



ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMIC
SCHOOL OF COMMERCE

GRADUATE PROGRAM IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT SUPPORTED DISTANCE LEARNING PROGRAM

ASSESSMENT OF SUPPLY CHAIN PERFORMANCE OF ANTI-
RETROVIRAL DRUGS IN PUBLIC AND PRIVATE HEALTH FACILITIES
IN ADAMA CITY, OROMIA, ETHIOPIA.

A THESIS SUBMITTED TO ADDISABABA UNIVERSITY, SCHOOL OF
COMMERCE, DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR
THE MASTERS OF DEGREE IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT

BY: BEZAYE KIFELEW

MAY, 2018

ADDIS ABABA, ETHIOPIA

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ADVISOR: TARIKU JEBANA (Dr.)

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Approved by Board of Examiners and Advisor

Advisor	Signature	Date
Tariku Jebana /Dr/	_____	_____

Internal examiner

Name	Signature	Date
	_____	_____

Examiner

Name	Signature	Date
	_____	_____

Chairman of Graduate Committee

Name	Signature	Date
	_____	_____

STATEMENT OF DECLARATION

I declare that this thesis entitled ‘Assessment of Supply Chain Performance of Anti-Retroviral Drugs in Public and Private Health Facilities in Adama City, Oromia is my original work, has not been presented for a degree in any other university or college and that all the sources of materials used for the thesis have been duly acknowledged.

Declared By: BezayeKifelew

Signature _____

Date _____

Confirmed By: Dr. Tariku Jebana (Advisor)

Signature _____

Date _____

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ABSTRACT

The goal of health commodities supply chain is to ensure that every customer gets products and services it needs in continuous and uninterrupted system. A poorly functioning supply chain leads to frequent stock outs and over stock which leads to wastage and service interruption. Thus, the objective of this study was assessed the supply chain performance of Anti- Retroviral drugs in public and private health facilities in Adama city. A descriptive cross-sectional study was conducted in all public and private health facilities which provide ART and PMTCT service. Both primary and secondary data was collected by semi- structured questionnaires, observation checklists and interview. The performance of Anti-Retroviral drugs were measured and analyzed using five selected indicators. The study revealed that inventory accuracy rate for ARV drugs in public and in private health facilities found to be 33.33% and 14.29 % respectively. 16.67 % of the public and 10 % of the private health facilities were able to submit report and requisition of ARV drugs to Pharmaceutical Fund and Supply Agency always according to the schedule. All of the public and 60% of the private health facility store managers had trained how to fill the Report and Requisition form. None of both the public and the private health facilities received the exact amount of ordered ARV drugs always. Whereas, 50 % of the public and 30 % of the private health facilities received the exact amount of ordered quantity some times. Majority of the public and the private health facilities received ordered quantity in less than a month period after requesting. Regarding storage condition of the health facilities, none of both the public and the private health facilities met at least 80 % of the acceptable storage criteria's according to the checklist. 83.33% of the public and 60% of the private health facilities met more than 50 % of the proper storage criteria's. In terms of stock out rate 50 % of the public and 40 % of the private health facilities were stocked out of one or more of ARV drugs within six-month period. Finally, from the study it is concluded that the performance of ARV drugs supply chain according to the indicators was not satisfactory which might lead to stock outs and service interruption. Based on the findings, it is recommended for both the public and private health facilities to improve ARV drugs recording and reporting, improve storage condition and prevent stock outs. In addition, training and manpower gaps should be analyzed and filled to improve the availability of ARV drugs.

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ACRONYMS AND ABBREVIATIONS

ARV:	Anti-Retroviral
ART:	Anti-Retroviral Therapy
AIDS:	Acquired Immune Deficiency Syndrome
EPHI:	Ethiopian Public Health Institute
FMOH:	Federal Ministry of Health
HCMIS:	Health Commodity Management Information System
HIV:	Human immunodeficiency virus
LIAT:	Logistics Indicator Assessment Tool
LMIS:	Logistic Management Information System
PMTCT:	Preventing Mother to Child Transmission
PFSA:	Pharmaceutical Fund and Supply Agency
SCPM:	Supply Chain Performance Measurement
WHO:	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

The Human Immunodeficiency Virus (HIV) continues to take a tremendous toll on human health, having claimed more than 35 million lives so far. In 2015, 1.1 million people died from HIV related causes globally. There were approximately 36.7 million people living with HIV at the end of 2015 with 2.1 million people becoming newly infected by HIV in the same year. Sub-Saharan Africa is the most affected region, with 25.6 million people living with HIV and accounts for two-thirds of the global total of new HIV infections (FMOH, 2017).

The first two HIV cases were identified for the first time in Ethiopia in 1984. Since then, the epidemic continued to progress, sparing no geographic areas, and communities all over the country, becoming the top most cause of illness and death especially at around the mid 1990's. The prevalence of HIV in 2016 was 1.18% and a total of 718,500 people were living with HIV of whom 60% were females. The HIV burden being heterogeneous shows disparity across geographic areas and population groups. Among regions and City administrations, the burden is highest in Addis Ababa city administration, followed by Gambella regional state where the prevalence in Oromia region is 0.08% (EPHI, 2017).

Ethiopia started free Antiretroviral Treatment program in early 2005 and since then a lot of lives have been saved due to the concerted efforts of the government and its partners. Currently more than 1,230 health facilities are providing ART service as of March 2017, reaching 439, 226 people with anti-retroviral treatment (FMOH, 2017).

Antiretroviral (ARVs) drugs enable people living with HIV to live full and productive lives but treatment is also an effective prevention intervention, reducing the risk of someone living with HIV passing on the infection to others by up to 96% (Yasmin *et al.*, 2006). This effect makes it particularly important to expand access to treatment more quickly in order to realize the potential preventive benefits and to slow the growth of the HIV epidemic.

Supply chain management of essential health commodities, including high-value medicines like ARV drugs involves a series of activities to guarantee the continuous flow of products from the point of manufacturing to the point they are used by consumers.

The nature of ART, the specific characteristics of ARV drugs and how they are used pose particular challenges for managing the supply chain for ARV drugs (Allers et al., 2006). The critical purpose of any supply chain, regardless of the commodities flowing through it, is to serve its customers. In the case of antiretroviral therapy programs, this purpose means ensuring an uninterrupted supply of quality ARV drugs to eligible people living with HIV/AIDS whenever they need them. Since 95% patient adherence is required for treatment regimens to be effective over the long term, the ARV drugs should be available for 95% of the time which include refills.

In the twice-a-day treatment regimen, achieving this effectiveness means that less than one dose can be missed every two weeks. Thus, to implement and maintain a supply chain that is focused on the ultimate customer, the national ART programs must design and prioritize interventions around the concept of uninterrupted availability of the ARV drug (DELIVER, 2005).

1.2 Statement of the problem

In health care service, ensuring the availability of adequate drugs and supplies for every patient is paramount, as partial or intermittent treatment can lead to less than optimal results and in some cases, this can even be disastrous, both for the individual patient and the public at large. Among the untoward effects of this lack of uninterrupted treatment are treatment failure and the risk of developing drug resistance which can also affect forecasting and donor support. Interrupted supply of ARV drugs increase the likelihood of drug resistance among patients and increase the expense to programs that already lack sufficient funds for buying and delivering drugs for essential health problems (DELIVER, 2005).

The ARV supply chain management has become increasingly difficult due to the increasing number of people on ART treatment, the increasing number of health facilities providing ART and the greater diversity of different ARV regimens (Erik et al., 2011). Thus, any interruption of the treatment for the individual patient puts his/her life at a greater risk as can be explained through drug resistance and even might lead to death which in turn hampers progress towards universal access and diminishes the credibility of ART program in the eyes of patients, community and healthcare providers and generally put the public health in danger (Pasquet et al., 2010).

In Ethiopia, as the expanding health coverage of the country can be inferred from the increasing number of public and private health facilities that provide ART and PMTCT services to patients living with HIV/AIDS. In parallel to this, the supply chain management of ARV commodities needs to ensure reliable and continuous supply by keeping appropriate stock level assisted with regular reporting and recording of important transactional data and maintaining proper storage condition to avoid service interruption due to stock outs and wastages due to expiry.

This study focuses on assessment of current supply chain performance of ARV drugs in public and private facilities in Adama city.

1.3 Research Questions

- 1) What are the practices of the public and private health facilities with respect to recording, reporting and storing of ARV drugs in Adama city?
- 2) What are the possible factors that contribute for the failure of public and private health facilities to send drug request and report on time to the PFSA to avoid stock out in Adama city?
- 3) What is the actual trend of the lead time from ordering to delivery for ARV drugs in public and private health facilities in Adama city?
- 4) What is the extent of a proper pharmaceuticals storage practice for ARV drugs in public and private health facilities in Adama city?

1.4 Objectives of the study

1.4.1. General Objective

The main objective of the study is to assess the supply chain performance of ARV drugs in public and private health facilities in Adama city.

1.4.2. Specific Objectives

- To assess the recording practices and mechanisms used during the management of ARV drugs in public and private health facilities in Adama city
- To assess the reporting and requesting practice of public and private health facilities in Adama city to the respective higher level, i.e. PFSA regarding ARV drugs.
- To assess the lead time, it takes from ordering to receiving of ARV drugs in public and private health facilities in Adama city.
- To assess the ARV drugs storage management practice as per storage guideline of public and private health facilities in Adama city.

1.5. Significance of the Study

This study was designed to assess the supply chain performance of ARV drugs in Public and private health facilities in Adama city and proposes possible intervention measures for better improvement by the health facilities

The study proposed an appropriate intervention area for the city health department and other concerned bodies working in the pharmaceuticals sector to take actions and measures for the improvement in the availability of ARV drugs, avoidance of wastage of resources and meeting client expectation on the service at both public and private health facilities.

The study also highlighted the supply chain challenges and gaps to governmental and nongovernmental bodies for a quick pick of the major improvement targets on the identified gaps and challenges to strengthen the supply chain of ARV drugs.

This study paper will also become a reference document for other researchers interested in the area to further discuss and suggest recommendations in improving the performance of supply chain of pharmaceuticals by providing an insight on the practical experience of adama city.

1.6. Scope of the study

This study focused on supply chain activities mainly ordering and inventory management of ARV drugs only on public and private health facilities located in Adama city that provide ART and PMTCT services.

This study did not include stakeholders that participate in the supply chain activities like PFSA, MOH and another stakeholder.

Data of the past six months until the date of the data collection was used as a source data. Data was collected using semi-structured questionnaires, checklist for observations and in-person interviews with the responsible professionals at the public and private health facilities under study located in Adama city.

1.7. Limitations of the study

- From the various supply chain management components, product selection and procurement of ARV drugs being managed at the national Ministry of Health level made it difficult to assess for the health facilities under study.
- Unavailability of stock recording bin cards in some visited health facilities made it difficult for obtaining an accurate data on ARV drugs in the respective facilities.
- Workload of the professionals who are the respondents of the questionnaire created a challenge to collect the questionnaires in time.

1.8. Definition of terms

Human Immunodeficiency Virus (HIV) - It is virus that causes AIDS. There are two different types HIV-1 and HIV-2. Worldwide HIV-1 is the most common type.

Acquired Immune Deficiency Syndrome (AIDS): Commonly refers to the advanced stage of HIV illness.

Antiretroviral Drugs (ARV) - Refers to drugs used against Human Immunodeficiency Virus commonly anti-HIV drugs

Antiretroviral Therapy (ART)-is the administration of at least three different medications known as ARV in order to suppress the replication of the human immunodeficiency virus (HIV).

Drug Resistance- is the ability of viruses and bacteria to multiply in the presence of drugs that would have normally killed them.

Inventory - Store of goods

Lead time - The time between the placement of an order and delivery influence the customer satisfaction.

1.9. Organization of the study

This study comprises of five chapters. Chapter one describes the background of the study ,statement of the problem, research questions, objectives of the study, scope of the study, limitations of the study, significance of the research, and organization of the study. Chapter two consist the review of related literatures; chapter three describes the research design which incorporated the study area description, study design; data collection methods and instruments; study population, data analysis used and ethical considerations. Chapter four has contained finding of the study including data presentation and discussion. The last chapter, chapter five contains summary of findings, conclusion and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURES

2.1. Supply Chain Management Concept

Lifesaving drugs such as anti-retroviral therapy and other critical supplies are becoming more accessible to the millions of people living with HIV. This has been in part due to the concerted effort of the international community, national governments, private industry, non-governmental organizations and others to improve the availability of supplies. The success of these nationwide programs will depend upon the ability of reliably and consistent in supply management of commodities to health facilities at all levels of the health system (Sangeeta et.al, 2004).

Supply chain management includes the logistic activities plus the coordination and collaboration of staff, levels, and functions. Logistic management is part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirement (CSCMP, 2011).The goal of a public health supply chain is much larger than simply making sure a product gets where it needs to go. Ultimately, the goal of every public health supply chain is to improve health outcomes. A properly functioning supply chain is a critical part of ensuring commodity security—when every person is able to obtain and use quality essential health supplies whenever he or she needs them (John Snow, Inc. 2011).

Well-functioning supply chains benefit public health programs in important ways by increasing program impact, enhancing quality of care and improving cost effectiveness and efficiency (USAID/DELIVER, 2011). It is therefore paramount that supply chain or logistics systems are treated as an important and critical function in getting the products to their destination. In fact, in order to sustain and expand the successful interventions experienced to date, the supply chains will need to be made more robust, agile and flexible through better management and increased investment of resources to achieve supply chain optimization (Sangeeta, and Nadeem, M.2004).

Logistic management also defined as” the part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers’ requirement. Logistics management is an integrating function, which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology.” (CSCMP, 2011).

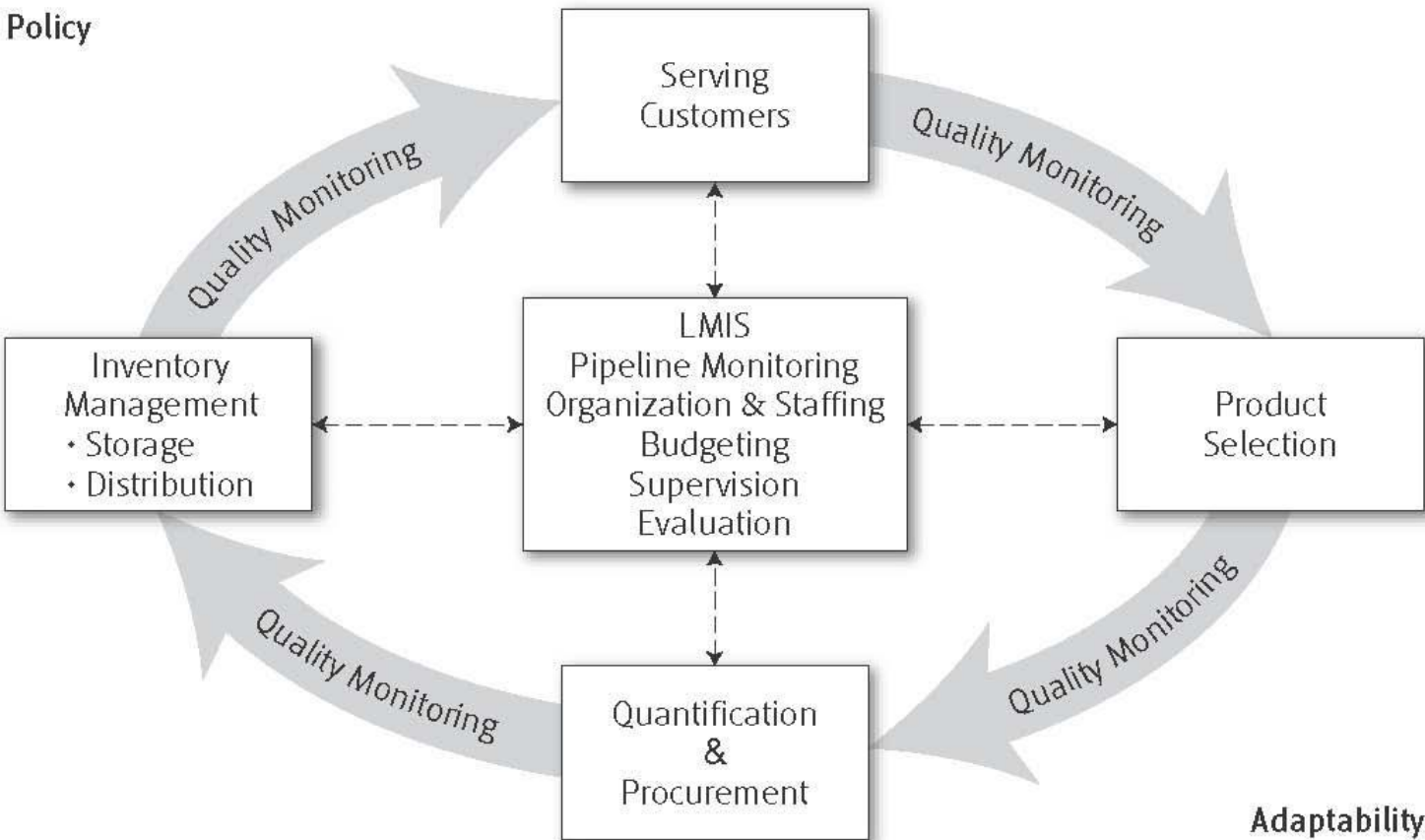


Figure 1: Pharmaceutical supply management framework (John Snow, Inc. and DELIVER, 2004)

2.2. Product selection

Product selection refers to the process by which health programs, as a whole, select, evaluate and ultimately procure the products that will be used and consumed in service delivery. A key element of the logistics cycle, product selection is directly linked to serving customers by defining what products are procured and used in the health system and the range of products that a customer can receive (John Snow Inc, 2011). WHO proposes a public health approach geared toward universal access, standardization, and simplification of antiretroviral (ARV) drug regimens to support the implementation of treatment programs in resource-limited settings and to ensure that, treatment programs using ARV drugs are based on scientific evidence. The goal is to avoid the use of substandard treatment protocols and to reduce the potential for the emergence of drug-resistant virus (USAID/DELIVER, 2005).

2.3. Product quantification

An accurate quantification is essential for all health commodities but of very importance for HIV/AIDS related commodities because quantification of drug and health commodity requirements for HIV/AIDS programs is complex and uninterrupted access for patients must be ensured (Family Health International, 2008). After products have been selected, the required quantity and cost of each product must be determined.

Quantification is the process of estimating the quantity and cost of the products required for a specific health program (or service), and, to ensure an uninterrupted supply for the program, determining when the products should be procured and distributed (USAID/DELIVER, 2011). Estimating the quantities of commodities enables program managers to plan budgets and procurement. However, for many of the HIV programs, the data needed to quantify the needs is usually not available. Data on ART services and ARV drug supply are limited and, when available, are often unreliable or insufficient to be used for quantifying ARV drug requirements.

Multiple sources of funding, procurement mechanisms, and distribution channels used for ARV drugs are also posing a problem on quantification of ARVs and other commodities. Communication and coordination are lacking among key stakeholders and implementers (i.e., policymakers, program managers, service providers, funding sources, procurement agents, and suppliers) on issues related to the selection, quantification, and procurement of ARV drug (Allerset *al.*, 2006).

2.4. Product Procurement

After a supply plan has been developed as part of the quantification process, quantities of products must be procured. Health systems or programs can procure from international, regional, or local sources of supply; or they can use a procurement agent for this logistics activity. In any case, procurement should follow a set of specific procedures that ensure an open and transparent process that supports the six rights (USAID/DELIVER, 2011).

Procurement of HIV products is complex because of the legal issues related to patents, changing treatment regimes, ensuring quality to name a few. Purchasing the commodities through one of the WHO pre-qualified suppliers can reduce the burden of quality assurance. For new programs, forecast activities should be conducted almost weekly and products of high value procured regularly rather than conducting large volume bulk procurements. While the cost of this type of procurement practice may be high, the risk of over or under stocking could be minimized, especially in infancy programs where the number of clients, the best treatment options are not fully established (Sangeeta, and Nadeem, M.2004).

2.5. Inventory Management; storage and distribution

Well organized, well built, well located and, well secured storage condition are the essential part of pharmaceuticals supply chain. An effective building provides the correct environment for the storage of commodities and assists the efficient flow of supplies. Storage facilities built with these factors in mind will help pharmaceutical quality and reduce operational cost (Management Science for Health,2012). Good warehousing ensures the physical integrity and safety of products and their packaging throughout the various storage facilities until they are dispensed to clients. The various activities that occur within a warehouse should be aligned so that products can be managed efficiently and orders can be filled and distributed expeditiously (USAID/DELIVER,2011) The primary distribution management goal is to maintain steady supply of pharmaceutical to the facilities where they are needed while insuring the resources effectively used (MSH,2012).

2.6. Logistics management information systems

A logistics management information system (LMIS) is the system of records and reports that you use to collect, organize, and present logistics data gathered across all levels of the system. Most important, an LMIS enables logisticians to collect the data needed to make informed decisions that will ultimately improve customer service. Information is the engine that drives the logistics cycle; without information, the logistics system would not run smoothly.

An LMIS collects data about commodities; this information is often used for activities, such as filling routine supply orders for health facilities (USAID/DELIVER,2005).The LMIS can be manual (paper-based), or partly or wholly computerized. While computerized LMIS can greatly facilitate the work of supply chain managers, the implementation of software packages can be costly and time-consuming, requiring planning and good management to achieve optimal outcomes.

There was a need for user-friendly tools and software packages to support the management of logistics information that is critical in making decisions regarding forecasting for program needs and for managing supply chains to ensure successful HIV programs (Wendy *et al.*, 2008). For any

supply chain system, the three essential LMIS data items are quantity of stock on hand, quantity of stock consumed and losses or adjustment.

2.7. Supply Chain Performance Measurements

Supply chain performance is the ability (of the entire supply chain) to meet end-customer needs, associated with ensuring the availability of product, deliver it on time in the right way and ensure appropriate inventory levels. It also exceeds the functional boundaries of organizations, i.e. production, distribution, marketing and sales, research and development. The functioning of the supply chains should be constantly improved. Therefore, measures to support the improvement of the performance of the global supply chain should be used, not only those that relate to the individual companies and their functions (Hausman 2004).

The development of a performance measurement system of the supply chain requires the proper selection of indicators. An important practical problem is the analysis of too many indicators (sometimes hundreds), which greatly hinders their interpretation. Furthermore, it stresses the lack of their relationship with the organization's and the supply chain's strategies).

Supply chain performance management (SCPM) has become one of the key ways of achieving perfection. SCPM aims to provide information and insight into the functioning of the supply chain by tracking key indicators, for example product quality, inventory levels etc. A well-organized system for measuring the performance of the supply chain is crucial for better supply chain management. In addition, the right tools and measurement methods should be chosen (Dorota, 2016).

Performance measurement as part of supply chain management has an impact on the effective planning, controlling, monitoring and conducting analyses of logistics processes. It provides relevant information on performance and results presented in the form of appropriate reports useful in decision-making

2.8. Empirical literature on Inventory Management

The study conducted in Nigeria, Kilombero and Ulanga districts revealed that stock-outs of HIV test kits and ARVs is common in Kilombero and Ulanga districts. Access to ART in the districts has some critical imbalances in the supply chain and management for HIV/AIDS care and treatment. All sites visited had experienced stock-outs of HIV test kits in the study. The main goals of programmers aiming at reducing HIV incidence may not be achieved as long as stock-outs of HIV test kits prevail (Daniel S et.al, 2015). In a study conducted in Abidjan, Cote d'Ivoire, found that at least 11% of the 1,554 patients who started ART between February 1, 2006 and June 1, 2007 were affected by stock-outs of at least one of their antiretroviral drugs (Pasqute et.at, 2010).

In Uganda study showed that, ARV shortages affected all ART-providing facilities with considerable fluctuations regarding capacities to take up new patients. ARVs were available at 83%, diagnostic kits at 70% and pediatrics ARVs at less than half of the health facilities surveyed. Patients were forced to switch to more complex and different drug regimens. Strategies to cope with stock-outs included lending and borrowing among facilities, late initiation of ART for new patients and treatment interruption.

Health workers reported insufficient knowledge regarding safe drug substitution and a general lack of guidance to deal with shortages of ARVs. It also revealed that provision of ARVs suffers from both over and under supply (Ricardaet.al, 2011). A study done in Oromia national regional state of Ethiopia showed that availability of first line ARV drugs was 100% and 95% at HCs and Hospitals respectively. Inventory control tools and Standard Operating Procedures and guidelines were barely used in both levels (Alemayehu, 2009).

2.9. Empirical literature on Storage conditions

According to a study conducted in South Africa, Western Cape on inventory management of ARV drugs at community health centers (CHC) revealed that none of the facilities adhered to the principle of storing medicines according to FEFO. 20% of CHCs did not meet the appropriate standards for the physical dimensions of the pharmacy storage site. Appropriate labeling of the shelves in the dispensary and in the storeroom was only done at 66.7% of the CHCs and the arrangement of stock in a manner accessible for counting and general management was only observed at 46.7% of CHCs (Alice M, 2013).

The study done in Tanzania showed that most health facilities (71%) had a main storage place, but the storage space for forecasted quantities of medicines and medical supplies was inadequate and this was affirmed by 56% of facilities surveyed. The study reported that expired stocks did have a separate storage space in only 41% of the health facility pharmacies. As regards products requiring cold storage, only 52% of the health facilities had the equipment (MOHSW, 2008).

A cross sectional descriptive study conducted at health centers of Addis Ababa showed that only 34.8% of the HCs had sufficient store sizes while 21.7% of them store stacked drugs at least 30 cm away from the walls (Mezid M). In addition, a study conducted in Eastern Ethiopia on supply chain performance of ARV drugs showed that Storage condition of ARV drugs were arranged on shelves with 70% clear visibility of the identification of product label, expiry dates and manufacturing dates. Only 70% of ARV products were stored at the appropriate temperature including cold chain storage (Tesfaye, G. and Tadesse, B., 2017).

2.10. Empirical literature on Logistic Management Information System

According to a study conducted in Eastern Ethiopia on supply chain performance of ARV drugs ninety percent of the health facilities dispensed the ARV drugs to patients when they come for resupply within 1-3 months but most of them were supplied within two months while 90% of the health facilities receive the ARV drugs bimonthly. More than half (60%) of the health facilities were sometimes received all the quantities of ARV drugs that they have ordered (Tesfaye, G. and Tadesse, B., 2017).

Assessment of Integrated Pharmaceutical Logistic System in Public Health Facilities in Addis Ababa revealed that bin cards, IFRRs and RRFs were available among 25 (96.2%) of the health facilities. Among these facilities, 16 (61.5%) health facilities update bin cards regularly, and 22 (84.6%) of them complete and send IFRR to their respective facility stores, while 24 (92.6%) of the facilities were completing and sending RRF to supplying PFSA every two months (Tilahune, A, 2016).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Description of the Study Area

The study was conducted in Adama city, Oromia region. It is located at 99km south east of the capital city, Addis Ababa. Currently there are 6 public and 10 private health facilities providing ART &PMTCT services to the community. From these facilities 11 health facilities provide ART service and 5 of them provide PMTCT services only. These health facilities receive, manage and stock their own ARV drugs.

3.2. Research Approach

This research is conducted based upon both qualitative and quantitative approaches. The qualitative data was gathered through observations and interviews with the responsible professionals and the quantitative data was collected through semi structured questionnaires.

3.3. Research Design

The study used cross sectional descriptive design to assess the supply chain performance of ARV drugs. The study data were collected using semi-structured questionnaire & interviews during the time of visit. In addition, the storage conditions of the facilities under study were assessed against a standard assessment tool through direct visit.

3.4. Unit of analysis

The units of analysis for this study are private and public health facilities that provide ART and PMTCT services in Adama city.

3.5. Population of the study

All public and private health facilities which manage ARV drugs are the source populations of the study. There are total of 16 ART and PMTCT health facilities which provide ARV drugs in Adama city of which 6 are public and 10 of them are private. The study employed a census technique no sampling method was used.

The brief details of the health facilities are as shown on the table below.

	ART Sites			PMTCT sites		
	Hospital	Health Center	Clinic	Hospital	Health center	Clinic
Public	1	3	0	0	2	0
Private	4	0	3	0	0	3
Total	5	3	3	0	2	3
	Total = 16					

Table1: - List of Public and private health facilities which provide ART and PMTCT services in Adama city.

3.6. Variables of the study and their measurements

Supply Chain performance of ARV drugs in these health facilities is the variable of the study. Supply chain performance is a multi-dimensional variable which comprises the following sub-variables.

- *Logistics management information system*: - the collecting, processing, and reporting of ARV supply chain data to the concerned body. It can be a paper-based system, also known as a manual system or an automated electronic system.
- *Inventory Management*: -is the managing of the stock, knowing how much stock to hold, when to order and how much to order.
- *Storage condition of ARV drugs*: - ensuring the physical integrity and safety of products and their packaging, throughout the various storage facilities, until the drugs are dispensed to clients.
- *Product selection of ARV drugs* – is the process by which health programs select, evaluate and ultimately procure the products that will be used and consumed in service delivery.
- *Product procurement of ARV drugs* – the process by which drugs and consumables are purchased.

(The last two sub variables are not assessed since they are managed at national level)

These variables were measured using the following indicators;

- a. Accuracy of logistics data for inventory management
- b. Percentage of facilities that receive the quantity of products ordered
- c. Percentage of facilities that send report and requisition on time to the supplier
- d. Percentage of facilities that maintain acceptable storage conditions.

- e. Percentage of facilities that experienced a stock out at any point during the study period or at the time of the visit.

NB. The description of these variables is annexed with the proposal(Annex II)

3.7. Data types, source and collection

The study relied on both primary and secondary sources of data for the desired qualitative and quantitative data. The primary data were collected using semi-structure questionnaires and observations. Secondary data were collected from reviewing related documents which are used in the management of ARV drug products. The major documents reviewed were ARV drug inventory control formats like bin cards, report and requisition formats and health management information system(HCMIS).

The LIAT for ARV drugs were used as a data collection tool which is adopted from USAID/DELIVER PROJECT with modification (Annex I).The tool assessed major supply chain activities like storage conditions, LMIS data quality, stock data of ARV drugs, usage pattern of recording materials, supervisions, report and requisition(Annex IV),and lead time for product delivery.

A total of 16 ARV drugs are selected for this assessment. A past six months data till the date of the data collection was taken from bin cards (Annex III), stock cards and related registration formats.

3.8. Ethical Consideration

Verbal consent from all respondents was obtained before enrolling them as the respondents of the study. During the consent process, the respondents were provided with the required information regarding the purpose of the study, why and how they were selected as the respondents of the study, and what was expected of them. They were also informed that they could withdraw from the study at any time during the interview process. Participants were also assured about the

confidentiality of the information that will be obtained in the course of the study. To assure the anonymity of the respondent's personal identifiers were not used during the data collection.

3.9. Data Analysis plan

The collected data were manually checked for completeness and consistencies before data entry in the computer. The quantitative data collected through the questionnaires were entered into and analyzed by Microsoft excel spread sheet. The qualitative data were analyzed thematically and are presented in a descriptive manner along with the quantitative data results. Lastly the findings and conclusions are being presented concurrently alongside with the quantitative and qualitative data by using thematic analysis technique.

3.10. Validity and Reliability

The questionnaire was pre-tested in a similar setting on the study subjects to whom the purpose of checking the relevance of the questions was explained to be clear without any ambiguity and the expected result was only the consistency of the answers. In order to maximize the response rate and minimize the response bias, the questionnaire was distributed and collected with due commitment. The questions were evaluated using the pretest samples for any questions that are subjected to multiple interpretations; questions with very little significance for the study purpose, and also the grammatical corrections.

CHAPTER FOUR

RESULTS AND DISCUSSION

From the data collected from both primary and secondary sources and using the fore mentioned study tools, the results are presented as follows using the supply chain performance indicators. A total of 56 questionnaires were distributed for 33 pharmacists, 14 pharmacy technicians and 9 clinical nurses. Finally, 49 were collected which represents 87.5%. The respondents were selected purposively that manage ARV drugs in the health facilities.

4.1. Indicators on Inventory management

4.1.1. Inventory Accuracy Rate

The use of bin cards or stock card for stock control of ARV drugs is a basic requirement to use this indicator. All, 6 (100%), of the public health facilities use bin cards to record stock control of ARV drugs while only 7 of the 10 (70%) of the private health facilities were found to have the practice. The rest 3 of the private facilities which do use neither bin cards nor stock cards are excluded from this indicator.

$$\begin{aligned}
 & \text{Inventory Accuracy Rate of Public facilities} = \frac{\text{[Number of public facility storage location with no inventory discrepancy]}}{\text{[total number of public facility storage location]}} \times 100 \\
 & = \frac{2}{6} \times 100 \\
 & = \underline{\underline{33.33\%}}
 \end{aligned}$$

$$\begin{aligned}
 \text{Inventory Accuracy of Private facilities} &= \frac{[\text{Number of private facility storage location with no inventory discrepancy}]}{[\text{total number of private facility storage location}]} \times 100 \\
 &= \frac{1}{7} \times 100 \\
 &= \underline{14.29\%}
 \end{aligned}$$

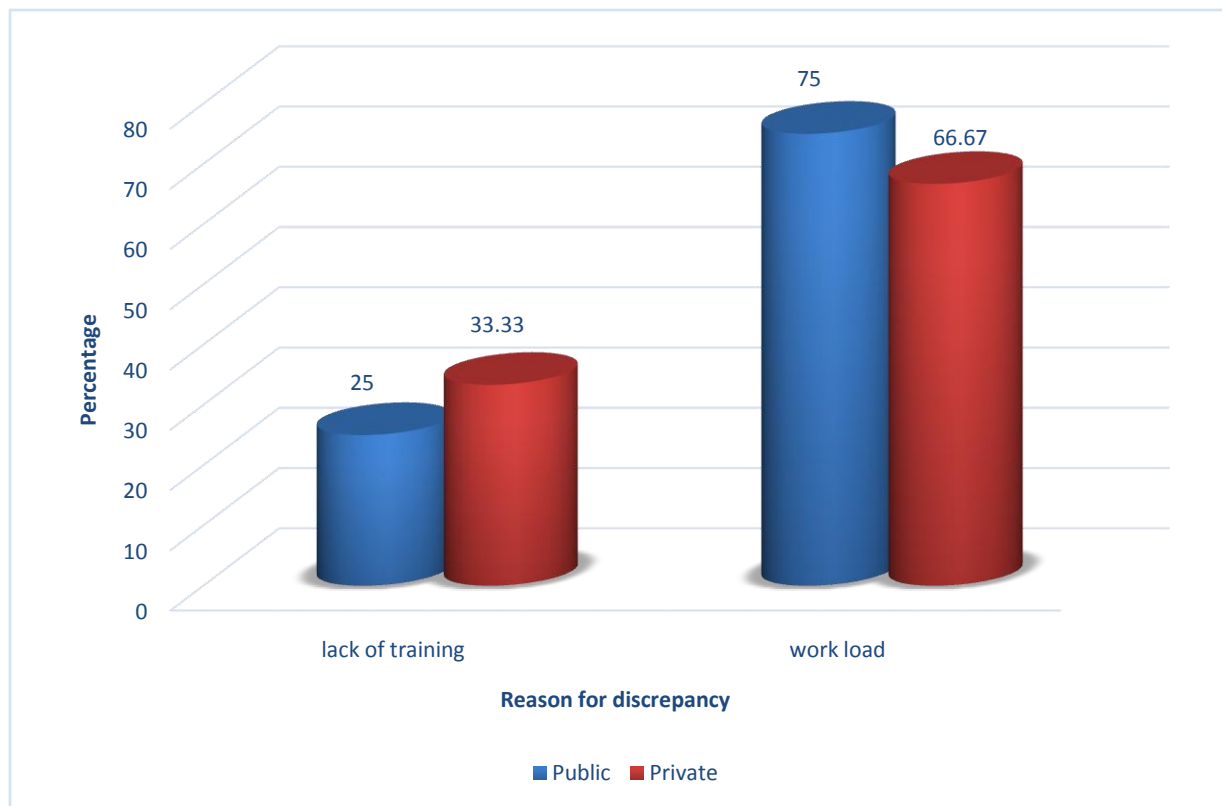


Figure 2: Public and private health facilities reasons for inventory discrepancy in Adama city, 2018

From this indicator, the inventory accuracy rate is found to be 2(33.33%) in public health facilities and 1(14.29%) in private health facilities. From this, it can be noted that the number of health facilities which has no discrepancy between ending balance on LMIS report and balance on the bin card according to RRF submitted to PFSA on the month of April,2018 is 33.33% in public and 14.28% private health facilities. The RRF (Report and Requisition Form) sent to PFSA, Adama branch for resupply purpose is prepared by store managers in all the visited health facilities.

The respondents from the 3 private health facilities which are exempted from this indicator reported that they use physical counting of ending balances to fill the RRF during the reporting month. The unavailability of a trained pharmacy professional to carry out this specific task was mentioned to be the reason for not recording inventory transactions on the bin card. The clinical nurses reported that they only receive and issue the drugs as required temporarily on and off from their other job assignments.

The private health facilities were found to have a larger discrepancy in the inventory accuracy than the public health facilities. According to this indicator the inventory accuracy rate is below 50% for both in public and private health which can lead to inaccurate report and request of ARV drugs.

A similar study done by (Tilahun, et.al 2016) on public health facilities in Addis Ababa indicated that discrepancy in the ending balance record between RRF data and bin card records was seen in 60% of the health facilities. Another study conducted by (Alice Mahoro, 2013) in South Africa showed that the percentage of total inventory variation between stock records and physical counts for the ARV drugs assessed was 51.7%.

Accuracy of information obtained during data transfer from inventory records to reporting formats will not only help in maintaining adequate stock levels of medicines, but also in establishing the basic information needed for ordering (Chandani *et al*, 2006). In pharmaceutical supply chain systems anything less than the established standards has a direct influence on the

health and safety of the consumers and community since it is a very delicate matter dealing with human lives.

The major reasons reported by the store managers for the discrepancy in inventory recording is work load 3 (75%) in public 4(66.67%) in private health facilities and lack of training 1(25%) in public and 2(33.33%) health facilities (Figure 2).

4.1.2. Percentage of acceptable storage condition that are met by the facilities

According to PFSA context any facility is said to have an acceptable storage condition when it fulfills at least 80% of the storage conditions defined in the check list used for evaluation of warehouses.

$$\begin{aligned}
 & \text{Percentage of private facilities with acceptable storage conditions} = \frac{\text{[No of private health facilities with acceptable storage condition]}}{\text{[Total no of private health facilities]}} \times 100 \\
 & = \frac{0}{10} \times 100 \\
 & = \underline{0.00 \%}
 \end{aligned}$$

$$\begin{aligned}
 & \text{Percentage of public facilities with acceptable storage conditions} = \frac{\text{[No of public health facilities with acceptable storage condition]}}{\text{[Total no of public health facilities]}} \times 100 \\
 & = \frac{0}{6} \times 100 \\
 & = \underline{0.00 \%}
 \end{aligned}$$

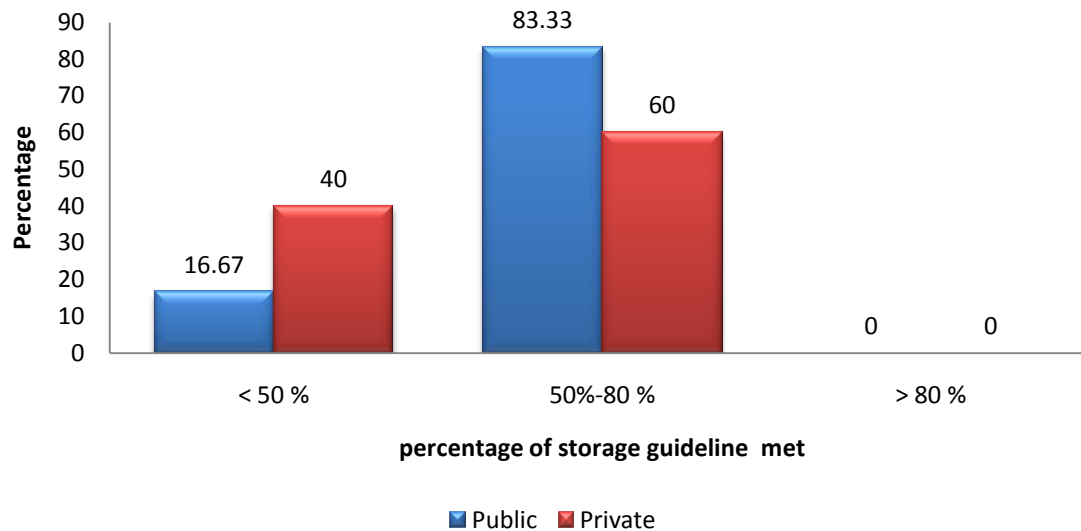


Figure 3: -Extent of the storage condition criterion met by the Public and private health facilities in Adama city, 2018

This study shows that none of both private and public health facilities met at least 80% of acceptable storage conditions according to the checklist. Majority, 5 (83.33%), of the public and 6 (60%) of the private health facilities met 50%-79% of the criterion of the storage condition whereas the rest 1 (16.67%) of the public and 4 (40%) of the private health facilities score less than 50% according to the checklist. (Figure 3). This result is comparable to the results obtained from a study done in Addis Ababa where only 34.8% of the health centers had sufficient store sizes while 21.7% of them store stacked drugs at least 30 cm away from the walls (Mezid M).

Similarly, a study done in Sera Leon also states that the storage condition observed in district and primary health care units were not generally in a good condition. Expired drugs and kits were stored together with the usable commodities which bring a shortage of space in the health facilities. (Allerset *al.*, 2007) An evaluation done in Ethiopia similarly showed that there was inadequate storage facilities, management, capacity, and temperature monitoring, especially for

the cold chain in the selected health facilities (USAID/ The Global Health Technical Assistant Project, 2009).

4.1.3. Percentage of facilities stock out of ARV drugs within 6-month period

$$\begin{aligned}
 &\text{Percentage of public facilities} && \text{[Number of facilities that} \\
 &\text{stock out of ARV drugs within} && \text{experience stock out of ARV} \\
 &\text{6-month period} && \text{drugs in 6-month period]} \quad \times 100 \\
 = & && \hline
 & && \text{[Total number of facilities]} \\
 & = && \underline{3} \quad \times 100 \\
 & && 6 \\
 & = && \underline{50.00 \%}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Percentage of private facilities} && \text{[Number of facilities that} \\
 &\text{stock out of ARV drugs within} && \text{experience stock out of ARV} \\
 &\text{6-month period} && \text{drugs in 6-month period]} \quad \times 100 \\
 = & && \hline
 & && \text{[Total number of facilities]} \\
 & = && \underline{4} \quad \times 100 \\
 & && 10 \\
 & = && \underline{40.00 \%}
 \end{aligned}$$

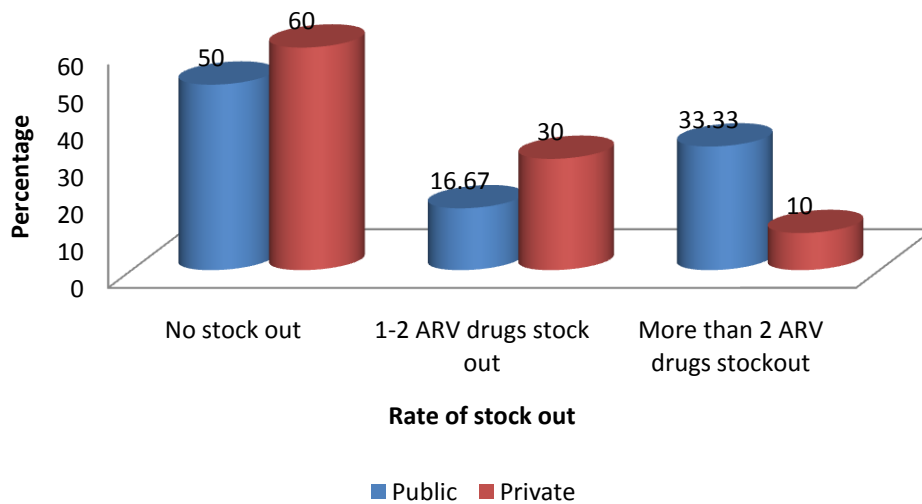


Figure 4: - Public and private health facilities stock out of ARV drugs in Adama city, 2018

This result shows that 50% of the public and 40% of the private health facilities were stock out of one or more ARV drugs in the study period. (Figure 4)

In contrast to this result, a study conducted in Oromia National Regional State showed that the availability of first line ARV drugs was 100% and 95% at Health centers and Hospitals respectively. An assessment done in Sierra Leon similarly showed that there were stock outs of the ARV drug Efavirinez (EFV) and second line drugs in ART providing facilities. (Allerset *al.*, 2007).

In line with this finding, a study done in Uganda showed that, ARV drug shortages affected all ART-providing facilities with considerable fluctuations. ARV drugs were available at 83% and diagnostic kits at 70% of the health facilities surveyed (Ricardaet *al.*, 2011).

4.2. Indicators on LMIS

4.2.1. Percentage of facilities that send report and requisition on time

$$\begin{aligned} & \text{Percentage of facilities that send} && \text{[Percentage of public health} \\ & \text{report and requisition on time=} && \text{facilities sends report always} \\ & && \text{on time]} && \text{X 100} \\ & && \hline & && \text{[total public facilities]} \\ & = && \frac{1}{6} && \text{X 100} \\ & = && \underline{16.67 \%} \end{aligned}$$

$$\begin{aligned} & \text{Percentage of facilities that send} && \text{[Percentage of private health} \\ & \text{report and requisition on time} && \text{facilities sends report always} \\ & = && \text{on time]} && \text{X 100} \\ & && \hline & && \text{[total private facilities]} \\ & = && \frac{1}{10} && \text{X 100} \\ & = && \underline{10.00\%} \end{aligned}$$

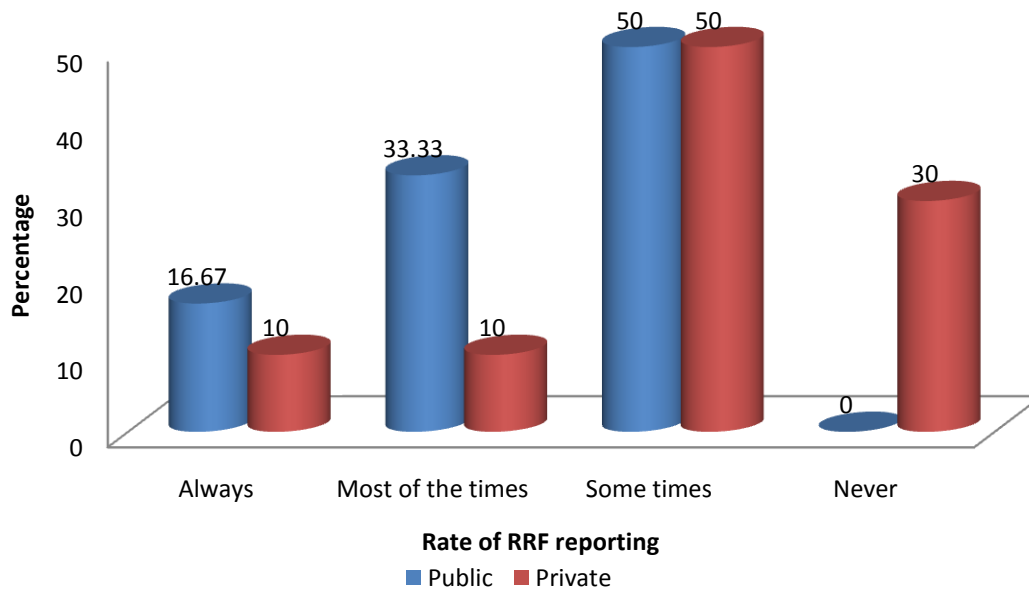


Figure 5: - Public and Private Health facilities reporting ARV products to the supplier in Adama city, 2018.

This result shows that only 1(16.67%) of the public and 1(10%) of the private health facilities send reports and requisitions from 1 to 10th day of the reporting month to the supplier. According to PFSA, all health facilities need to report and request ARV drugs every two month from starting from 1 to 10th day of the reporting month using RRF format.

From the figure above, figure 5, it can be seen that 33.33% of the public health facilities and 10% of the privates' health facilities report on time most of the time; and 50% of both types of facilities reported that they report only sometimes whereas 3 (30%) of the private health facilities reported that they never reported the RRF format on time for PFSA.

Work load and negligence of responsible personnel was reported to be the reason for not reporting the RRF in time to the PFSA, Adama branch located in the same city as the facilities.

RRF is filled by store managers in all visited public and private health facilities. From the visited facilities 100% of public and 60% private facility store managers had trained how to fill the RRF.

4.2.2. Percentage of facilities that receive the exact quantity of drugs ordered

As can be referred from the study results, none of the health facilities always received the exact quantity of products ordered from the supplier, PFSA. Therefore, this indicator is calculated only for health facilities that reported to receive exact ordered quantity most of the time, sometimes and never.

$$\begin{aligned}
 &\text{Percentage of public facilities that} && \text{[No of public health facilities} \\
 &\text{receive the exact quantity of products} && \text{that receive the exact quantity} \\
 &\text{ordered most of the time} &= & \frac{\text{of products ordered]} && \text{X 100}}{\text{[Total no of public health} \\
 & & & \text{facilities]}} \\
 & &= & \frac{3}{6} && \text{X 100} \\
 & &= & \underline{50.00 \%} &&
 \end{aligned}$$

$$\begin{aligned}
 &\text{Percentage of private facilities that} && \text{[No of private health facilities} \\
 &\text{receive the exact quantity of products} && \text{that receive the exact quantity} \\
 &\text{ordered most of the time} &= & \frac{\text{of products ordered]} && \text{X 100}}{\text{[Total no of private health} \\
 & & & \text{facilities]}} \\
 & &= & \frac{3}{10} && \text{X 100} \\
 & &= & \underline{30.00 \%} &&
 \end{aligned}$$

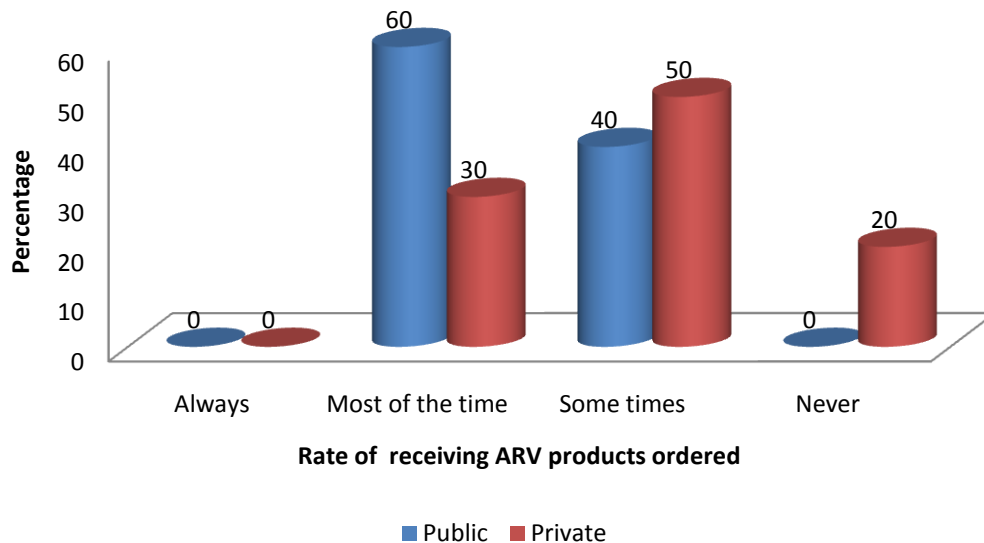


Figure 6: - Public and private health facilities receiving the exact quantity of ARV drugs in Adama city, 2018

The result of this study shows that 60% of the public and 30% of the private health facilities store managers receive the exact ordered quantity most of the time. 40% of the public health facilities and 50% of the private facilities reported to sometimes receive the exact quantity they ordered while 20% the private and none of the public facilities reported that they never received the exact ordered quantity. (Figure 6)

The results of this indicator is lower as compared to a result found in a similar study conducted in eastern Ethiopia on supply management of ARV drugs where 30% of the health facilities received the ordered quantity always, 60% of health facilities receive ordered quantity most of the times and 10 % of health facilities never received the ordered quantity(Tesfaye et. al ,2016).

According to Chandrasekaran and Kumar, 2003 pharmaceutical supply chain must ensure close to 100 percent fill rate. However, the perceived order fill rate ranges from 14 % to 60 % according to the study done by PFSA, 2015. Not that there are many reasons why a facility may not be supplied with the quantity ordered. Shortage is one, but it is also possible that facilities were ordering more or less than the required or correct quantity (PFSA, 2015). Therefore, there is a need to replenish what has been reported and requested.

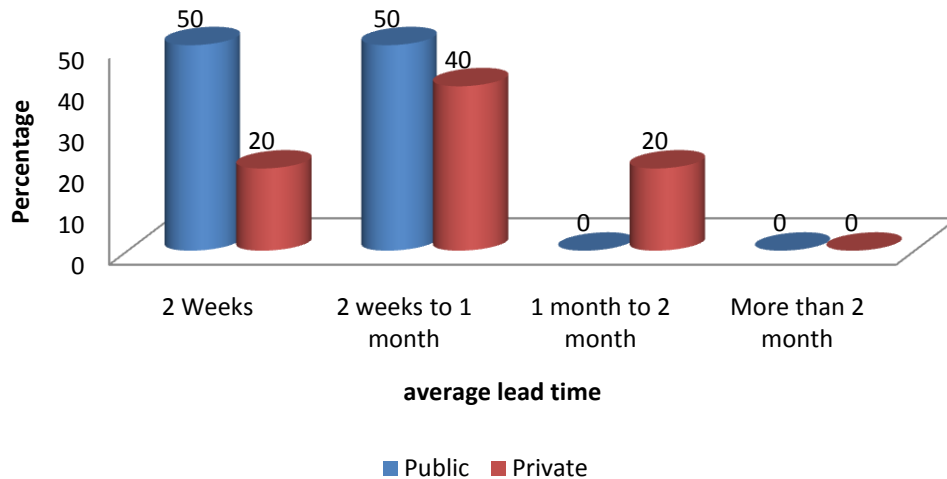


Figure 7: - Lead time for receiving ARV drugs in public and private health facilities in Adama city, 2018

The supplier PFSA Adama branch expected to deliver order quantity from 11th to 25th of the reporting month. In calculating the lead time from ordering to receiving this study showed that the number of public and private health facilities that received ordered quantity in two weeks was 50 % and 20 % respectively(Figure 7). This result shows that majority of health facilities receive ordered quantity from 2 weeks to month after reporting from supplier.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1. Summary of findings

The major findings of this study are summarized as below;

Inventory accuracy rate for ARV drugs were found to be 33.33% in the public facilities and 14.29% in the private health facilities. The major reasons reported for the discrepancy were workload and, lack of training on LMIS.16.67% of the public and 10% of the private health facilities reported that they send RRF to PFSA always according to the schedule.

None of both the public and the private facilities reported they always received exact ordered quantity. 50% of the public and 30% of the private health facilities reported that they receive exact ordered quantity most of the time whereas 40% of the public and 50% of the private health facilities reported they receive exact ordered quantity sometimes and the rest 20% private health facilities reported the they never receive exact ordered quantity.

Both the public and the private health facilities did not meet at least 80% of proper storage conditions criteria's according to the checklist. 83.33% public and 60% of private health facilities met 50%-79% of proper storage condition criteria's.

Percentage of health facilities that reported stock out of one or more ARV drugs in the past six months were found to be 50 % in the public and 40% in the private health facilities from this 16.67% public and 30% private facilities were stock out of 1 to 2 ARV drugs and 33.33 % public and 10% private health facilities were stock out of more than two ARV products within the study period. In summery the supply chain performance of ARV drugs in the public and the private health facilities of Adama city were not satisfactory.

5.2. Conclusions

The following conclusions were drawn based on the results of the study;

In the health facilities, stock records like bin cards and stock cards was not being implemented as required which resulted from lack of training on recording and reporting of LMIS data and workload of the personnel in charge of these tasks. As a result, any inaccuracy in inventory data of ARV drugs will mislead the supplier during calculating the resupply quantity which will cause stock out or overstock of products in the health facilities. In some of the facilities absence of a dedicated responsible person to manage the store and inventory control was also observed.

Discrepancy between ordered and received quantity is noted from the reported trend of delivery of exact ordered quantities to the health facilities. As a result of this receiving less than or above ordered quantity from the supplier in turn led to stock out or overstock of ARV products.

Despite the relatively easily accessible geographical location of the supplier, PFSA Adama branch, to the health facilities, most of the health facilities fail to report on time as required.

Even though health facilities storage locations for ARV drugs is critical and necessary to maintain the acceptable storage condition criteria, none of the health facilities under study met the acceptable storage criteria (i.e. 80% of the criteria on the checklist).

ART treatment medications need full adherence to the treatment without missing doses for better treatment outcome. Interruptions of ARV drugs due to stock out will impair the treatment course and lead to drug resistance and life-threatening risk to the patient. Yet, majority of the health facilities were stock out of ARV drugs for at least one ARV drug during the study period.

5.3 Recommendations

Based on the results of the study, the following recommendations are suggested for consideration;

- Health facilities should use and update inventory recordings like bin card for all ARV drugs in every transaction to improve the inventory accuracy rate performance in both public and private health facilities in Adama city.
- Trainings should be given to store managers by the regional health bureau and non-governmental organizations working in the area to fill the gap analyzed during the study regarding the recording and reporting of LMIS data.
- The working force in ART & PMTCT services should be staffed with the adequate number and qualification of personnel to minimize the occurrence of data discrepancies and poor utilization of recording tools due to workload and absence of dedicated personnel to manage the store and inventory control.
- Health facilities should send report and requisitions form according to the schedule to the supplier to minimize stock outs occurred due to late reporting of ARV drugs. PFSA and responsible health offices should monitor and provide feedbacks to improve on time request.
- PFSA and other suppliers should work strongly to avail the necessary ARV drugs to the health facilities to avoid stock outs and further consequences to the direct consumers.
- Health facilities should improve Storage conditions with respect to following standard storage guidelines and criteria's of ARV drugs in order to maintain safety, efficacy of the drugs and minimize damage and expiry of products.
- Computerized inventory management technologies should be implemented in the health facilities to improve data quality and minimize the time taken on using manual methods.
- This research may show the direction for other researchers to make further studies on this topic.

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Annex I. ARV Drugs Questionnaire and Observation Check List

Addis Ababa University

School of commerce

Department of Logistics and Supply Chain Management

Date: _____

Ownership; Public Private

Service Type; ART PMTCT Both

Name of the facility _____

Questions on ART/PMTCT service

1 How long have ART/PMTCT services been offered at this facility

2 Are the data of the number of patient on ART by regimen reported to higher level?

Yes No

3 From where you get the data

Store ART pharmacy ART clinic Don't know

4 What reporting form do you use for reporting this Information to a higher level? (ask to see copy of the report)

5 Who is the principal person responsible for managing ARV drugs at this facility

Pharmacist Druggist Pharmacy Technician Other

Questions on ART pharmacy

6 Do you have training related to ARV drugs management (specify)?

Yes No

7 Where do you record information on the quantities of ARV drugs in stock (stock on hand)?

Stock Card Bin Card Not Recorded Other

8 What report do you use for reporting to higher level? Ask to see the copy of the report)
write the name of LMIS here

9 Verify the type of data collected in the LMIS report (look at the LMIS report to verify)

A. Quantity received

Yes No

B. Quantity issued

Yes No

C. Consumption

Yes No

D. Stock on hand

Yes No

E. Loss and adjustment

Yes No

F

Others(specify)

10 Who prepares the orders/reports for ARV drugs for this facility

Head of the pharmacy Store manager Other _____

11 When was the last time you submitted the report on consumption and stock on hand of ARV drugs at this facility?

Never Within the last month _____ months ago More than 2 months ago

12 How often are you supposed to submit reports to the higher level?

Monthly Bimonthly Quarterly Semi-annually
Annually Other _____

13 Are you able to submit you report on time?

Always Most of the time Sometimes Never

14 What factors influence not being able to submit your report on time

Takes too long Not enough time between reports Don't have the for
Approval process is too Long Other _____

15 How long does it take you to complete your Report /order?

16 How did you learn to complete the forms?

On job training Never been trained Other (specify) _____

17 Who determines the quantities of ARV drugs to order? (Mark all that apply.)

Pharmacy department The facility itself Higher level facility

Other _____

18 How are the order resupply quantities determined? (ask interviewee to explain the formula used to arrive at the order quantity and note here)

Formula Don't know Other means (specify) _____

19 What factors affect the quantities you order?

No of patients on ARV Consumption Size of the store

Other

20 How many emergency orders for ARV drugs were placed in the past 6 months?

None 1 2 3 More than 3

21 How do you transmit your report/order to the higher level?

Send by facility vehicle Picked up by higher level

Other (*specify*) _____

Questions on receiving/ Distribution/ Transportation

22 How often do you receive supplies?

Weekly Biweekly Monthly Bimonthly

Other (*specify*) _____

23 Do you keep a copy of your proof of Delivery?

Yes No Don't know

24 Do you receive the quantities of ARV drugs that you order?

Always Sometimes Never

25 Who is responsible for transporting ARV drugs to your facility?

The supplier The facility itself Other (specify) _____

26 What type transportation is most often used for ARV drugs?

Facility vehicle Supplier vehicle Other (specify) _____

27 On average, approximately how long does it take from the time the facility places an order until the ARV drugs are received?

Less than 2 weeks 2 weeks to 1 month

Between 1 and 2 months More than two months

Questions on storage condition, stock keeping practice, physical inventory

28 Do you have a training related to your job?

Please specify _____

29 Do you use HCMIS in your store?

Yes No

Storage condition

Ask where the main storage area for ARV drugs is located. Ask for permission to visit the storage area. Assess storage conditions of main storage area *only*. Place a check (tick) mark in the appropriate column based on visual inspection of the storage area; note any relevant observations in the comments column. To qualify for a Yes response, all products must meet the criteria for each item.

S/N	Description	Y	N	Comment
1	Products are arranged on shelves with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible.			
2	ARV drugs are stored and organized to FEFO procedures and are accessible for counting and general stock management			
3	External packaging cartons are in good condition (not crushed, perforated, stained, or otherwise visibly damaged).			
4	There is separate store for expired and damaged products, and procedures exist for removing them from inventory			

5	Damaged and expired products are separated from usable products in the storeroom, and procedures exist for removing them from inventory			
6	ARV drugs are stored in a dry, well-lit, well-ventilated storeroom. (Visually inspect roof, walls, and floor of storeroom.)			
7	Cartons and products are protected from direct sunlight			
8	The storage area is well protected from rodents or insects. (Visually inspect the storage area for evidence of rodents[droppings] or insects that can damage or contaminate the products.)			
9	Storage area is secured with a lock and key and only accessible during normal working hours; access is limited to authorized personnel.			
10	Roof is maintained in good condition to avoid sunlight and water penetration			
11	Storeroom is clean, with all trash removed, no evidence of food and drinks, products stored on sturdy shelves/bins, and boxes organized neatly.			
12	Current storage space is sufficient for existing products.			
13	Expiry date tracking chart is available			

Questions on stock Data for ARV Drugs (for the past 6 months till the day of the visit)

Instructions

Column:

1. Name of each ARV drug that will be checked.
2. Whether or not the product is available, is this facility supposed to manage this product? Answer Y for yes or N for no. If the facility has been stocked out of a particular product for a long time, it may report as —not managing. Make sure to ask if the facility is actually supposed to manage the product.
3. Record if the facility is experiencing a stock out of the product on the day of the visit, according to the physical inventory; answer Y for yes or N for no.
4. Check if the bin card is available for each product; answer Y for yes or N for no. If another type of record is used (e.g., stores ledger), note, and continue to gather stock information using another type of record.
5. Check if the bin card has been updated within the last 30 days; answer Y for yes or N for no. Note: If the balance was 0 the last time the bin card was updated and the facility has not received any resupply of ARV drugs, consider the bin card up-to-date.
6. Record whether the facility has had any stock outs of the product during the last six complete months before the day of the visit: answer Y for yes or N for no.
7. Record how many times the product stocked out during the six complete months before the day of the visit according to the bin cards.

8. Record the total number of days the product was stocked out during the last six complete months before the day of the visit.
9. Record the number of days for which any data are recorded on the bin cards, including 0.
10. Reason(s) for stock outs. For any product that experienced a stock out in the last six complete months before the survey, record the specific reason(s) for the stock out.
11. If a Maximum/Minimum Inventory Control System has been established, fill in the maximum and minimum months of stock and order interval in the spaces provided at the bottom of the table.

Table. Stock Data for ARV Drugs (for the last 6 months till the day of the visit)

Product	Managed at this Facility? (Y/N)	Stock out on day of visit? (Y/N)	Bin card Available? (Y/N)	Bin card Up dated? (Y/N)	Stock out most recent 6 months? (Y/N)	Number of Stock outs (most recent 6 months)	Total number of days of stock out(s)	Number of days of data available on stock card
ABC/3CT 60/30								
EFV 50								
EFV 200								

EFV 600								
ZDV/3TC 300/150								
ZDV/3TC/NVP 300/150/200								
TDF/3TC 300/300								
TDF/3TC/EFV 300/300/600								
ABC 300								
NEV 200								
NEV 240 ML								
LOP/RTV 200/50								
LOP/RTV 100/25								
ATV/RTV 300/100								
ZDV/3TC/NEV 30/60/50								
ZDV/3TC 30/60								

Table; LMIS Data Quality: Usable Stock on Hand at Time of Most Recent LMIS Report

On the basis of the standard operating procedures, determine whether health facilities report stock on hand (SOH) that is kept in the storeroom only or in the storeroom *and* all other places. If the SOH in the LMIS report includes ARV drugs kept in the storeroom and all other places, there will always be a discrepancy between the balance according to the LMIS form (2) and the balance from the bin card (3).

INSTRUCTIONS

Column:

1. List the same products as in table 1. (Do this before finalizing the questionnaire)
2. Obtain the most recent LMIS report for the selected products, and record the SOH from the LMIS report.
3. Write the quantity of usable SOH from the stock records at the time of the selected LMISreport.
4. Note the reasons for any discrepancy.

Usable Stock on Hand at Time of Most Recent LMIS Report			
Products	Ending balance on recent LMIS report	balance on bin card from time of LMIS report	Reasons for discrepancy
ABC/3CT 60/30			
EFV 50			
EFV 200			
EFV 600			
ZDV/3TC 300/150			
ZDV/3TC/NVP 300/150/200			
TDF/3TC 300/300			
TDF/3TC/EFV 300/300/600			
ABC 300			
NEV 200			
NEV 240 ML			
LOP/RTV 200/50			
LOP/RTV 100/25			
ATV/RTV 300/100			
ZDV/3TC/NEV 30/60/50			
ZDV/3TC 30/60			

Ask the participant(s) if they have any questions or would like to make any comments.

Participant Comments:

Additional data collectors Comments (if any):

Brief Analysis of Findings from the Facility Visit:

Annex II

Description of Supply Chain Performance Indicators

i) Inventory Accuracy Rate=

$\frac{\text{No of health facilities that has accurate logistic data}}{\text{Total no of health facilities}} \times 100$

Total no of health facilities

ii) Percentage of facilities that send report and requisition on time=

$\frac{\text{Percentage of health facilities that send report on time}}{\text{Total number of health facilities}} \times 100$

Total number of health facilities

iii) Percentage of facilities that receive the exact quantity of products ordered=

$\frac{\text{No of Health facilities that receive the exact quantity of products ordered}}{\text{Total no of health facilities}} \times 100$

Total no of health facilities

iv) Percentage of facilities that maintain acceptable storage conditions=

$\frac{\text{No of health facilities that maintain acceptable storage conditions}}{\text{Total number of health facilities}} \times 100$

Total number of health facilities

v) Percentage of facilities that experienced a stock out at any point during the study period or at the time of the visit=

Number of health facilities that experience stock out x 100

Total number of health facilities

(Source, Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010. Measuring supply chain performance: Guide to key performance Indicators for Public Health Managers. Arlington, Va: USAID/ DELIVER PROJECT, Task Order 1.)

Annex IV

Report and Requisition Form (RRF)

Report and Requisition Form

Health Facility: -----**Region:** -----**Zone**-----

Supplying Branch: -----**Woreda**-----

Maximum Stock Level: 4 Months of Stock

Reporting Period: From-----**To**-----**Emergency order point =0.5 Months of Stock**

S. N	Product Description	Unit of Issue	Report Part						Requisition Part			
			Beginning Balance	Qty. Received	Loss/Adj.	Ending Balance		Calculated Consumption	Days out of stock	Max. stock Qty.	Qty. Needed to reach Max.	Qty. Ordered
						DU	Store					
			A	B	C	D	E	F=A+B+/-C-D-E	G	H=(120x F)/60-G	I=H-D-E	J

Product with shelf life less than 6 months (S. No, Qty and Expiry Date): -----Remark: -----
-

Completed by: -----sig.: -----

Date: -----

Verified by: -----sig.: -----

Date: -----

Approved by: -----sig.: -----