Operational Performance of Tracer Drugs: Adequate Availability

The first objective of the study was to examine the effect of inventory management practice on operational performance of tracer drugs, adequate availability. The study revealed that supportive supervision and LMIS implementation have significant effect on adequate availability of tracer drugs in the last six months with beta values of 0.765 and .257 respectively. Average percent of products available on the day of visit was also assessed and showed that 87.9 percent of tracer drugs were available on the day of survey.

This show that although there is improvement in practices of the inventory management there is still a gap as on average 12.1 percent of products were not available on the day of visit which may be contributed by mal practices of inventory management at health centers. The average percent of time the tracer drugs out of stock was 3.5 percent.

Inventory Management Practices of the Health Centers

The second objective of the survey was to study the inventory management practices of the health centers. The study revealed that although there is implementation of LMIS in the health centers only 33 percent of the facilities are using computerized system of LMIS. The study showed that important LMIS formats were available at all health centers visited although their utilization differs from health facility to health facilities. According to the study 96 percent of the tracer drugs have bin cards of which 84 percent were updated. The study also revealed that the average percentage of accurate stock keeping records were 81 percent. Even though this result seems good relative to other studies in different health facilities the result highlights that there is inventory management problem which makes limited use of information for decision making of tracer drugs in the health centers of Adama Town. In general, as seen from the study inventory management practices like LMIS implementation, inventory control systems like demarcating of max-min levels, and lean inventory systems such as on time refill and minimizing wastage were exercised in the health centers of Adama Town.

Tracer Drugs Storage Condition

The third objective of the study was to assess the storage conditions of Tracer Drugs in Public Health Centers of Adama Town. The study revealed that majority of the health centers, 4(66.67 percent) practiced unacceptable storage condition and only 2(33.33 percent) of the health centers' storage condition met the standard guideline. This implies that tracer drugs are not stored in appropriate storage conditions that enable to keep their potency optimum level and also to keep them safe.

Challenges in implementing inventory management practice for Tracer Drugs

The fourth objective of the study was to examine the challenges in implementing inventory management practice for Tracer Drugs in Public Health Centers of Adama Town.

The study revealed that lack of awareness on the benefits of inventory management, demand uncertainty, lack of communication and management support on inventory management, amount of budget allocated, lack of good infrastructures like IT equipment and inefficient internal process are the hindrance to inventory management practice in the health centers. In addition to this lack of man power, gaps in capacity building (training) and inadequate storage spaces were among many challenges for inventory management practices mentioned by key informants.

5.2 Conclusion

The findings of this study revealed that inventory management of tracer drugs was not satisfactory in terms of record keeping, stock level monitoring and the storage condition. Availability of tracer drugs in health centers of Adama town was not 100 percent and the facilities had faced a number of stock outs of tracer drugs in the last six months. Stock keeping records in the health facilities surveyed was not accurate. There were incidence of some stock records count to read more than what was actually available in stock and also there were incidence of some stock record count to read less than what was actually available in the stock. This practice will potentially pose high risk for frequent stock outs, expiry and high wastage of tracer drugs in the health facilities.

In other words, with respect to the findings of the research study, it is conclusive that inventory management practices impact significantly the operational performances of tracer drugs in health facilities of Adama Town. The implementation of an effective inventory management leads to many benefits in the organization including ensuring on adequate availability, and minimize over stock and shortages of tracer drugs. The findings of this research study establish that health facilities of Adama town would likely to benefit from LMIS, inventory control and lean inventory (which works to minimize wastages, less over stock and timely refill) systems.

In addition, discipline to use the available information technology, digital LMIS, will enhance the operational performance of the tracer drugs specifically on monitoring adequate availability of tracer drugs and minimizing wastage.

Tracer drugs storage condition in majority of health centers of Adama town was below the acceptable standard. Placing fire safety equipment and stacking of cartons off the floor and away from the wall needs special attention.

However, there were good practices in all health facilities in protecting the storeroom from water penetration, secured store room with lock and key and arrangement of cartons in the store room.

Lack of awareness on the benefits of inventory management, lack of management support, demand uncertainty, budget constraints for tracer drugs purchase, lack of infrastructures like IT, gaps in capacity building and training, and inadequate storage space were among many challenges for inventory management identified in this study.

5.3 Recommendation

From the findings of this study, the following are the researcher recommendations that health centers in Adama town may maximize the benefits of inventory management practices. The availability of tracer drugs was less than the recommended percent. Supportive supervision for proper implementation of LMIS very important for adequate availability of tracer drugs in the health centers. Inventory management is not something practiced only in the store but needs involvement of many departments those can influence the performance of tracer drugs in holding stocks and making decision about the products in the health centers. Based on this:

- The researcher advice that Health facilities in Adama town may use inventory management systems supported by computers at all units concerned with tracer drugs as they contribute a lot in supporting adequate availability of tracer drugs, minimizing over stock and shortages of these products at health facilities.
- The research study highly recommend supportive supervision to improve the inventory record accuracy by using system based inventory management practices and engage all its staff (store managers and all dispensing units) to use the current available system properly .i. e IPLS.
- Adama town health administration may take efforts to ensure that the Health facilities have “standard” store for pharmaceuticals.
- These stores of the health centers may be spacious enough to allow the health facilities to keep a stock level of two months of stock with fulfilled storage guide principles. It is good if the town more focus to enhance use of fire safety equipment and proper arrangement of all products in the health facilities.

5.4 Limitation and Suggestions for Future Studies

One of the major limitation of this study that worth mentioning is the fact that it does not comprehensively capture all aspects of inventory management practices rather it made emphasis in describing and revealing the prediction of independent variables like LMIS implementation, Supportive supervision, training, stock keeping accuracy, refill time on dependent variable, performance of tracer drugs in the health centers of Adama town. Future studies may consider some other dimensions of inventory management practices that haven't been considered in this particular study.

The other point not well covered by this study where the remaining inventory management challenges that may affect the inventory management practices of the health facilities. So the researcher suggests for future studies to incorporate other internal and external factors that may affect the inventory management practices, and relationship to the operational performance of tracer drugs.

Some of the limitations that faced in an attempt to find out effect of inventory management practices on operational performance of tracer drugs was lack of sufficient literature directly related to the health centers.

Another limitation was, since the study is only limited to Public Health Centers in Adama Town due to cost and time constraints, the findings may not give a general picture of the inventory practices in the entire region of Oromia.

In addition to this, concerning the study design, which is cross-sectional and assesses availability in a determined period, and therefore does not allow concluding whether the lack or existence of medicines is constant or limited to that determined period. Finally, this study focuses only on 25 Tracer Drugs and therefore the findings may not be generalized to the inventory management practices of other health commodities such as other reproductive health commodities, essential medicines, laboratory commodities, vaccines and medical supplies. However, despite these limitations, the study will offer significant insights into the weaknesses of Tracer Drugs management in the Public Health Centers in Adama Town. In this regard, the study is of importance to pharmaceuticals Supply Chain Management Officers of the Town and program owners.

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Annexes

I. Data Collection Instrument

Addis Ababa University

School of Commerce

A. Consent Form

This questionnaire has been designed for the sole purpose of collecting data on the effect of inventory management practices on availability of Tracer Drugs in Public Health Facilities of Adama Town, Oromia. The data collected will be treated with a very high degree of confidentiality and it is meant for academic purposes only.

The questionnaire will take 10-15 minutes of your time. Your participation is voluntarily and information given will be treated with at most confidentiality and for academic research only.

Thank you for taking your time to share the insight with me.

Yours faithfully,

For comments/questions please contact Assefa Shanko (0910115701)

Email: **edassefa@gmail.com**

B. Data Collection Tools Store Department

Health Facility Code _____ Region _____ Date: _____

Section A, Part 1: General issues.

1. Your Gender: A. Male B. Female
2. Your Age : Years _____ months _____
3. What is your profession?
A. Nurse B. Clinical Officer C. Druggist D. Pharmacist E. Laboratory technologist F. Accountant
G. other
4. What is your education level?
A. Master's Degree B. BSC degree C. Diploma D. Certificate
5. How many years you have served in this position? Year _____ Month _____
6. Did you receive enough training to do the job effectively?
A. Yes B. No
7. Did you receive enough support to do your job effectively?
A. Yes B. No
8. If yes to Q7, Which drug management activities did your supervisors checked?
A. Stock record card utilization B. Reports checked C. Expired stock removal from usable
products D. Storage condition checked E. All,

Part 2: LMIS related

9. Is there LMIS system in your facility?
A. Yes B. No
10. If yes to ques. No 9, is it computer based or paper based?
A. Computer B. Paper C. Both
11. What LMIS formats does the health center use? (identify all LMIS formats)
A. Bin cards B. Stock cards C. IFRR D. RRF E. A, C & D F. All G. None
12. What forms does the health center use for ordering supplies?
A. Order book B. RRF C. Requisition and Issue voucher D. Other (*specify*):
13. How often are these LMIS report sent to the highest level?
A. Monthly B. Bimonthly C. Quarterly D. Semiannually E. Annually

Part 3. Perceived Availability of Tracer Drugs

14. Did all tracer drugs adequately available in the past six months?
A. Yes B. No

15. If no to Q14, What are the reasons for shortages of tracer drugs at the Health Center

- A. delay in delivery/high lead time
- B. Error in forecasts
- C. Lack of funds
- D. Long procurement procedure
- E. No stock out
- F. Others, mention_____

16. Did over stock of tracer drugs occurred in the past 6 months in your health facility?

- A. Yes B. No

17. Did shortage of tracer drugs occurred in the past 6 months in your health facility?

- A. Yes B. No

Section B. Part I. Inventory management Practice

LMIS implementation Please to what extent do you agree with the following LMIS implementation for tracer drugs availability at your health center		Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
		1	2	3	4	5
18.	Pharmacy has a formalized stock management system based on stock keeping cards or a computerized inventory control system					
19.	The store man uses LMIS-based inventory management system for real-time monitoring					
Inventory control system						
20.	Max-Min stock level is defined/demarcated in the health center					
21.	Information recorded on stock keeping card at the time of movement of drug					
22.	Physical count is made at regular intervals (at least once a month) and regularly.					
23.	Replenishing is practiced when the minimum level is reached.					
24.	Drugs with shorter expiry dates are exchanged and documented.					
25.	The health center has procedures for recording the movement of inventory					
Lean Inventory System						
26.	There is minimal waste ,less overstock and under stock, very minimal surplus inventory and absolute inventory					

27.	On time refill or Operation of Just In Time purchasing system –where no safety stocks are kept is the practice					
28.	Store of the health center is Providing inventory when requested by the user for effective demand management,					
29.	There is a guideline used as strategic agreement with suppliers to refill timely					

Part II. The Effect of Inventory Management Practice on Availability of Tracer Drugs

	Please to what extent do you agree with the following LMIS implementation for tracer drugs availability at your health center	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
		1	2	3	4	5
30.	Inventory management practice enables to avail tracer drugs timely					
31.	Health care delivery of the health center is frequently affected by the unavailability of tracer drugs					
32.	Additional costs are incurred to procure and avail adequate tracer drugs					
33.	Good inventory controlling system can reduce the total health care delivery cost of the health center and it significantly affects the customer satisfaction of the facility					
34.	Stock parts system balance is same with the physical inventory and no service interruption due to this effect					
35.	Accurate and up-to- date stores records is an Inventory management practices and it is standardized practice of the health center					

Part IV. The Challenges in Implementing Inventory Management Practice in the HC

	Please to what extent do you agree with the following inventory management related factors on tracer drugs performance at your health center	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
		1	2	3	4	5
36.	Demand uncertainty is the challenge of inventory management practice in the health center					
37.	Inefficient internal process is the hindrance to inventory management practice in the health center					
38.	Lack of awareness on the benefits of inventory management is the challenge					
39.	Lack of good infrastructure like IT equipment is the challenge					
40.	Lack of Management support on inventory management is the challenge					
41.	Amount of budget allocation dictates amount to order tracer drugs					

Data Collection Tools---- Dispensing Units

Health Facility Code _____ Region _____ Date: _____

Section A. Part 1: General issues.

1. Your Gender: A. Male B. Female
2. Your Age : Years _____ months _____
3. What is your profession?
A. Nurse B. Clinical Officer C. Druggist D. Pharmacist E. Laboratory technologist F. Accountant
G. other
4. What is your education level?
A. Master's Degree B. BSC degree C. Diploma D. Certificate
5. How many years you have served in this position? Year _____ Month _____
6. Did you receive enough training to do the job effectively? A. Yes B. No
7. Did you receive enough support to do your job effectively? A. Yes B. No
8. If yes to Q7, did the visit include drug management activities?
A. Yes B. No

Part 2: LMIS related

9. Is there LMIS system in your facility?
A. Yes B. No
10. If yes to ques. No 9, is it computer based or paper based?
A. Computer B. Paper C. Both D. None
11. What LMIS formats does the dispensing unit use for inventory management of tracer drugs?
(Check all that apply and verify.)
A. Bin cards B. IFRR C. A and B D. Stock card E. None
12. What forms does the dispensing unit use for reporting and resupplying supplies? (Check all that apply and verify.)
A. Order book B. IFRR C. Good receiving voucher D. Other
13. How often are these LMIS report sent to the store?
A. Weekly B. Biweekly C. Monthly D. Bimonthly E. other
14. What forms does the dispensing unit use for receiving supplies?
A. Delivery note B. Good Receiving voucher C. Other

Part 3. Perceived availability

15. Did all tracer drugs adequately available in the past six months?

A. Yes B. No

16. What will you do in situations of lack of tracer drugs in the health center?

A. Replacing the medicine prescription

B. Refers to the Popular Pharmacy

C. Recommends the purchase

D. Other, specify _____

17. Did over stock of tracer drugs occurred in the past 6 months in your health facility?

A. Yes B. No

18. Did shortage of tracer drugs occurred in the past 6 months in your health facility?

A. Yes B. No

Section B, Part 1. Questionnaire for customer service assessment

With Regard to customer service, please tick the appropriate box to indicate the extent to which you agree or disagree with each statement. The item scales are five point Likert type scales with 5= Very satisfied, 4= somewhat satisfied, 3= neither satisfied nor dissatisfied, 2= somewhat dissatisfied, 1= Very dissatisfied

	Customer Service	Very dissatisfied	somewhat dissatisfied	neither satisfied nor dissatisfied	somewhat satisfied	Very satisfied
		1	2	3	4	5
19.	You as intermediate customer (service Provider) tracer drugs you receive from store have quality					
20.	All tracer drugs are always available on time you need from store					
21.	You get the staff working on Trace drugs' distribution (store man) at the time (schedule) you need to refill					
22.	You take the documents related to the trace drugs you receive from store (Good receiving Voucher-model 22)					

Thank you for your participation!!

Data Collection Tool ...Purchasing Departments

Health Facility Code: _____ Region: _____ Date: _____

Section A. Part 1: General issues.

1. Your Gender: A. Male B. Female
2. Your Age: Years _____ months _____
3. What is your profession?
A. Nurse B. Clinical Officer C. Druggist D. Pharmacist E. Laboratory technologist
F. Accountant G. other
4. What is your education level?
A. Master's Degree B. BSC degree C. Diploma D. Certificate
5. How many years you have served in this position? Year _____ Month _____
6. Did you receive enough training to do the job effectively?
A. Yes B. No
7. Did you receive enough support to do your job effectively?
A. Yes B. No

Part II. LMIS Related

8. Is there LMIS system in your facility?
A. Yes B. No
9. If yes to ques. No 9, is it computer based or paper based?
A. Computer B. Paper C. Both
10. What LMIS formats does the health center use? (identify all LMIS formats)
A. Bin cards B. Stock cards C. IFRR D. RRF E. A, C & D F. All G. None

Part III. Perceived Availability of Tracer Drugs

11. Did all tracer drugs adequately available in the past six months?
A. Yes C. No
12. Did over stock of tracer drugs occurred in the past 6 months in your health facility?
A. Yes B. No
13. Did shortage of tracer drugs occurred in the past 6 months in your health facility?
A. Yes B. No
14. What are the reasons for shortages of tracer drugs at the Health Center?

- A. Delay in delivery/high lead time B. Error in forecasts C. Lack of funds D. Long procurement procedure E. No stock out F. Others,

Part IV. The Challenges in Implementing Inventory Management Practice in the HC

15. Amount of budget allocated dictates amount to order tracer drugs
A. Strongly disagree B. Disagree C. Neutral D. Agree E. Strongly Agree
16. Absence of different types of record keeping cards makes difficult to order pharmaceuticals.
A. Strongly disagree B. Disagree C. Neutral D. Agree E. Strongly Agree

Thank you for your participation!!

Data Collection Tool---Facility Heads

Health Facility Code _____ Region _____ Date: _____

Section A.

Part I: General issues.

1. Your Gender: A. Male B. Female
2. Your Age: Years _____ months _____
3. What is your profession?
A. Nurse B. Clinical Officer C. Druggist D. Pharmacist E. Laboratory technologist F. Accountant G. other
4. What is your education level?
A. Master's Degree B. BSC degree C. Diploma D. Certificate
5. How many years you have served in this position? Year _____ Month _____
6. Did you receive enough training to do the job effectively?
A. Yes B. No
7. Did you receive enough support to do your job effectively?
A. Yes B. No

Part II: LMIS related

8. Is there LMIS system in your facility?
A. Yes B. No
9. If yes to ques. No 6, is it computer based or paper based?
A. Computer B. Paper C. Both
10. What LMIS formats does the health center use? (Check all that apply)
A. Bin cards B. Stock cards C. IFRR D. RRF E. Other (specify): F. None

11. What forms does the health center use for ordering supplies? (Check all that apply)
A. Order book B. RRF C. Requisition and Issue voucher D. Other (*specify*):
12. How often are these LMIS report sent to the highest level?
A. Monthly B. Bimonthly C. Quarterly D. Semiannually E. Annually
13. What forms does the health center use for receiving supplies?
A. Delivery note B. Good receiving voucher C. Other (*specify*):
14. Does the health center pharmacy store have standard preprinted requests and reporting forms (RRF)?
A. Yes B. No C. Don't know/not sure

Part II. Perceived Availability of Tracer Drugs

15. Did all tracer drugs adequately available in the past six months?
A. Yes B. No
16. Did over stock of tracer drugs occurred in the past 6 months in your health facility?
A. Yes B. No
17. Did shortage of tracer drugs occurred in the past 6 months in your health facility?
A. Yes B. No
18. What are the reasons for shortages of tracer drugs at the Health Center?
A. delay in delivery/high lead time
B. Error in forecasts
C. Lack of funds
D. Long procurement procedure
E. No stock out
F. Others, mention _____

Section B, Part I. Technical, Administrative and Protocol for Product Receipt:

The item scales are five point Likert type scales with 5=strongly agree, 4= agree, 3= neutral, 2= disagree and 1= strongly disagree

	Please to what extent do you agree with the following inventory management related activities on tracer drugs performance at your health center	Strongl y disagre e	Disag ree	Neut ral	Agr ee	Strongl y Agree
		1	2	3	4	5
19.	Proper procedures are followed for receiving supplies					
20.	Condition of boxes at the time of delivery is checked by a health worker					
21.	Expiry dates of all items are checked before receiving supplies					
22.	There are regular inspections to determine if there is any deterioration of drugs.					
23.	Prompt and proper action is taken if the deterioration of drugs received is suspected.					
24.	Discrepancies are being documented and reported: unacceptable expired drugs or drugs of poor quality are identified.					

Part II. The Challenges in Implementing Inventory Management Practice in the HC**(Demand uncertainty, Lack of Communication, and Manual Documentation)**

	Please to what extent do you agree with the following inventory management related factors on tracer drugs performance at your health center	Strongly disagree	Disagr ee	Neutral	Agree	Strongly Agree
		1	2	3	4	5
25.	Demand uncertainty is the challenge of inventory management practice in the health center					
26.	Inefficient internal process is the hindrance to inventory management practice in the health center					
27.	Lack of budget for inventory management systems of the HFs					
28.	Lack of good infrastructure like IT equipment is the challenge					
29.	Lack of Management support on inventory management is the challenge					
30.	Lack of awareness on the benefits of inventory management is the challenge					

Thank you for your participation!!

Data collection Tool For In-depth Interview

i. In-depth interview guide

2. Do you monitor stock status of your health center? _____ How
? _____ Is there any system to use _____
3. From your experience, what are challenges that affect inventory management of tracer drugs?

4. What are the root causes of these challenges?

What measures were taken to alleviate the challenges?

What do you think are the possible solutions? _____
5. Did you encounter over-stocking problems of Tracer Drugs at this HF? __ If yes what are the
main possible reasons & which type of products is prone to this problem?

6. How did you overcome the problems? _____
7. Do you encounter stock-out problems of Tracer Drugs at this HF? __ If yes what are the main
possible reasons & which type of products is prone to this problem?

8. How did the customers feel the availability of tracer drugs of your health center?
_____ Is there any complain _____
9. What are the opportunities the health center does not utilized to improve the inventory
management of tracer drugs?

10. Do you think that the storage condition of your warehouse fits the standard storage guideline?

Is the warehouse adequate for current stock you have? _____ If no why?

11. What challenges are there concerning your facility storage condition for tracer drugs?

Thank You

Storage Condition

Observational checklist to assess storage condition as per standard

S/ N	List of Storage guidelines	Yes	No
1	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).		
2	Pharmaceuticals stored in a dry, well-lit, well-ventilated storeroom – out of direct sunlight.		
3	Protect storeroom from water penetration.		
4	Fire safety equipment is available, accessible, and functional, and trained employees to use it.		
5	Latex products are stored away from electric motors and fluorescent lights.		
6	Cartons and products are protected from water and humidity during all seasons.		
7	Maintained cold storage, including a cold chain, as required.		
8	Storage area is secured with a lock and key but is accessible during normal working hours; access is limited to authorized personnel.		
9	Cartons are stacked at least 10 cm off the floor, 30 cm away from the wall and other stacks, and no more than 2.5m high.		
10	Medical Supplies are stored away from insecticides, chemicals, old files, office supplies and other materials.		
11	Pharmaceuticals are arranged to facilitate FEFO procedures and stock management.		
12	Cartons are arranged with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible		
13	Unusable pharmaceuticals are separated from usable pharmaceuticals and dispose of damaged or expired products.		

Section C. LMIS Data Quality & Stock Status (Specify a full six-month period prior to the survey; and the day of visit **from Medical Store**)
 months of stock _____ Minimum months of stock _____ Order interval _____

Maximum

Note: For any product that experienced a stock out in the last 6 months (including the day of visit), please note reasons (by product).

Are stock cards and reports completed using the smallest unit of count? Y/N...

Product	Unit s of cou nt	Manag ed at this facility ?	Physical inventory — Store room	Stock out today? (Y/N)	Quan tity of expire d produ cts	Purch ase value	BC avail able ? (Y/N)	BC update d? (Y/N)	Balanc e on BC	Stock out most recent 6 months (Y/N)	Numb er of stock outs	Total number of days stocked out	Total issued (most recent 6 months)	Numbe r of days of data availabl e
1	2	3	4	5	6		7	8	9	10	11	12	13	14
Adrenaline injection														
Albendazole/Mebendazole tab/sus														
Amlodipine tab														
Amoxicillin dispersible/susp/caps														
Arthmeter + Lumfanthrine tab														
Ciprofloxacin tab														
Co-trimoxazole 240mg/5ml susp														
Furosemide tab														
Gentamycin inj														
Glucose 40%														
Hydralazine inj														
Iron + folic acid tab														
Magnesium Sulphate inj														
Medroxyprogesterone Inj														
Metformin tab														
Metronidazole cap														
Normal Saline 0.9%														
Omeprazole cap														
ORS+/- Zinc sulphate														
Oxytocin inj														
Pentavalent vaccine														
RHZE/RH														
TDF/3TC/DTG														
Tetanus Anti Toxin (TAT) inj														
TTC eye ointment														

II. List of Tracer Drugs

S/N	List of Tracer Drugs
1	Adrenaline injection
2	Albendazole tab
3	Amlodipine tab
4	Amoxicillin dispersible tab
5	Arthmeter + Lumfanthrine tab
6	Ciprofloxaxillin tab
7	Co-trimoxazole 240mg/5ml susp
8	Furosemide tab
9	Gentamycin inj
10	Glucose 40%
11	Hydralazine inj
12	Iron + folic acid tab
13	Magnesium Sulphate inj
14	Medroxyprogesterone Inj
15	Metformin tab
16	Metronidazole cap
17	Normal Saline 0.9%
18	Omeprazole cap
19	ORS+/- Zinc sulphate
20	Oxytocin inj
21	Pentavalent vaccine
22	RHZE Tab
23	TDF/3TC/DTG *
24	Tetanus Anti Toxin (TAT) inj
25	TTC eye ointment

