FACTORS AFFECTING THE HIV RAPID TEST KITS SUPPLY CHAIN MANAGEMENT PERFORMANCE OF SELECTED GOVERNMENT HEALTH FACILITIES IN ADDIS ABABA HEALTH BUREAU

By

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A thesis submitted to the Addis Ababa University, School of Commerce, Department of Logistics and Supply Chain Management, in partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply Chain Management

Advisor: Shiferaw Mitiku (PhD)

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Declaration

I, **Gizaw Thomas Germame** declared that a thesis entitled with "**Factors Affecting the HIV Rapid Test Kits Supply Chain Management Performance of Selected government Health Facilities in Addis Ababa Health Bureau**" is my original research work and has never been submitted to any other university for any Diploma or Degree. I also declare that all the resources used under this research has been acknowledged clearly.

Declared by:

Gizaw Thomas Germame

Signature: _____

Date: _____

Certification

This is to certify that a research under taken by Gizaw Thomas Germame under my advising entitled with: "**Factors Affecting the HIV Rapid Test Kits Supply Chain Management Performance of Selected government Health Facilities in Addis Ababa Health Bureau**" submitted to the Addis Ababa University in partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply Chain Management complies with the regulations of the Addis Ababa University and meets the accepted standards with respect to originality and quality.

_____

Shiferaw Mitiku (PhD)

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List of Abbreviations and Acronyms

AACAHB	Addis Ababa City Administration Health Bureaus
AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ART	Antiretroviral Treatment
BSC	Balanced Scorecard
DHIS-2	Demographic Health Information System
EFY	Ethiopia Fiscal Year
e-LMIS	Electronic Logistics Management Information System
EPHI	Ethiopian Public Health Institute
EPSA	Ethiopian Pharmaceutical Supply Agency
HCT	HIV Counseling and Testing
HIV	Human Immunodeficiency Virus
IFRR	Internal Facility Report and Resupply
IPLS	Integrated Pharmaceutical Logistic System
KP	Key Populations
LIAT	Logistics Indicator Assessment Tool
LMIS	Logistics Management Information System
MOH	Ministry of Health
NGO	Non-Governmental Organization
NA	Not Applicable

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Abstract

To end HIV/AIDS epidemics by 2030, the world is on a Fast-Track strategy. To achieve this, the concept of three 90s (90-90-90) was developed where by 2020, 90% of people who are HIV infected will be diagnosed, 90% of people who are diagnosed will be on Antiretroviral treatment and 90% of those who received ART will be virally suppressed. Ethiopia has achieved exemplary successes in terms of HIV service expansion and uptake, which impacted to 81% decline of new HIV infection from 1995 to 2016, but only 73% of people know their HIV status. Interruption of supplies and stock outs HIV rapid test kits decrease the HIV testing performance of health facilities in the Addis Ababa and ultimately hinders the achievement of the first 90 target. The aim of this study is to assess factors affecting the HIV rapid test kits Supply chain management performance in selected public hospitals and health centers in Addis Ababa Health Bureau. Health facility based descriptive and explanatory study design was used for quantitative and qualitative data collection techniques to gather the required data from May 5-15, 2020. Accordingly both parametric, specifically descriptive statistics like mean, frequency and percentage, non-parametric tests Spearman's Correlation test was used. And it was found that only 50% of the health facilities testing units perform all test due to shortage of Abon (2^{nd} test) and SD Bioline (3^{rd} test). And 71.4% of health facilities encountered HIV testing service interruption at the laboratory unit in the last 6 months prior to data collection. The Non parametric, Spearman's Correlation shows there is a statistical significance positive correlation between HIV rapid test kits supply chain management performance and Health Facility Environment (N=48, sig (2-tailed) =0.002, P<0.05); Top Management Commitment (N=48, sig (2-tailed) =0.002, P<0.05); Mutual Understand and Trust (N=48, sig (2-tailed) =0.009, P<0.05); Information Sharing and Flow (N=48, sig (2-tailed) =0.030, P<0.05); Consumers Demand (N=48, sig (2-tailed) =0.000, P<0.05). Increase the availability of the 2^{nd} and 3^{rd} test by limiting the testing unit and or increase the supply so as to decrease HIV test interruption. Health facilities should give due attention for factors affecting the HIV rapid test kits supply chain performance negatively.

Key Words: HIV, RTK, SCM, SCM Performance, Testing

CHAPTER ONE

INTRODUCTION

This chapter provides background of the study, statement of the problem, basic research questions, objective of the study, significance of the study, scope of the study, definition of terms, organization of the study and limitation of the study.

1.1. Background of the study

Since the discovery of Human Immunodeficiency Virus (HIV), over 35 years, it is still a major public health threat. According to the Joint United Nations Program on AIDS (UNAIDS) gap report 2019, globally, there were 37.9 million people living with HIV. About 0.8% of adults aged 15–49 years worldwide are living with HIV, though the burden of the epidemic remains to vary significantly between regions and countries. Even though an unprecedented global response has provided HIV treatment for 24.5 million people, and on the same year estimates shows that 8.1million did not know that they were living with (UNAIDS, 2019).

According to UNAIDS (2019) report, Eastern and Southern Africa have 20.6 million (18.2 million-23.2 million) people living with HIV while 800, 000 (620,000-1.0 million) people are newly infected, 310, 000 were Acute Immune Deficiency Syndrome (AIDS) related deaths and only 13.8 million people accessing treatment in the same year. These figures show that there are more than half of the people living with HIV and nearly half of newly infected globally in 2019 were in Eastern and Southern Africa (UNAIDS, 2019).

According to the Ethiopian Public Health Institute (EPHI) (2018) HIV related estimates and projections for Ethiopia for the year 2018, the national HIV prevalence rate is 0.96%, which shows decrement from 2016 (1.5%). According to the same estimate for 2018, there are a total of 610,335 people living with HIV. Besides, there are an estimated 13,488 and 13,556 people newly infected and annual estimated AIDS related death for 2018 respectively. According to EPHI HIV related estimates and projections for Ethiopia (2018) there are 56,514 HIV infected children younger than 15 years who are also eligible for ART. The 2018 total estimated number of new HIV infections among children younger than 15 years is 2,994 and estimated annual death is 3,181 (EPHI, 2018).

There are differences in prevalence among regions and city administrations, the highest prevalence being in Gambella region, followed by Addis Ababa city administration (EPHI, 2018).

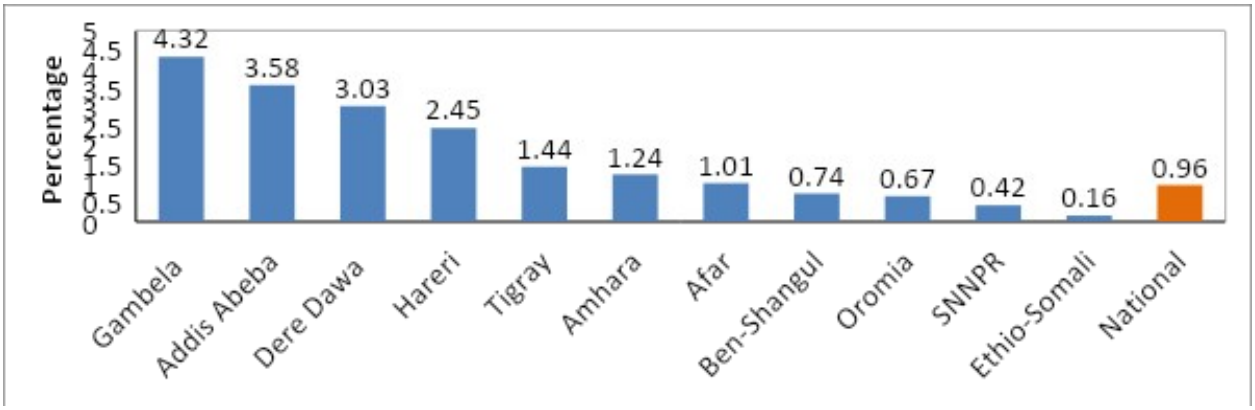


Fig.1 HIV Prevalence by region, (EPHI, 2018)

To end HIV/AIDS epidemics by 2030, the world is on a Fast-Track strategy. To achieve this, the concept of three 90s (90-90-90) was developed where by 2020, 90% of people who are HIV infected will be diagnosed, 90% of people who are diagnosed will be on Antiretroviral treatment and 90% of those who received Antiretroviral Therapy (ART) will be virally suppressed. The strategy will have a benefit of averting 21 million AIDS-related deaths and 28 million new infections by 2030. Ethiopia also planned to prevent more than half a million AIDS-related deaths and prevent up to 80,000 new infections by 2020. The focus objective is the proportion of people living with HIV who know their status from 60-65% to 90% by 2020 through intensifying targeted HIV testing to the identified target population groups for identification of majority of the HIV infection (UNAIDS, 2014, WHO, 2016).

This study tried to identify the factors affecting the HIV rapid test kits Supply Chain Management (SCM) performance in selected public Hospitals and Health Centers in Addis Ababa Health Bureau. Addis Ababa was selected for the study because it is the second highest in HIV prevalence (3.58%), EPHI 2018 estimate. The result of this study would help decision makers and stake holders to have insight on factors affecting the HIV rapid test kits SCM performance and make an informed decision accordingly.

1.2. Problem Statement

Ethiopia has achieved exemplary successes in terms of HIV service expansion and uptake, which impacted to a 81% decline of new HIV infection from 1995 to 2016 (Girum *et al*., 2018). According to 2018 HIV estimates there are 13556 (9.62% lower than 2016) deaths, 13,488 (15.7% lower than 2016) new infections, and 610,335 (0.05% higher than 2016) adults and children living with HIV from which 62% are females. But, only 73% of people know their HIV status (UNAID, 2016 and MOH-Ethiopia, 2019).

According to Pasquet. *et al* (2010) an interrupted supplies and stock outs are the main challenges in the SCM of health commodity so that, ensuring HIV/AIDS commodity security is essential to the success of HIV/AIDS prevention, care, and treatment programs. Even though, Commodity security depends on a country's capability to accurately forecast, adequately finance, effectively procure, and steadily deliver essential HIV/AIDS commodities to the people who need them (Pasquet. *et al.*, 2010).

Interruption of supplies and stock outs HIV RTK decrease the HIV testing performance of health facilities in the Addis Ababa City Administration and ultimately hinders the achievement of the first 90 target (AACAHB, 2019).

Challenges in forecasting HIV RTK contain the numerous purposes of testing, the unevenness in HIV testing procedures, and the varied categories and brands of HIV RTK accessible in the market, HIV testing algorithms, and the most shared purposes of testing in resource limited settings, as well as precise guidance on the information collection and analysis required to define which type(s) of data will be used to inform the assumptions on the demand for HIV testing services and future consumption of HIV RTK (Butao *et al*., 2009).

According to Addis Ababa City Administration Health Bureau (AACAHB) report, the following challenges were identified in HIV Rapid Test Kits (RTK) supply chain performance: data quality problems, delay in placing an emergency order, in appropriate use of internal facility report and resupply form (IFRR), in appropriate implementation of "Dagu-2" and initiation of operation triple A (AAA, Addis Ababa Accelerated) was not supported by additional HIV RTK commodity (AACAHB, 2019).

While it has been over a decade since ART became reachable in resource limited countries, most health related data systems are still lagging. Antiretroviral Therapy programs have made evolution in collecting, reporting, and using data, but in many circumstances, monthly reports are incomplete and inaccurate, making it problematic to produce a valuable forecast which is one of the indicators of supply chain management performance (EPSA, 2019).

Hence, the purpose of this study was to assess the factors affecting the HIV rapid test kits SCM performance which helps health managers to make evidence-based decision to withstand the burden that comes due to new strategy (the three 90's) on supply system particularly and achieve the 2030 targets in general.

1.3. Research Objective

1.3.1. General objective

To assess factors affecting the HIV rapid test kits Supply chain management performance in selected public hospitals and health centers in Addis Ababa Health Bureau.

1.3.2. Specific Objectives

- To assess HIV rapid test kits supply chain management practices (Customers services practices, Logistics management practices, Inventory management, and Distribution management) in selected health facilities in Addis Ababa
- To measure the performance of HIV rapid test kits supply chain management in selected health facilities in Addis Ababa
- To identify the major factors of HIV rapid test kits supply chain management practices in selected health facilities in Addis Ababa
- To identify facilitators/ drivers of HIV Rapid test kits' supply chain management

1.4. Hypothesis

The objectives of this study was fulfilled by testing the nine hypotheses stated in terms of null hypothesis.

- Hypothesis 1 (H1): Environmental uncertainties negatively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 2 (H2): Top management commitment positively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 3 (H3): Mutual understanding and Trust positively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 4 (H4): Information Sharing and Flow positively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 5 (H5): Consumers demand positively and significantly affects the HIV rapid test kits supply chain management performance

- Hypothesis 6 (H6): Information Technology positively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 7 (H7): Supply Chain Relationship positively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 8 (H8): Human Resource positively and significantly affects the HIV rapid test kits supply chain management performance
- Hypothesis 9 (H9): Education and Training positively and significantly affects the HIV rapid test kits Supply Chain Management Performance

1.5. Scope of the Study

Even though the supply chain operation reference (SCOR) model for supply chain performance recognizes five performance attributes (Reliability, Responsiveness, Agility, Cost, and Asset Management Efficiency), this particular study used the first three attributes as quoted by Mekonen (Mekonen, 2019). In addition, since HIV RTK is a under the category of program pharmaceuticals, it would be insignificant to look into cost of the HIV RTK at health facility because of the forecasting and procurement is being done at the national level. Due to variable under consideration, the City Administration selected and the budget constraint anticipated, this study was conducted at government health facilities that are under Addis Ababa City Administration Health Bureau.

There are federal and private health facilities that provide HIV testing services for the residents of the city. However, this study only deals with those health facilities which are managed by AACAHB. The selection of HIV RTK has been conducted by EPHI and FMOH and the program drugs including RTK have been procured nationally and distributed by the Ethiopian Pharmaceutical Supply Agency (EPSA) for health facilities. Hence the selection and procurement components of supply chain management of HIV RTK were not assessed. Finally, the study did not cover other factors like Socio-Economic conditions, finance and political/government related situations which affects Supply chain management performance.

1.6. Significance of the study

The ultimate goal of every public health supply chain is to improve the public health outcome. Supply chain also determines the success or failure of any public health program. To achieve the

1st 90 new strategic plans in 2020, envisioned to end AIDS by 2030 through test and treating strategy, sustainable supply of HIV rapid test kits needed at health facilities. The report of the study will help stakeholders managing HIV RTK supply chain and health managers at different levels to know the potential HIV rapid test kits supply chain performance factors.

The final report of this study would be shared with different stakeholders who are concerned with the HIV/AIDS and or HIV rapid test kits supply chain management including the selected facilities for this study to use this information as an input for decision making regarding SCM of HIV Rapid Test kits. The study also tried to identify the factors that affects the HIV RTK supply chain management performance that might hinder the success of the first 90 so that interested stakeholders use it for further intervention. The study would be help for further and wider assessments in the future.

1.7. Organizations of the study

This thesis organized into five chapters, the introductory chapter contains background of the study, statement of the problem, research objectives, hypothesis, significance of the study, scope of the study, definition of terms, and organization of the study. Chapter two discusses the review of related literature on basic concepts on background of study, principles of supply chain, studies done in different areas, supply chain system in Ethiopia. Chapter three deals with description of the study area, research approach, research design, population and sampling design, data sources and types, data collection procedures, data analysis and ethical consideration. Chapter four will covers the findings of the study, interpretation and discussion of the findings by comparing with the existing literature. Chapter five covers summary, conclusion, and recommendation from the findings.

1.8. Limitations of the study

Even though this study was used census method to conduct in all health facilities in Addis Ababa City Administration Health Bureau, only 48 health facilities were included into consideration out of the total 104 health facilities due to HCMIS/Dagu software failure, infancy of HCMIS/Dagu implementation and the emergency of Covid 19 pandemic. In addition, since the study is a cross sectional, it assesses the situation only over the study period irrespective of the dynamic nature of the case over time. Therefore, the above two reasons are the possible limitations of the study.

1.9. Definition of Terms

Conceptual definitions of Terms

Supply chain management: it includes the planning and management of all activities involved in sourcing and procurement and all logistics management activities. Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served (JSI, 2017).

Integrated Pharmaceutical Logistics system: is the single pharmaceuticals reporting and distribution system based on the overall mandate and scope of the EPSA. It aims to ensure that patients always get pharmaceuticals they need. To be successful, the system must fulfil the six rights of supply chain management by ensuring the right products, in the right quantity, of the right quality, at the right place, at the right time and for the right cost (PFSA, 2017).

Logistics Management information system: is a system to collects, organizes, and reports data that enables people to make logistics decisions (PFSA, 2017).

Inventory Control System: is a system designed to inform personnel when and how much of a pharmaceutical to order and to maintain an appropriate stock level to meet the needs of patients (PFSA, 2017).

The Three 90's

- First 90; by 2020, 90% of all people living with HIV will know their HIV status.
- Second 90; by 2020, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy.
- Third 90; by 2020, 90% of all people receiving antiretroviral therapy will have viral suppression (UNAIDS, 2014).

Accuracy: The degree in which the transferring of the real situation of the stock to the reports for the essential data items) of IFRR submitted to main stores in a facility and RRF reported to EPSA hubs for making sound decision in resupplying products (PFSA, 2017).

Timeliness: Indicates reporting at the agreed day and within days in the schedule set for IFRR reporting; whereas within the specified period (1-10th days) for RRF reporting (PFSA, 2017).

Completeness: The degree of transferring the essential data items to all products (i.e. pharmaceuticals list on RRF and list specific to each DU (PFSA, 2017)

Operational definitions of Terms

HIV Rapid test kits: HIV test kits which have been used for HIV testing algorithm in Ethiopia currently. HIV Rapid test kit allows results of the test to be ready 5 to 30 minutes and it allows testing, counseling, and referrals to be done in one visit (UNICEF, 2008).

Program drugs: are drugs/supplies used to diagnose, treat and rehabilitate HIV/AIDS (including HIV RTK), Malaria, TB and Leprosy, EPI and MCH, and they are procured and distributed through PFSA by "free" (PFSA, 2017).

Reporting and Ordering Form (RRF): is a form used to report and ordering program drug including ARV drugs and HIV rapid test kits every two months at Hospital and Health centers in Ethiopia (PFSA, 2017).

Distribution: the refilling of HIV rapid test kits from immediate supplier to health facilities and within facilities. It doesn't include the central EPSA distribution. The transportation raised here is within this distribution only (PFSA, 2017).

Internal Facility Report and Resupply form (IFRR): is the form by which drugs is issued within the facility to maintain a record of the products that are issued and received (PFSA, 2017).

Stock out: when the product is not available in health facilities dispensing units and in store for greater than three days in the last six months and at the day of visits (PFSA, 2017).

Refill time: the time interval RRF is reported and EPSA delivery products to health facilities. The ideal time set is three weeks (PFSA, 2017).

On time report: Health Facilities send RRF to PFSA before 10th days in the reporting period (PFSA, 2017).

HCMIS/ Dagu: is a locally developed eLMIS designed to support inventory control, and logistics management information at public health facilities of Ethiopia. It provides a systematic recordkeeping system for managing health commodities at health facility stores (Tewfik, 2018).

CHAPTER TWO: RELATED LITERATURE REVIEW

2. Introduction

Literature review is a description of the literature relevant to HIV RTK SCM practices, performance and factors affecting it. It gives an overview of what has been said, who the key writers are, what are the prevailing theories and hypotheses, what questions are being asked, and what methods and methodologies are appropriate and useful. The first part has helped in framing the study in terms of the already existing theories. Whereas, the second part summarizes findings of related studies conducted having consistent and contradictory findings. Finally, identified literature gaps were described.

2.1. Theoretical Literature Review

2.1.1. HIV RTK Supply Chain Management practices

The main components of Pharmaceutical Supply Chain Management (PSCM) system are selection, Quantification, procurement, inventory management, storage and distribution, and customer use. Management support is also an integral to each component of the cycle (MOH-Ethiopia, 2019).

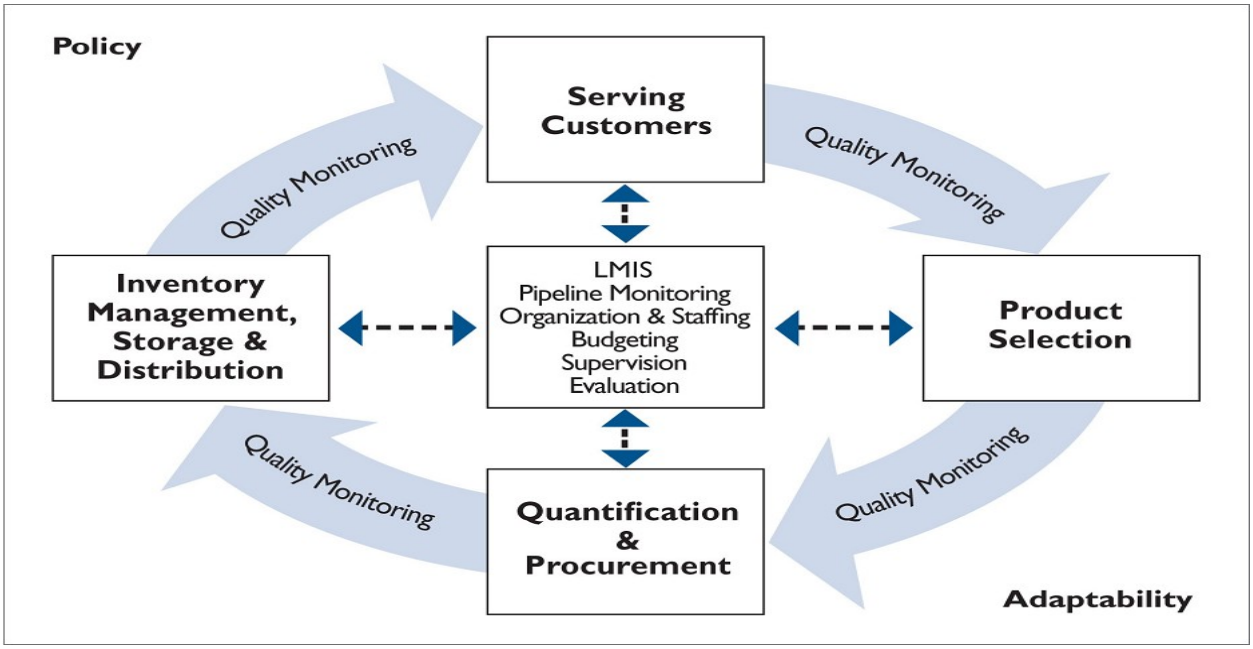


Figure 2: Components of PSCM system (*Source:* JSI, USAID|DELIVER PROJECT, 2011)

Selection

Selection of ARV pharmaceuticals (including HIV RTK) is done at national level considering their safety, efficacy, quality and cost. Accordingly, the National Essential Medicines List (EML) is updated whenever new ARVs are included. The following criteria's are used to select ARV (including HIV RTK); Epidemiological profile (category mix: morbidity and drug resistance), Evidence based medicine/Proven efficacy and safety, Level of health facility and its capacity (eg. diagnostic facilities, STG), Financial resources, Genetic, demographic and environmental factors, Treatment guideline for first line, second line and third line therapy, Marketing approval/registration, Advocating fixed dose combination (FDC) (MOH-Ethiopia, 2019).

Quantification

National quantification of ARV pharmaceuticals is conducted by Ethiopian Pharmaceutical Supply Agency (EPSA) in collaboration with FMOH and other stakeholders. It is done every two years which is revised every year based on changes in guidelines at national level and the data obtained from ART sites. It is important to have detail report on number of clients currently on ART, disaggregated by regimen and patient type, attrition rate, and logistics data. Most of the

data required emanates from health facilities and it is crucial to ensure the accuracy and completeness of logistics data to conduct a successful quantification. The goal of quantification is to maintain the most cost-effective balance between service levels and inventory costs (MOH-Ethiopia, 2019).

Procurement

The procurement of ARVs and related pharmaceuticals is executed by EPSA. The procurement process follows the national and international procurement regulation (MOH-Ethiopia, 2019).

Inventory control system

The purpose of an inventory control system is to inform personnel when and how much of a pharmaceutical to order and to maintain an appropriate stock level so as to ensure commodity security. A well designed and well operated inventory control system helps to prevent shortages, oversupply, and expiry of pharmaceuticals. The inventory control system for the Integrated Pharmaceuticals Logistics Systems (IPLS) is a Forced Ordering Maximum/Minimum inventory control system. This system is designed to ensure that quantities of stock in health facilities fall within an established maximum and minimum range and facilities are required to report on a fixed schedule. All products are re-supplied each time a report is completed. In emergencies, an emergency order can be placed. Health centers and hospitals calculate their own order sufficient quantities of ARVs along with other programs to bring stock levels up to the maximum level, and required to report and order every two months (MOH-Ethiopia, 2019).

Pharmaceuticals management information system (PMIS)

Information is the engine that drives the entire PSCM cycle. We collect information to make decisions; the better information we have, the better decisions we can make. The purpose of PMIS is to collect, organize, and report information to other levels in the system to make decisions that govern the logistics system and ensure that all the six rights are fulfilled. Keeping good records helps everyone to understand the flow of supplies into and out of the facility. Bin Cards and Stock Record Cards are used to account for products held in storage, including their receipt and issue. Internal facility report and resupply form (IFRR) should be appropriately documented. Valuable information used to make re-supply decisions is recorded on the Bin

Card, Stock Record Card and IFRR; data from these records are used in reporting, calculating reorder quantities and for monitoring stock levels (PFSA, 2017).

Data is generally considered high quality if it is "fit for its intended uses in operation, decision making and planning. In relation to essential data items in IPLS, it refers to the timeliness, completeness, and accuracy of IFRR submitted to main stores in a facility and RRF reported to EPSA hubs for making sound decision in resupplying products. The following issues can contribute for challenge in acquisition of quality reports and needs to be sought as areas of intervention for improving data quality; Sources of delay in reporting timely include lack of awareness on the benefits of timely reporting, forgetfulness, low staffs' commitment and, low enforcement by the management; Sources of challenges related to completeness are lack of due attention, knowledge gaps (program items), organizing products as per the sequences in the reporting format; Sources of Data Inaccuracy include not maintaining bin card for all products, lack of regular bin card updating, error created while transferring data from bin card to reports (PFSA, 2017).

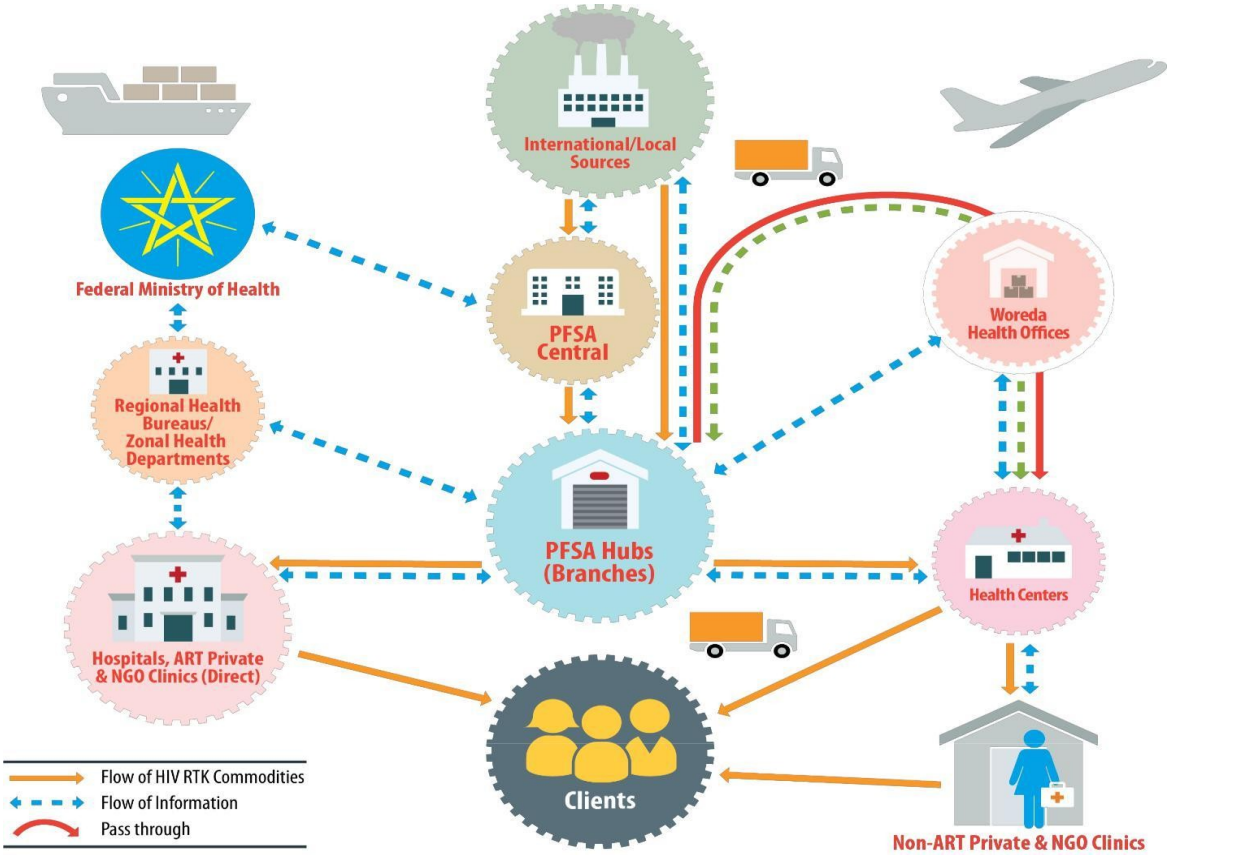


Figure 3: The flow of RTKs and information in the IPLS (MOH, 2018)

Storage and Distribution

Proper storage of ARVs, including refrigeration, is critical to maintain the quality of the medicines and related supplies. Central EPSA will deliver the pharmaceuticals to hubs; subsequently the hubs distribute the pharmaceuticals to health facilities every two months based on orders placed by the health facilities to EPSA hubs. Health facilities are expected to follow consumptions and keep record regularly. They get ARV medicines and related supplies if they submit their report and order, using Report and Requisition Form (RRF) with accurate data and in a timely manner. The logistics data for the RRF should always come from bin cards and IFRR or DAGU-2 software if the health facility is DAGU site. The quality of this data is very crucial as it will be used for quantifying future consumption (PFSA, 2017).

Prior to the integration of RTK logistics in to IPLS, RTKs distribution plan had been done centrally for each region, federal hospital, and police and military health facilities taking the target set for each region every quarter. Then EPSA hubs in collaboration with regional health bureaus distribute the RTKs to testing sites (MOH-Ethiopia, 2019).

Rapid Test Kits (RTKs) supply chain system had been characterized by significant variations in HTS targeting and testing performance, weak coordination mechanisms, non- standardized product and information flow, long tier distribution and irregular distribution practice. To address these gaps, an optimal RTK supply chain system was designed that leverages the existing integrated pharmaceutical logistics system. The design considers use of both logistics and service data for RTK resupply decision making. A supplemental standard operating procedures manual was also developed to serve as guidance and reference document for the implementation of the newly designed RTK logistics system and serves as a reference for service providers working in EPSA, health facilities, and administrative units that provide management and supervisory support in the RTK logistics system (MOH-Ethiopia, 2019).

Customer Services

Strategies to halt HIV/AIDS epidemics

Global Response to the HIV/AIDS Epidemic

To end AIDS epidemics by 2030, the world is commencing on a Fast-Track. To achieve this, the concept of three 90's was developed that by 2020, 90% of people who are HIV infected will be diagnosed, 90% of people who are diagnosed will be enrolled on Antiretroviral treatment (ART) and 90% of those who received ART will be virally suppressed. The strategy is an attempt to get the HIV epidemic under control and is based on the principal "Universal testing and treating". Before this strategy, ART treatment was initiated based on CD4 and WHO clinical stage. This test and treat approaches identify people early on in their infection, and start treatment so they become virally suppressed, the onward transmission of HIV will be prevented, and this will impact on HIV incidence at population level. The strategy will have a benefit of averting 21 million AIDS-related deaths and 28 million new infection by 2030 (UNAIDS, 2014, WHO, 2016).

Before the test and treat strategy, probability of late presentation of client with increased risk of illness, disability, and ultimately death was a major gap in the HIV care and treatment. Not only does a late HIV diagnosis, but evidence suggest that undiagnosed HIV infection contributes disproportionately to the number of new infections. Thus, the 1st 90 strategy addresses HIV testing. Currently, there is a number of new HIV testing tools are available in the market which are easy self-testing option that specifically responds to the documented preferences of many people at risk of HIV infection is part of the solution to ending AIDS as a major public health problem. It can substantially increase the proportion of people living with HIV who know their HIV status (the first 90), sharply lower the rates of late HIV diagnosis, alleviate stigma and discrimination, support HIV prevention efforts, and contribute toward an increase in the proportion of PLHIV who achieve viral suppression (IAPAC, 2017).

Response to the HIV/AIDS Epidemic in Ethiopia

The HIV response in Ethiopia has evolved, over the past three decades, since the first time when HIV was known to have happened in Ethiopia in 1984. Ethiopia has achieved exemplary successes in terms of HIV service expansion and uptake, which impacted to a 95% decline of new HIV infection from 1994 to 2012 and 73 % reduction of AIDS deaths compared to the periods 2006 to 2016 respectively (MOH-Ethiopia, 2019).

Ethiopia has developed HIV/AIDS prevention care and treatment strategic plan in an investment case approach which is being implemented from 2015-2020. This strategic plan aims to pave the path for ending AIDS by 2030 through averting 70,000- 80,000 new HIV infections and saving about half a million lives till 2020. The targets set in this plan are in line with the three 90's (90-90-90) targets set by UNAIDS to help end the AIDS epidemic (MOH-Ethiopia, 2019).

Ethiopia introduced ART in 2003 in selected health facilities following the issuance of the national antiretroviral (ARVs) drugs supply and use policy in 2002. The first adult treatment guideline was issued in 2003, and revised in 2005, 2007, 2014 and 2018. A pediatrics treatment guideline was also developed in 2007 and after that it was consolidated with the adult guidelines. Free ARV service was launched in 2005 in public hospitals and in 2006 in health centers. As of March 2019, a total of 440,439 adults and 21,947 children under the age of 15 are taking ARV (MOH-Ethiopia, 2019).

2.1.2. HIV RTK Supply chain Management performance

According to Estampea *et al*., (2013) Supply chain performance can be measured both in terms of customers' level of satisfaction and the costs incurred (Estampea *et al*., 2013). Customer's satisfaction level is a sign of the required standard service level of a company, which is closely related to the whole performance of its supply chain (Chan, 2003). Evaluating supply chain performance is a complex process as it involves several actors collaborating and interacting each other to achieve a given strategic supply chain objectives (Estampea *et al.,* 2013). Companies to improve the overall supply chain performance and to track the supply chain operations, they share supply chain information among the partners to reduce the lack of demand visibility as it goes from downstream end customer to upstream partners in the chain, work closely with customers and suppliers in order to improve information and product flows, and reduce surprises from demand fluctuations, enhance internal processes integration, work with suppliers to reduce lead times, reduce risk of supply disruption, mitigate the bullwhip effect, reduce supply chain cost of all members through collaboration and trust (Krajewski *et al*., 2010).

There are different performance indicators that companies use to assess the performance of the supply chain. The following parameters can be used to evaluate the performance of the supply chain:

- Lead time – the time interval between placing purchase order and delivery of the product to the customer;
- Cost of order processing, shipping and delivery;
- Capacity including warehousing, transportation and shipping capacity;
- Quality of suppliers - the ability to meet quality standards set by manufactures;
- Delivery has three dimensions including delivery speed, production lead time & delivery reliability;
- Flexibility (ability to adapt to their changing environment) (Coyle *et al.,* 2003).

According to Chopra & Meindl (2004) flexibility has four dimensions: (a) Customer service flexibility-refers to the ability to provide the special customer requests or inquiries. (b) Order flexibility- means the ability to adjust order size, volume or composition during logistics operation. (c) Location flexibility refers the ability to service customers from alternative wholesaler locations or supermarket outlets (d) Delivery time flexibility refers to the ability to provide delivery times for customers (Chopra & Meindl, 2004).

Figure 4 Customer –focused supply chain performance indicators (Gunasekaran, *et al.* 2004)

Supply chain operation reference (SCOR) model

There are several methods of measuring and evaluating the performance of supply chain. The most common methods are Supply Chain Operations Reference (SCOR) model and the Balanced Scorecard (BSC). Supply chain performance measurement is essential for competitiveness as it provides information about strengths that need to be maintained and on weaknesses that need to be addressed. The SCOR model is the product of Supply Chain Council, Inc. (SCC). SCC established in 1996 and developed the SCOR process reference model for evaluating and comparing supply chain activities and performance. It offers a unique context that links business process, best practices, metrics, and technology into a fused structure to support communication among SC partners and to advance the effectiveness of SCM and related supply chain improvement activities. SCOR comprises of standard SC processes, standard performance qualities and metrics, standard practices and standard job skills (Alomar and Pasek, 2014).

The main supply chain processes are plan, source, make, deliver, return and enable. In terms of performance, SCOR enables to assess reliability, responsiveness, agility, costs and assets management of a given supply chain. In order to identify, measure and improve supply chain management processes, SCOR model can be used. The SCOR model provides a common process for communicating among supply-chain partners (Huan *et al*., 2004).

The SCOR-model has been developed to define the business activities related with all phases of satisfying a customer's demand. The model has been able to successfully describe and provide a basis for supply chain analysis and improvement. These processes are defined in increasing levels of facts beginning with a description of the overall process. The processes are further classified into process elements, activities, and tasks. Each basic supply chain is a chain‖ of source, make, and deliver execution process. Each interaction of two execution processes (source-make-deliver) is a link‖ in the supply chain (Huan *et al*., 2004).

Table 1 The SCOR Performance attributes metrics and definition.

Supply Chain Performance Attribute/ Variables /Characteristics	Definition

Reliability	The ability to accomplish tasks as expected. Reliability focuses on the expectedness of the outcome of a process. Typical metrics for the reliability characteristic include: On-time, the right quantity, the right quality.
Responsiveness	The speed at which jobs are performed. The speed at which a supply chain delivers products to the customer. Examples consist of cycle-time metrics.
Agility	The ability to reply to external stimuli, the ability to respond to market place changes to gain or keep competitive advantage. SCOR Agility metrics comprise of Flexibility and Adaptability.
Costs	The cost of operating the supply chain practices. This contains material costs, labour costs, and management and transportation costs. A distinctive cost metric is Cost of Goods Sold.
Asset Management Efficiency (Inventory Management).	The ability to efficiently use assets. Asset management strategies in a supply chain consist of inventory reduction and in-sourcing vs. outsourcing. Metrics include: Inventory days of supply and capacity utilization.

SCOR Model Version.11 (2012)

Reliability, Responsiveness and Agility are customer-focused performance characteristics. Cost and Asset Management Efficiency are internal-focused performance characteristics. Each performance attribute has one or more strategic performance metrics as indicated in the above table. SCOR supply chain processes are unique processes a supply chain requires to execute in order to support its primary objective to fulfill customer orders. SCOR provides a set of processes most companies perform to effectively execute their supply chains. The six macro level SCOR processes are Plan, Source, Make, Deliver, Return and Enable are well known and broadly adopted. Hence, this study tried to address the customer- focused performance characteristics.

2.1.3. Challenges of HIV RTK Supply Chain Management Practices

Supply chain management (SCM) is the process by which SC activities are accomplished to gain an advantage over competitors as well as getting the most out of the value of our customers. It basically represents the efforts by which the supply chain management solutions help to develop and manage supply chain activities in the most efficient way. When we talk about supply chain management, we also pertain to product development, sourcing of materials, production of quality goods and logistics. With well-organized SCM Software we will be able to manage the flow of easily. By knowing the activities involved in the range of supply chain management, we can also detect the possible challenges and offer solutions to them. Hence, there are a number of major supply chain management challenges:

- **Quality Customer Service**: The SCM is centralized on the requirements of the customers. It is about giving the right amount and the right quality of the product for the right amount of money. All this, in perfect timing and setting.
- **Costing**: Globally speaking, the costs of raw materials, energy and labor have increased due to economic constraints. In order for operations to carry on production and provide consumers with good quality items at affordable rates, changes have to be made to keep operations running.
- **Risk Management**: Due to the persistent change in the market, coming from a divers sources such as consumer demands, global sourcing, and political agendas would cause major issues to the operations.
- **Supplier Relationship**: By creating a mutually sound and harmonious relationship with your partners or suppliers, you will be able to provide your customers with products of high standards in a timely manner. This also allows you to create opportunities for improvement in terms of performance.
- **Qualified Personnel**: Over the years, it turns out to be a challenge to find talent interested and passionate about SCM. Personnel employed in this field must have an understanding about the obligations and responsibilities needed.
- **Unforeseen Delays**: Procurement of materials and products may be easy, but the delivery may not always be 100% on time, especially with time differences and a variety of shipping time frames. When items are sourced from diverse countries, delays like this are very common.

- **Fast-Changing Markets:** With technological advancements changing our markets every day, it is quite difficult to stay in pace and adapt to the variety of innovations in the market. But because the goal is to stay efficient in these changing times, companies would have to be more flexible (Lans, 2019).

2.1.4. Facilitators/ Drivers of HIV Rapid Test Kits' Supply Chain Management

Pharmaceutical Supply Chain Management in Ethiopia

Supply chain management (SCM) is the process of planning, implementing, managing, and controlling all activities involved in sourcing, procurement, conversion, and logistics management, with the aim of satisfying the end users as efficiently as possible. Importantly, it also includes coordination and collaboration with middle-level actors who serve as a link to the end users (MOH-Ethiopia, 2019). A public health supply chain is a network of interconnected organizations or actors that ensures the availability of health commodities to the people who need them (JSI, 2017).

Pharmaceutical supply chain management (PSCM) follows these principles with the addition of public health concept and the sensitivity of pharmaceuticals. PSCM typically include selection, quantification, procurement, inventory management and serving customers. The goal of every public health supply chain management system is to ensure that every customer can obtain and use quality essential health supplies whenever he or she needs them. Successful HIV programs are only possible if all health facilities providing ART are equipped with an uninterrupted and sustained supply of high-quality ARV medicines. Ensuring adequate and continuous availability of other pharmaceuticals that are needed to support ART services such as medicines to prevent or treat opportunistic infections, laboratory reagents, supplies and equipment to test and diagnose HIV and related infections, monitor the progression of HIV (MOH-Ethiopia, 2019)

There are six attributes of supply chain performance, according to supply chain council. These are, supply chain reliability: the performance of the supply chain in delivering the correct product to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation. Supply chain responsiveness is the speed at which supply chain provides products to the customer. Flexibility is the agility of a supply chain in responding to market place changes to gain or maintain competitive advantage. A supply

chain cost is associated with operating supply chain. Asset management if the effectiveness of an organization in managing assets to support demand satisfaction. Finally, component management: the operational management of the supply chain components such as suppliers and customers as quoted by Bala and Kumar (Bala and Kumar, 2011).

The provision of complete health care necessitates the availability of safe, effective and affordable drugs and related supplies of the required quality, in adequate quantity at all times. Despite this fact, in the past, the pharmaceutical supply chain management system of the country had several problems including non-availability, unaffordability, poor storage and stock management and irrational use. To solve these problems in public health facilities, the former Pharmaceuticals Fund and Supply Agency (PFSA) now Pharmaceutical Supply Agency (since 2018) was established in 2007 by Proclamation No. 553/2007 based on the Pharmaceuticals Logistics Master Plan (PLMP). The Agency is mandated to avail affordable and quality pharmaceuticals sustainably to all public health facilities and ensure their rational use. So as to execute its mandate in the area of pharmaceuticals supply in an efficient and effective manner, integrated pharmaceuticals logistics system (IPLS) has been developed and implemented since 2010 (PFSA, 2017).

Integrated pharmaceuticals logistics system is the term applied to the single pharmaceuticals reporting and distribution system based on the overall mandate and scope of the PFSA. It aims to ensure that patients always get pharmaceuticals they need. To be successful, the system must fulfill the six rights of supply chain management by ensuring the right products, in the right quantity, of the right quality, at the right place, at the right time and for the right cost. The IPLS integrates the management of essential pharmaceuticals including the following pharmaceuticals that were used to be managed vertically: HIV/AIDS (including HIV RTK), Malaria, TB and Leprosy, EPI, MCH and purchased essential drugs. It is the primary mechanism through which all public health facilities obtain essential and vital pharmaceuticals. Products included on the National pharmaceuticals procurement List (NPPL) are supplied and managed through the IPLS (PFSA, 2017).

2.2. Empirical Literature Review

2.2.1. HIV RTK supply chain management practices

Customer Service

According to Daniel *et al.* (2015) the study done in Tanzania, shows that all respondents from the Clinics testified to have experienced stock-outs of rapid tests to diagnose HIV in the year earlier the study. The stock outs persisted for an average of 5.6 weeks (range: 1 week - 3 months). At the time of the study, one clinic had both HIV diagnostic tests in stock, whereas 42% and 25% care and treatment centers did not have Bioline or Determine, respectively (Daniel *et a.l*, 2015). However, the study on laboratory commodity SCM in Tanzania, in 2013, shows that there is an improvement of HIV test kits availability. The assessment shows that the stock out of Determine (the first test) and Unigold the (2nd test) HIV test kit were 28.2% while SD Bioline (the 3rd test) was only 5.1%. And, 66.7% of health facilities reported to have made at least one emergency order within 12 months before the study (Kagaruki *et al.*, 2018).

According to Narkotey (2012), 77.7% of health facilities in Ghana, encountered stock out before the study, and 22.2% have never experienced stock out. To resolve stock out, 34.8% of health facilities in Ghana ordered an emergency order while 26.1% of inventory managers borrow from other health facilities (Narkotey, 2012). Contrary to the study done in Ghana, in South Africa, only 6.1% of logistics tools have stock out data and at the day of visit no stock out observed at health facilities. In case of stock out, health facilities in South Africa borrow from others as in Ghana (Mahoro, 2013).

The study by Tilahun *et al.* (2016) found that 29.2% and 33.3% of health facilities in Addis Ababa were stocked out KHB while 56.3% and 60% of facilities were stocked out of DBS kit at day of visit and any time in the last 6 months respectively (Tilahun *et al.*, 2016). Another study in the same city, showed that only 36.8% of health facilities were fully stocked, while 63.2% were stocked out of one or more of the HIV test kits available at the time of data collection. Six months prior to this study, 70% of health centers and 50% of hospitals stopped VCT service due to shortage of HIV test kits. Hence, they were only doing for emergence cases or PMTCT purpose at the time of shortage (Berhanemeskel *et al.*, 2016).

The national Integrated Pharmaceutical Logistics System showed that 68% of hospitals and 43% of health centers placed at least one emergency order in the 3 months before the survey (PFSA, 2015). And 75% of health centers had one or more and all hospitals placed more than three times an emergency order of HIV test kits in the past 6 months prior to the study (Berhanemeskel *et al.*, 2016).

A study conducted on patient satisfaction at Mwananyamala hospital in Tanzania, indicates that client satisfaction on quality of care is only 53% in which one of the tangible reasons was lack of essential drugs in hospital (Kudra & Bernand, 2014). Comparable study in public health facilities of Nigeria shows that 33% of patient dissatisfied due to non-availability of drugs in facilities (Gabriel, et al., 2018). The frequently reported trends of stock out of HIV test kits in Tanzania is expected to compromise patient's access to HIV testing services causing a obstacle in implementation of HIV/AIDS care and program in the country (Kagaruki *et al.*, 2018).

The study done by Oljira and Gebresilassie, at Jimma Hospital in 1999, indicated that one of the most frequently encountered problems affecting utilization on the day of visit leading to dissatisfaction is letdown to obtain prescribed medications where only 33.3% secured from hospital pharmacy (Oljira and Gebresilassie, 2001). The similar study done at Jimma Hospital, 2010, also showed that one of the issues for dissatisfaction was absence of medicine (only 30% obtained) from hospital pharmacy which is similar result with study conducted ten years prior (Asefa et al, 2011). And an assessment conducted at Yekatit 12 hospital medical college, one of the most recurrent identified problems was lack of adequate drugs and supplies (Berehel *et al.*, 2018).

Supply Chain Management capacity building

Pharmacy professionals are one of the major essential health personnel in pharmaceutical supply chain management implementation at all stages. The study done in Ghana on inventory management in health facilities indicated that 94.4% are trained in health commodity management (Narkotey, 2012). The survey conducted on IPLS implementation in Ethiopia, 2014, showed that 87% pharmacy personnel trained on how to order quantities (PFSA, 2015). The study done in East Wollega, Oromia region, indicated that 75.8% of personnel who were managing pharmaceuticals had received IPLS training (Tiye and Gudeta, 2018). The assessment

done in Addis Ababa, Ethiopia also indicated that 72.7% and 51.5% of health facilities' staff working on pharmacy units were trained on IPLS and laboratory commodity management (LCM) respectively (Tilahun et al, 2016). A study done by Birhanemeskel *et al.* (2014) in Addis Ababa indicated that 78.9% of store managers in health centers and 75% in hospitals had on job training on IPLS (Berhanemeskel *et al.*, 2016).

Inventory management

According to a study conducted by Narkotey (2012) in Ghana, only 25% of inventory managers update their stock weekly, whereas 43.75% update their stock quarterly. Again on the same study 47.64% of inventory managers use economic order quantity to retain optimal level of inventory (Narkotey, 2012). Also the study conducted at public health facilities of Metropole in South Africa indicated that only 6.7% and 66.7% of inventory managers update their stock weekly and monthly respectively. The average total percentage of variation between stock cards and physical counts for ARV medicines was 51.7%. In the same study only 32.9% of health facilities update stock cards monthly with 21.9% record keeping accuracy (Mahoro, 2013).

Logistic Management information system (LMIS)

According to Kagaruki *et al.* (2018) 56.4% use ledgers and 17.9% use stock cards for keeping track of laboratory reagents and supplies in health facilities of Tanzania. Therefore, majority of laboratory data system was not incorporated within Integrated Logistics System; the laboratories lacked important data to support decisions in determining orders or procurement quantity, forecasting, or monitoring system performance (Kagaruki *et al.*, 2018). A study done in Lesotho, indicated that 53% facilities had stock cards to keep track of laboratory reagents, and only 17% had stock status reporting forms. Nonetheless, none of the laboratories evaluated had stock exchange forms (Pharasi B., 2007). The study conducted by Narkotey (2012) in Ghana, indicated that 73.9% of inventory managers issued commodities by approved requisition (Narkotey, 2012).

According to Tilahun *et al.* (2016) in Addis Ababa, only % 61.5% of facilities used and updated bin card, and only 57.7% of facilities used bin card for KHB but 19% updated, 12.1% used and 11.5% of facilities updated for DBS kit (Tilahun *et al.*, 2016). Comparable study done in Addis Ababa also indicated that 52.6% of health centers and 50% hospitals had bin card for selected

HIV test kits (Berhanemeskel *et al.*, 2016). And According to the IPLS survey in Ethiopia, 2014, 60% of facilities updated bin card for selected products (PFSA, 2015).

Again the same study done by Tilahun *et al.* (2014) indicated that 84.6 and 82.3% of health facilities completed and reported IFRR and RRF (Tilahun *et al.*, 2016). While a study done in East Wollega, 97% of facilities report RRF with 64.6% accuracy (Tiye and Gudeta, 2018). The IPLS survey also indicated that completeness of RRF was found to be good; though the exact accuracy was in average 46% (PFSA, 2015).

Distribution

The study done in Lesotho indicated that there is push system of distribution used in the vertical medicine supply chain for the specific commodities, from which most of them are HIV/AIDS related commodities. Conversely, a pull system of distribution is used for general medicines (Pharasi, B. 2007).

The study conducted by Narkotey (2012) 66.7% and 27.8% of health facilities received their commodities between 2 to 4 weeks and less than a week after an order is placed (Narkotey, 2012). A study done by Mahoro (2013) showed that 60% of health facilities in South Africa are fully supplied in their last placed order, in which 66.7%, 6.7%, 13.3% and 13.3% of them received within three, one, two and seven days after order placed respectively (Mahoro, 2013).

The study done on supply chain management of ARV drugs in public health facilities in Eastern Ethiopia, 2014, indicated 60% facilities were received sometimes and 30% of them received always all quantities of ARV drugs that they requested (Gabriel and Tafesse, 2017). According to IPLS survey, 80% of health centers and hospitals received products within a month or less (PFSA, 2015).

Storage

According to Pharasi B. (2007) lack of temperature control poses a serious danger to the stability of some medicines. Though some facilities stores are equipped with shelves and pallets, 75% percent of facilities still store supplies on the floor and 33%of facilities failed to adhere a general

standard storage guideline for storage (Pharasi, B, 2007). None of the health facilities in Metropole, South Africa adhere to first expire first out (FEFO) system for ARV medicines at the time of visit and 80% of them fulfilled standard storage guideline (Mahoro, 2013).

The study done by Gabriel and Tafesse (2017) showed that only 50% of health facilities in Eastern Ethiopia had enough storage space for existing ARV medicines, and only 70% of ARV medicines stored at the appropriate temperature (Gabriel and Tafesse, 2017). A study done in Addis Ababa by Tilahun *et al.* (2016) showed that 54.4% of facilities had sufficient store room for existing products (Tilahun *et al.*, 2016). The study conducted in Addis Ababa by Mudzteba (2014) indicated that though mean storage condition was 71.8%, the size of stores in most of the HCs was not acceptable which leads to stacking of products one over the other, and making FEFO organization, easy picking of products and cleaning difficult (Mudzteba, 2014). The national IPLS survey result also showed that 55% of facilities met at least 80% of storage criteria (PFSA, 2015).

2.2.2. HIV RTK supply chain management performance

According to a study done by Mekonen (2019) in Oromia region, Ethiopia, the respondents agreed for operation supply chain performance of reliability (grand mean is 4.19): facility provide right quantity of HIV rapid test kit for testing units with correct packaging, by keeping its quality and giving voucher for receivers with full information. Though, providing right quantity was agreed and there are respondents with strongly disagree also. Respondents were agreed on operational supply chain performance of responsiveness (grand mean 4.24) and agility (grand mean 4.24) indicating that the operation supply chain performance of HIV RTK is moderately agreed by respondents (grand mean greater than 4) (Mekonen, 2019).

2.2.3. Challenges of HIV RTK supply chain management practices

2.2.3.1. External factors:

Company environment

According to a study carried out by Quesada et al. (2010), uncertainty negatively affects company performance. But this can be decreased if a strategic relationship with important suppliers is established. Thus, companies need to implement new strategies that permit them to

deal with environmental uncertainties in the supply chain in order to accomplish in a proficient manner (Quesada *et al.,* 2010).

- **Hypothesis 1 (H1): Environmental uncertainties negatively and significantly affects the HIV RTK supply chain management performance**

Top management commitment

The commitment at the top level management is vital to make SC responsive since their decision and strategies to execute the whole supply chain. Top management backing is indispensable for cross functional training, integration of subdivisions inside the organization and vendor development for a responsive supply chain. Top management responsibility is a key enabler for effective SCM. Top management have key role in developing supply chain strategies. Since the success of the supply chain is determined by the effectiveness of strategies. Strategies for material, time, money, technology, and power; also executed by top level authority. The support from top management is essential for harmonization of different department within an organization for example training of employees; development of suppliers (Sandberg and Abrahamsson, 2010).

- **Hypothesis 2 (H2): Top management commitment positively and significantly affects the HIV RTK supply chain management performance**

Mutual understanding and Trust

Trust is a positive attitude that occurs when one supply chain member has assurance in other supply chain member. Trust is essential for flow of information in the supply chain. Risk and reward sharing affects individual supply chain member's behavior and its interaction with other supply chain members. Conflicts of interest are possible to occur when existing risk and reward sharing maximize individuals benefit despite the benefit of all the supply chain members (Cachon and Lariviere, 2005). Trust and commitment are vital for improving performance of supply chain in developing countries (Bianchi and Saleh, 2010).

- **Hypothesis 3 (H3): Mutual understanding and Trust positively and significantly affects the HIV RTK supply chain management performance**

Information Sharing and Flow

According to Simatupang *et al.,* (2006) information sharing and flow is defined as the degree to which critical and proprietary information is communicated to one's supply chain partner. It refers to the access to secretive data between trading partners that allows them to observe the

development of products and orders as they move across various processes in the supply chain (Simatupang *et al.,* 2002).

Shared information can differ from strategic to tactical in nature and could relate to logistics, forecasts, customer orders, markets, schedules, or more. Some of the components that include information sharing consist of: data acquisition, storage, processing, retrieval, presentation, and dissemination of request and forecast data, order status, inventory status and locations, cost-related data, and performance status (Simatupang and Sridharan, 2005).

Information sharing relating key performance metrics and process data, advances supply chain visibility which enables effective decision making by organizations. Information communicated in a supply chain is helpful only if it is applicable, truthful, well-timed, and trustworthy. And accordingly the bullwhip effect can be diminished or removed by sharing information with partners (Simatupang and Sridharan, 2005).

Moreover, information sharing guarantees that the right information is available for the right trading partner in the right place and at the right time. Information sharing with trading partners enables better decisions making by organizations, on the basis of greater visibility making firms and supply chains competitive (Liu and Kumar, 2003).

- **Hypothesis 4 (H4): Information Sharing and Flow positively and significantly affects the HIV RTK supply chain management performance**

Consumers demand

The most of e-commerce, unlike, business-to-consumer is still business-to-business, but consumer anticipations still affect the supply chain. For example, if a customer buys a defective product at a retail store and files a complaint, the company that provided the product to the store may have to find the source of the defect through its supply chain to find the problem. Because of consumer expectations, many companies now hire supply chain management officers or whole supply chain management sections to handle any matters that come up.

- **Hypothesis 5 (H5): Consumers demand positively and significantly affects the HIV RTK supply chain management performance**

Information Technology

Use of information technology such as internet, intranet, software applications packages and discussion support system can be applied to facilitate the information flow with in the supply chain members. Computer technology and Telecommunications allow all the players in the supply chain to communicate among each other. The use of IT permits suppliers, manufacturers, distributors, retailers, and customers to decrease lead time, paperwork, and other needless activities. It is also revealed that managers will experience huge advantages with its use such as the flow of information in a synchronized manner, data inter change and access to information, better customer and supplier relationships, and inventory management not only at the national level but also worldwide (Stanley et al., 2009).

- **Hypothesis 6 (H6): Information Technology positively and significantly affects the HIV RTK supply chain management performance**

Supply chain relationships

Supply chain relationships play a vital role in realizing the firm's goals. The coordination and integration of activities with suppliers and understanding of customer's requirements results in greater benefits for companies. Supply chain management is directly interconnected to relationship management, which embraces suppliers and customers. Strategic supplier partnerships and customer relationships are key components in the supply chain management practices, leading to information sharing (Hines and Samuel, 2007).

- **Hypothesis 7 (H7): Supply Chain Relationship positively and significantly affects the HIV RTK supply chain management performance**

2.2.3.2. Internal factors

Human Resource

Research suggests that human resource practices can affect supply chain management strategy indirectly through organizational culture, resource alignment, and through managerial competencies. The ever-flourishing supply chain management market demands a different approach to the key potential of the economic development, and those are employees with their knowledge and skills. Strengthening of human creativity, novelty and efficiency increases organizational skills and the creation of logistics intellectual capital, which comprises of three significant components such as: structural capital, human capital, and customer capital. An

efficient human resource management facilitates companies to attain a competitive advantage, reduce costs, increase productivity and, market share, and increase profit of the companies in the supply chain (Gómez-Cedeño et al., 2015).

- **Hypothesis 8 (H8): Human Resource positively and significantly affects the HIV RTK supply chain management performance**

Education and Training

Supply chain managers need skills in project management, cost accounting, and e-business or e-procurement systems. They should also have international awareness, good business ethics, and an understanding of legal agreements. Since supply chain management can encompass working across silos and in many different cultures, soft talents like effective presentation, communication, and multicultural understanding are also significant. The achievement of these abilities comes from both formal education and on-the-job training.

- **Hypothesis 9 (H9): Education and Training positively and significantly affects HIV RTK Supply Chain Management Performance**

2.2.4. Facilitators/ Drivers of HIV Rapid Test Kits' Supply Chain Management

HIV Rapid Test kits Supply Chain Management in Ethiopia

HIV rapid test kits are among the program health commodities. It managed by IPLS in similar to other drugs. Selection of the testing procedure will be done at central level contrasting to other products. Otherwise, the quantification, procurement, transportation, distribution, inventory management, storage and LMIS activities are managed the same to other pharmaceuticals (PFSA, 2017).

Based on the consumption data and the targets of HIV testing, quantification and procurement has been done at central level yet each health facility prepare and send its annual quantification for respective EPSA hub. EPSA central receive the kits, store and distribute for EPSA hubs based on the consumption or distribution plan based on the target from regional health bureaus. The integrated pharmaceutical logistics system of the country implies that supplying EPSA hub distributes directly for health facilities or through pass through woredas by integrating with other program drugs (AACAHB, 2017).

However, in the past two years, due to algorithm shifts, HIV Rapid test was distributed by quota system, not by LMIS, through zonal health departments. Due to this and other reasons, there was shortage and low HIV testing in country as well as in Addis Ababa (FMOH, 2017).

Reporting and requesting of HIV RTK

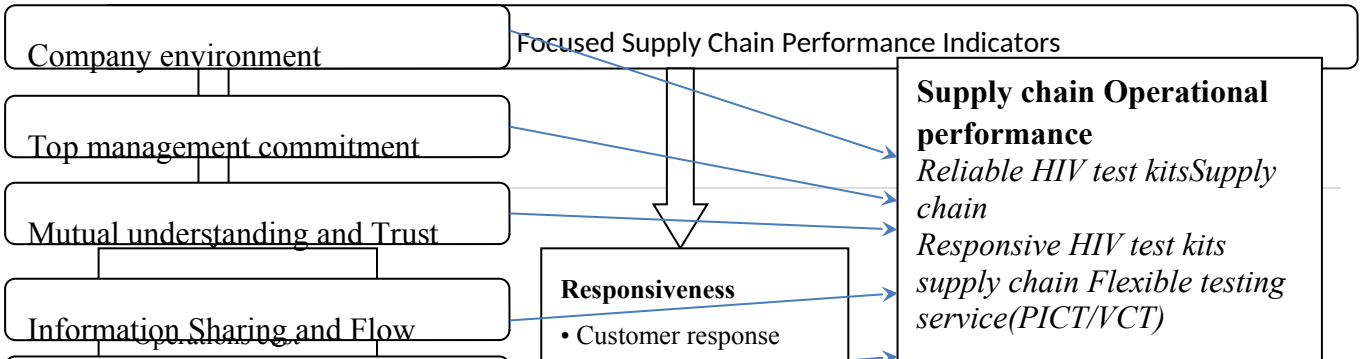
In the IPLS, it is well known that program pharmaceuticals are requested every two months by health facilities and directly delivered by PFSA to these health facilities. But HIV RTK were neither directly delivered by PFSA nor managed through IPLS. As a result, rationing system has been employed by AACAHB and sub cities to distribute HIV RTK to health facilities. This system contributed to poor recording/documentation and inappropriate stock transfer (especially at testing points) (AACAHB, 2017).

After analyzing the assessment, the AACAHB organized a consultative workshop with all stakeholders to discuss on the identified gaps and propose possible solutions. After deep discussion in the workshop, a modified IPLS system was recommended to manage HIV RTK. The modified reporting and requesting system requires: reporting of the number of tests performed (both reactive and non-reactive); the number of clients tested negative or positive that is generated from HMIS and daily registers for RRF and IFRR, respectively; kits used for quality control, training, and invalid tests (AACAHB, 2017).

Reporting and Issuing/Receiving within the health facilities

Health facility stores will use IFRR to issue HIV RTK to testing points. IFRR will be submitted weekly/Bi-weekly (based on store distribution schedule) by properly recording the beginning balance, quantity received, loss/adjustment, and ending balance columns; and test reports. Before the new algorithm (Stat pack, Abon and SD Bioline) due to frequent RTK shortage, HCT focal person of the health facility will request the unigold (the then confirmatory test) for the facility (when there is only one unigold in the facility). Vikia (the then tie-breaker) will be requested by laboratory department only. IFRR will be completed by the testing point coordinator or his/her delegate, verified by HCT focal person and approved by pharmacy head (AACAHB, 2017).

2.3. Conceptual framework of the study



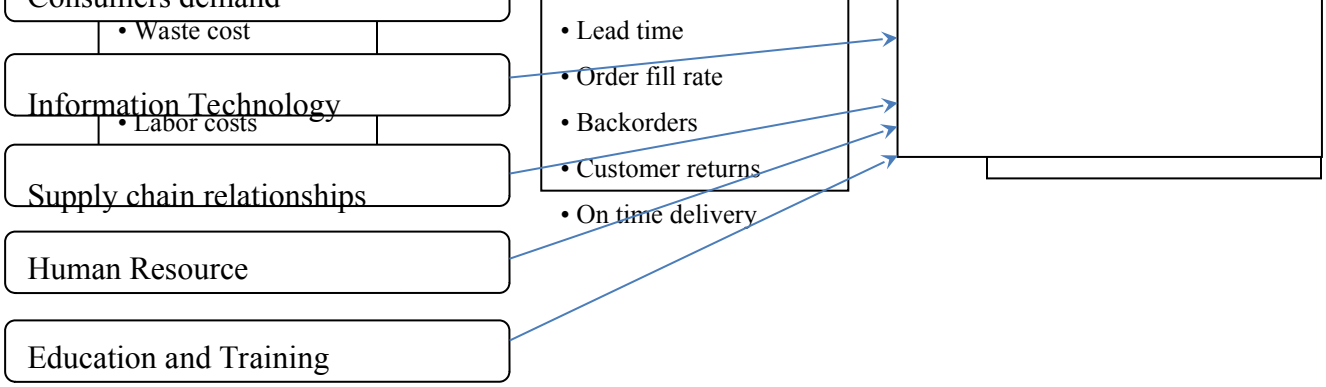


Figure 5: Conceptual Framework of the study (Source: Fekadie (2019), Modified)

2.4. Identified Literature gap

Though there are a number of studies done in different parts of the country regarding pharmaceutical supply chain management in general and some studies particular to HIV RTK supply chain management practice and challenges, supply chain management practice and challenges of HIV RTK performance not done in Addis Ababa. Therefore, the goal of this study were; to assess HIV RTK supply chain management practices (Customers services practices,

Logistics management practices, Inventory management, and Distribution management) in selected health facilities measure the performance of HIV RTK supply chain management in selected health facilities, to identify the major factors that affect HIV RTK supply chain management practices and performance in selected health facilities, and to identify facilitators/ drivers of HIV Rapid test kits' supply chain management in the selected health facilities in Addis Ababa.

CHAPTER THREE: METHODS OF THE STUDY

3. Introduction

This chapter deals with description of the study area, research approach, research design, population and sample, data sources and types, data collection procedures, ethical consideration, data analysis, validity and reliability of the study.

3.1. Description of the study area

Addis Ababa is the capital city of Ethiopia. Administratively Addis Ababa is divided into 10 sub cities and 116 woredas. It has a population of 3,686,068 (City government of Addis Ababa, 2019). Currently (in 2020), there are 6 governmental hospitals and 98 health centers (HCs) in Addis Ababa City Administration Health Bureau. There are a total of 74 ART sites, more than 202 Voluntary Counseling and Testing (VCT) sites and 104 Prevention of Mother to Child Transmission (PMTCT) sites in Addis Ababa. Reports showed that as of June 2013, more than 125,994 patients had been enrolled in HIV/AIDS care, 74,986 patients had ever started ART and 53,677 patients were currently on ART (Addis Ababa City Administration Health Bureau, 2019). HIV/AIDS related care in Ethiopia is mainly dominated by partners with some involvement of national government and other stakeholders. The major donors and sources of HIV/AIDS funding in the country are the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM), the US Presidential Emergency Program for AIDS Relief (PEPFAR) and the UN system (PEPFAR, 2019). Ethiopian Pharmaceutical Supply Agency (EPSA) is a governmental pharmaceutical importer and distributor which is mainly involved in the supply of ARV drugs and test kits to the health facilities. Before January 2011 Ethiopian fiscal year, the Addis Ababa City Administration Health Bureaus (AACAHB) was responsible for distribution of test kits to regional hospitals and health centers (via Sub City) as pass through. Since the beginning of the 2012 EFY RTK distribution was integrated in the IPLS and EPSA took the responsibility of managing its distribution to health facilities in Addis Ababa.

The Addis Ababa City Administration Health Bureau has been monitoring 110 public, 77 private and 17 NGO priority health facilities to achieve three 90s. Regular supportive supervision of SCM of HIV/AIDS has been provided for the above facilities in collaboration with stake holders.

3.2. Research approach

The study used both qualitative and quantitative approaches. Quantitative approach was used to assess the current supply chain management of HIV rapid test kits by using modified standard Logistics Indicator Assessment tool (USAID | DELIVER PROJECT, Task Order 1, 2009) while qualitative approach was used to complement quantitative findings, especially the reasons on LMIS data quality, challenges of SCM performance by interviewing HIV RTK SCM expert working at Addis Ababa City Administration Health Bureau.

3.3. Research design

Health facility based descriptive and explanatory study design was used for quantitative and qualitative data collection techniques to gather the required data from May 5-15, 2020.

3.4. Population and Sample Design

The population of interest for this study was all health centers and hospitals that are under Addis Ababa City Administration Health Bureau. Hence, census method was used. There are 98 health centers and 6 hospitals where all of them are eLMIS "Dagu" facilities and out of which 34 are at early stage of implementation support (practice phase) and 70 are mature sites (6 hospitals and 64 health Centers) from which 13 health centers have encountered Dagu system failure. Therefore, 47 health facilities which are at the early stages of implementation and that have non-functional "Dagu" was excluded due to lack of relevant supply chain data (for those facilities with Non-functional "Dagu") and low use at the early stage of implementation (less than one year) for immature sites. Hence, one year or more of continuous implementation of the system and "Dagu" functionality was used as exclusion criteria. Due to Covid-19 pandemic, 5 health centers were found to be isolation centers for covid-19 and excluded from the study. Therefore, the study included 6 hospitals and 51 health centers.

Quantitative data was collected from 192 respondents (1 HTS focal person, 1 Laboratory head, 1 Pharmacy head, and 1 store manager from each selected health facilities). For qualitative data; two HIV RTK SCM coordinators from EFSA hubs (each from Addis Ababa branch hubs) and responsible HIV RTK supply chain expert from AACAHB was interviewed purposively based on their experience and position in the organization. In order to ensure stratification by type of facilities, location, patient load and performances, the selected health facilities will be categorized under the following group, type of facility (hospital and health center).

3.5. Data source and type

The sources of data for the study were; the eLMIS "Dagu", health facility records and pharmacy store managers, HTS focal persons, Laboratory focal person and pharmacy department head working in the selected 48 health facilities. The primary data was collected by observation, interview and self-administered questionnaire and the secondary data was collected from physical inventory, assessment of facility records, HIV test tally sheet, DHIS-2, RRF, monthly,

quarterly and annual report, Bin card, Model 19 (receiving voucher), Model 22 (Issuing Voucher).

3.6. Data collection Procedure

A combination of structured questionnaire and observation checklist was used to collect data on receiving, storage, distribution, transfer, bi-monthly report, bin-card, internal facility reports, daily testing registration and an interview guide was used to seek the reasons. A quantitative questionnaire was prepared and a total of 192 usable responses were obtained. The response rate was 92.3% percent.

3.7. Methods of data collection

Table 2: Means of media where by questionnaire sent and returned, AACAHB, 2020

Media	# of health facilities Questionnaire sent	Percent	# of health facilities Filled questionnaire received	Percent
Email	2	3.85	3	6.25
Telegram	49	94.23	36	75.00
Hard copy	1	1.92	8	16.67
Messenger	0	0	1	2.08
Total	52	100	48	100
NB:4 Non respondents				

Initially, though the data collection was designed to be collected in person, due to the current Covid-9 pandemic thanks to the advancement of technology, it was collected by using different media after consulting advisor. Majority of the questionnaires (49 (94.23%)) were sent via telegram and only one delivered by hard copy. Most of the filled questionnaires were also returned back via telegram (36 (75%)).

3.8. Method of data analysis and presentation

The collected data was checked manually for completeness and consistencies before it was entered into the computer. The quantitative data was entered into Epi-info version 7 and was analyzed using latest SPSS version 25 software. Descriptive statistics specifically percentage, frequency, mean and inferential statistics specifically Spearman correlation test was done to describe the relationship and effect of the independent variables (factors that affect the HIV RTK SCM performance) and dependent variable (Supply chain operational performance: Reliability, Responsiveness and Flexibility). Qualitative data was analyzed based on content analysis.

3.9. Validity and Reliability test

Validity Test

Before embarking upon data collection, to ensure the validity of the survey tools (questionnaires, data abstraction forms and checklist), pretest was performed in two health facilities that have both PICT and VCT testing modality and was excluded in the study. Expert opinion was also addressed accordingly.

Reliability Test

The reliability test of customer service and supply chain management performance matrixes: reliability, responsiveness and agility was checked by calculating Cronbach's alpha using SPSS version 25 and found out to be 0.915, since it is higher 7 automatically acceptable according to Cronbach and Shavelson (Cronbach and Shavelson, 2004).

Table 3: Reliability test

Variables	# of Variables	Reliability
Supply Chain Management element		
Customer Services	5	0.726
Total	5	0.726
Supply Chain Management Performance		
Reliability	4	0.464
Responsiveness	3	0.899
Agility	3	0.856
Total	10	0.739

Source survey data

3.10. Ethical Considerations

A formal letter was obtained from Addis Ababa University, School of Commerce, Department of Logistic and Supply chain management. Ethical approval was acquired from the Ethics Review Committee of AACAHB. Verbal consent from all respondents was also obtained before enrolling them as the respondents of the study. During the consent process, the respondents were

provided with information regarding the purpose of the study, why and how they are selected as the respondents of the study, and what was expected of them. They were informed that as they can withdraw from the study at any time during the interview process. Participants were assured about confidentiality of the information that was obtained in the course of the study. To assure the anonymity of the respondents' personal identifiers were not used during the data collection.

CHAPTER FOUR: RESULT and DISCUSSION

This chapter covers the findings of the study, interpretation and discussion of the findings by comparing with the existing literature.

4.1. Introduction

A total of 228 questionnaires were planned to be distributed based on the inclusion and exclusion criteria for 57 health facilities (6 hospitals and 51 health centers). But due to Covid-19 pandemic 5 health centers were found to be Covid-19 Isolation center for Covid-19 related cases; hence by

default excluded. Therefore, 208 questionnaires were distributed to 52 health facilities (6 hospitals and 46 health centers) that are under Addis Ababa City Administration Health Bureau. But 16 questionnaires were not collected from four (4) health facilities due to respondents couldn't return the questionnaire. The respondents from each health facilities were, pharmacy heads, Laboratory focal person, VCT/HTS focal person, and pharmacy store manager.

Table 4: Questionnaires sent and received with respect to units in the health facilities, AACAHB, 2020

S. N	Unit	Questionnaire sent	Questionnaire returned	Questionnaire not returned
1	Pharmacy	52	48	4
2	HTS/VCT	52	48	4
3	Laboratory	52	48	4
4	Medical Store	52	48	4
Total		208	192	16

The questionnaires were sent to the respective pharmacy heads by using one of the above mentioned Medias by instructing how the data will be collected and who will be the respondents. Data was collected from 42 (87.5%) health centers and 6 (12.5%) hospitals which are under the Addis Ababa City Administration Health Bureau.

4.3. Demographic information of the respondents

Table 5: Demographic information of the respondents at VCT, Laboratory and Pharmacy units

S. N	Demographic information		VCT/HTS Focal Person	Laboratory Focal Person	Pharmacy Heads	Store manager
1	Gender	Male	20 (41.67%)	34 (70.8%)	26 (54.2%)	23 (47.9%)
		Female	28 (58.33%)	14 (29.2%)	22 (45.8%)	25 (52.1%)
2	Years of Experience at	1-3 years	32 (66.7%)	14 (29.2%)	21 (43.5%)	26 (54.2%)
		4-7 years	13 (27.1%)	24 (50%)	18 (37.5%)	14 (29.2%)

	the respective unit / position					
		8-10 years	0	7 (14.6%)	6 (12.5%)	7 (14.6%)
		Above 10 years	3 (6.3%)	3 (6.3%)	3 (6.3%)	1 (2.1%)
3	Profession	Nurse	35 (72.9%)	NA	NA	NA
		Health Officer	13 (27.1)			
		Laboratory technologist	NA	48 (100%)		
		Pharmacist		NA	38 (79.17%)	27 (56.3%)
		Druggist			10 (20.83%)	21 (43.8%)

All supply chain personnel working in the pharmacy units are all pharmacy professionals. 79.17% (38) and 56.3% (27) of the pharmacy personnel working as pharmacy head and store manager are pharmacist respectively which is higher than the study done by Mekonen (2019) where 95.3% personnel working as store managers are pharmacy professionals. It is also much higher than the study done in health facilities by Annor (2013) where only 61% of facilities had pharmacy professionals. Regarding HIV testing units, all respondents from the laboratory unit working as focal person are laboratory technologists and from VCT/HTS unit 72.9% (37) are Nurses and the rest (27.1%) are Health Officers.

4.3. General information regarding HTS/VCT testing services

Table 6: General information regarding HTS/ VCT testing services, AACAHB, 2020

Knowledge of HIV testing algorithm	Frequency	Percent
Yes	48	100
HIV testing algorithm in the facilities	Frequency	Percent
First test – Stat pack	48	100
Second test – Abon	48	100
Third test – SD Bioline	48	100

Provide VCT service for all	Frequency	Percent
Yes	41	85.4
No	7	14.6
Total	48	100
Units HIV testing being performed in the facility	Frequency	Percent
OPD	43	89.6
TB Clinic	40	83.3
Inpatient wards (Unit)	37	77.1
VCT room	48	100
Antenatal care unit	46	95.8
Laboratory	21	43.8
Other (family planning)	1	2.1
All tests are being performed at each test sites	Frequency	Percent
Yes	24	50
No	24	50
Total	48	100
Has HTS and positive yield target	Frequency	Percent
Yes	46	95.8
No	2	4.2

All personnel working at VCT/HTS units (100%) have the knowledge on the current HIV testing algorithm all of them responded Stat pack, Abon and SD Bioline being the 1st test, 2nd test and 3rd test respectively which is higher that the study by Tulu (2018) where 9.8% of staffs at testing unit perform HIV testing without demonstrating on new testing algorism. 85.4% of the VCT/HTS unit provide HIV testing services for all clients who need HIV testing while the rest (14.6%) provide the service based on the exposure of the client for the HIV virus. According to the result found all the VCT unit (100%) provide HIV testing followed by Antenatal care unit (95.8%), Out Patient Department (89.6%)TB Clinic (83.3%), Impatient ward (unit) (77.1%) and Laboratory (43.8%).

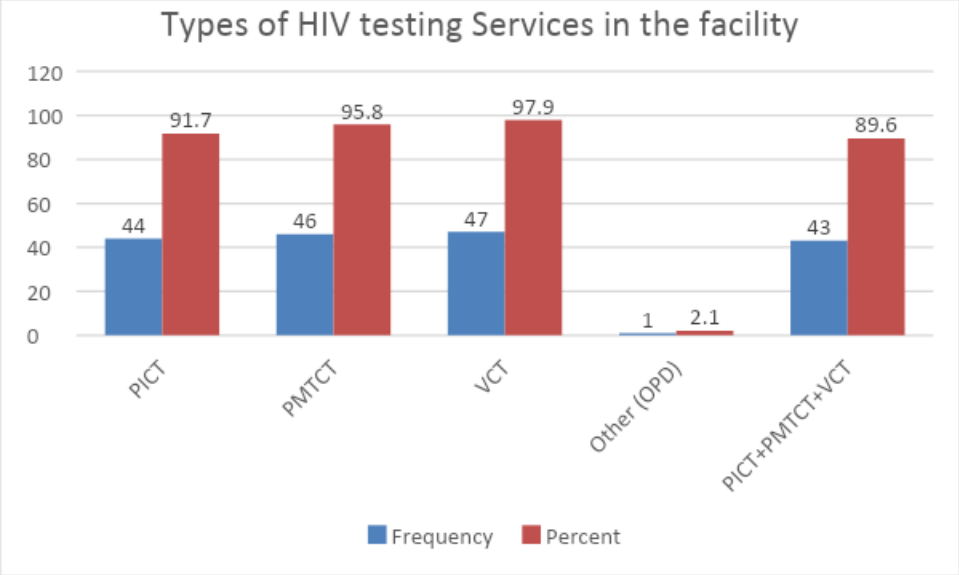


Figure 6: Types of HIV testing services in the facilities

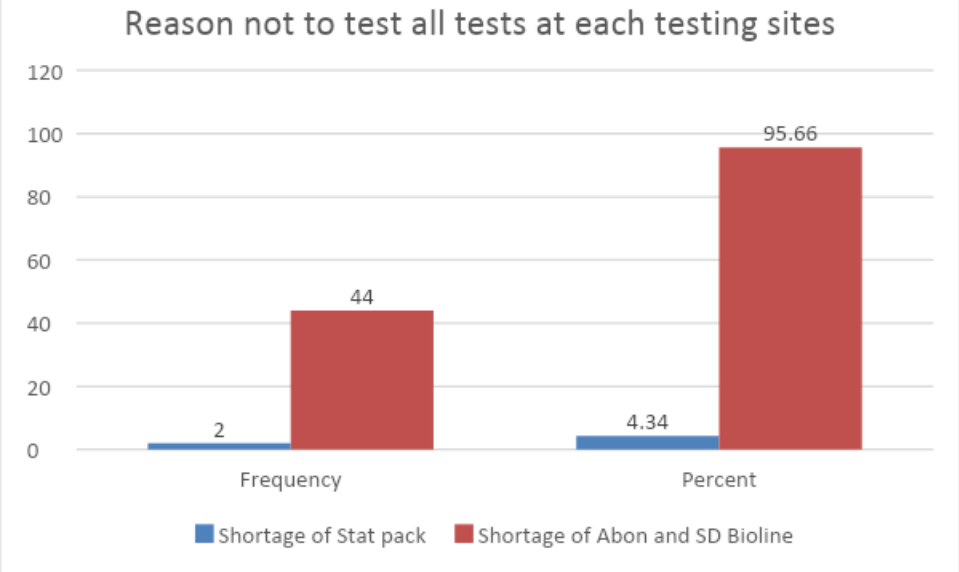


Figure 7: Reason not to test all tests at each testing sites

According to the survey (figure 1) only half (24(50%)) of the health facilities testing units perform all test (1st 2nd and 3rd) when needed and 89.6% (43) provide PICT, PMTCT and VCT which is lower that the study done by Mekonen (2019) where 100% of the facilities provide PICT and VCT. Almost all of the facilities that do not provide all the tests in every test units responded that shortage of Abon and SD Bioline (95.66%) was the main reason (figure 2) followed by expiry of HIV RTK. Majority (95.8%) of the health facilities do have HIV testing and positive yield target.

4.4: Customer services response of HIV testing service provider

Table 7: HIV testing provider customer services, AACAHB, 2020

Customer services parameter	Mean	Sd. Deviation
All the three tests are available whenever needed at all test sites	3.437	1.428
All HIV Rapid test kits have quality	4.083	1.028
HIV Rapid test kit is always available on time when customer need	3.541	1.071
The store manager is always available to refill test kits	4.437	0.822
You receive voucher (model-22) on time	4.687	0.689
Grand Mean	4.037	1.008

For the customer services assessment 5-point Likert scale questionnaire was filled by the respondents by selecting the extent of their agreement for the question from the choice provided with the scale 5, 4, 3, 2, and 1 for the strongly agree, agree, neutral, disagree, and strongly disagree respectively. As quoted by Gebreyesus (2016), based on the response of the respondents (table 7), Mean score range of 1-1.5, 1.5-2.5, 2.5-3.5, 3.5-4.5, and mean above 4.5 means that the respondents were strongly disagree, disagree, neutral, agree, and strongly agree respectively. Hence, based on the finding on table 9, the majority of the respondents were neutral (mean 3.437) the availability of all the three tests (Stat pack, Abon and SD Bioline) whenever needed which was in line with fact that almost all of the facilities that do not provide all the tests in every test units and responded that shortage of Abon and SD Bioline (95.66%) was the main reason followed by expiry of HIV RTK, but they agreed that the tests were available for the clients when they need them (mean=3.541) . The same result was found by Mekonen (2019) the respondents agreed (mean=4) that the HIV RTK are available on time when the customer needs it.

Regarding the RTK quality most of the respondents agreed (mean = 4.083) that the rapid test kits have the acceptable level of quality which is almost similar with Mekonen (2019) where the respondents had agreed with mean 4.0. The respondents also agreed (mean = 4.437) that the store manager is available in the store all the time to issue the HIV RTK when the testing sites request which is again the same with Mekonen (2019) with mean score 4.19.

The respondents in this study strongly agreed (mean 4.683) that voucher 22 will be given to them when they receive RTK from the store which has better score than the study by Mekonen (2019) which has mean score 4.29, this is may be due to the implementation of auditable pharmaceuticals transaction and services initiative by the health facilities in this study.

4.5. General information regarding laboratory unit HIV testing services

Table 8: General information regarding laboratory unit testing services, AACAHB, 2020

Provide HTS in the laboratory unit	Frequency	Percent
Yes	28	58.3
No	20	41.7
Total	48	100
Have training on HTS	Frequency	Percent
Yes	21	75
No	7	25
Total	28	100

Table 9: HIV RTK supply chain management monitoring at laboratory unit, AACAHB, 2020

From which unit do you get the HIV RTKs currently?	Frequency	Percent
Medical store	21	75
Laboratory unit	6	21.4
VCT	1	3.5
ANC	1	3.5
Do you use bin card for HIV RTKs recording?	Frequency	Percent
Yes	24	87.5
No	4	14.3
Total	28	100
Is the bin card updated?	Frequency	Percent
Yes	21	87.5

No	3	12.5
Total	24	100
Reason for not updating bin card	Frequency	Percent
Do not know how	2	50
I don't have time	4	100
What formats do you use to monitor HIV RTK utilization in this unit?	Frequency	Percent
Tally sheets	2	50
HTS Register	3	75
No registration at all	1	25
Do you provide HIV Testing service (HTS) today?	Frequency	Percent
Yes	17	60.7
No	11	39.3
Total	28	100
Did you have HTS interruption in the last 6 months?	Frequency	Percent
Yes	20	71.4
No	8	28.6
Total	28	100
How many times does HTS interruption occurred in the last 6 months?	Frequency	Percent
Once	4	20
Twice	10	50
Three times	3	15
Four and more time	3	15
Total	20	100
What was the reason to stop delivering HTS in the last 6 months?	Frequency	Percent
HIV kits stock out in the facility	9	45

Kits available but not issued	2	10
No useable stock (Expired)	9	45
Which test kits are often stocked out in this unit?	Frequency	Percent
Stat Pack	5	17.8
Abon	14	50
SD Bioline	15	53.6

According to the result of the study 58.3% of the facilities laboratory unit provides HIV testing service in addition to other lab tests, 75% of the respondents are performing the HIV test with formal HIV testing training. The majority (75%) of the laboratory unit under study indicated that they take the HIV RTK from the medical store which is much higher than the study done by Tulu (2018) where only 24.9% of testing sites had staffs taking comprehensive HIV rapid testing using the national approved module. Eighty seven percent of them use bin card to record HIV RTK transaction while 12.5% of them fail to update it from which 50% of them do not know how to use bin card which has much higher performance than the study done by Mekonen (2019) where only 29.5% of testing sites use and update bin cards and according to IPLS survey done by EPSA (2019) only 71.8% of health centers and 76.4% of hospitals update bi card. They also responded that, though they are unable to use bin card they register HIV testing service data on HTS register (75%) and using tally sheets (50%).

According to the result of the study 71.4% of respondents at the laboratory unit encountered HIV testing service interruption in the last 6 months moreover at least once (20%) whereas 50% of them encountered twice, when compared to IPLS survey by EPSA (2019) result where 50% and 39.5% stock out of RTK in the last six month before the survey in hospital and health center respectively, the facilities in this study has higher stock out rate. When compared to the study done by Narkotey (2012) in Ghana, where 77.7% of health facilities encountered stock out before the study, and 22.2% have never experienced stock out, it has less service interruption. Contrary to this study and the study done in Ghana, in South Africa by Mahoro (2013), only 6.1% of logistics tools have stock out data and at the day of visit no stock out observed at health facilities.

Moreover 39.3% of in this study did not provide HTS service at the time of data collection again has higher HIV RTK stocked out facilities at the time of data collection than facilities included in the IPLS survey where 100% of hospitals and 84.7% health centers had HIV RTK at the time of survey. The majority of the respondents (90%) indicated that the cause of service interruptions are HIV RTK stock out and expiry of HIV RTK, since the respondent mentioned that most of the time near expiry HIV RTK being delivered by EPSA. Most of the time Abon and SD Bioline are the once that are stocked out or expired. Some of the participants also indicated that the emergence of Covid-19 pandemic also played its part on the stock out of the HIV RTK since the supply chain of pharmaceuticals in general affected by the pandemic.

4.6 General information regarding HIV RTK SCM at pharmacy unit (pharmacy head)

Table 10: Pharmacy work force at health center and hospital, AACAHB, 2020

# pharmacy Work force	Frequency	Min	Max	SD
At Health center	42	4	11	1.087357
At Hospital	6	18	53	12.16553
Total	48			

According to EPSA (2017) the pharmacy work force is the main player of the HIV RTK supply chain management that the appropriate number of the pharmacy professionals is important to manage and ensure the HIV RTK supply chain management accordingly. Based on the result obtained (table 9) minimum of 4 and maximum of 11 pharmacy professionals are available unlike to hospitals where the minimum and maximum of pharmacy professionals are 18 and 53 respectively this is very much higher than the IPLS survey done by EPSA (2019) where the majority of the health centers had 1-2 pharmacy professionals. According to the key informant, this is due to the preference of pharmacy professionals to work in Addis Ababa so as to pursue their education.

4.7. Facilitators / drivers of HIV Rapid test kits' supply chain management (Supportive supervision Practices and workforce at pharmacy units)

Table 11: General information of the pharmacy Unit, AACAHB, 2020

	Pharmacy head	Store Manager

Did you take store management training?	Frequency	Percent	Frequency	Percent
Yes	NA	NA	32	66.7
No	NA	NA	16	33.3
Total	NA	NA	48	100
Did you have Supply Chain Management related training?	Frequency	Percent	Frequency	Percent
Yes	46	95.8	45	93.8
No	2	4.2	3	6.3
Total	48	100	48	100
Type of training that you taken	Frequency	Percent	Frequency	Percent
IPLS	44	91.7	40	83.3
Supply Chain Over View	18	37.5	9	18.8
SCM and M and E	18	37.5	5	10.4
LCM	9	18.8	6	12.5
Quantification	25	52.1	13	27.1

According to the Ethiopian Pharmaceutical Supply Agency (2019) supply chain related trainings are very important in order to manage pharmaceuticals as per the standard set by the manufacturer specifications. And implementation of IPLS needs a well-trained and motivated work force. Based on the finding of the study, majority of the pharmacy heads (91.7) and store managers (83.3) have taken the integrated pharmaceutical logistic system (IPLS) which is higher that a study done East Wellega by Tiye and Gudeta (2018) where only 75.8% of pharmacy person had IPLS training. And 67.7% of the store managers also took store management training. Not as popular as IPLS, training like quantification (Ph= 52.1%), SM = 27.1%), Supply chain over view (Ph=37.5%), SM = 18.8%), supply chain management and monitoring evaluation (Ph=37.5%), SM = 10.4%), Laboratory Commodity Management (Ph=18.8%), SM = 12.5%). But most respondents also indicated that since 2017 supply chain related trainings are becoming rare and rare. This also backed by the key informant when asked about HIV RTK SCM related capacity building where he responded that before 2017 HIV the capacity building activity was strong that trainings such as IPLS, SCM overview and LCM had been provided to pharmacy

professionals. But, nowadays SCM related trainings are rarely provided due to lack of financial support.

Table 12: Supportive supervision provided for the pharmacy unit, AACAHB, 2020

Did you receive supportive supervision (mentorship) on management of HIV Rapid test kits in last 6 months?	Frequency	Percent
Yes	45	93.8
No	3	6.3
Total	48	100
Who provided the supportive supervision?	Frequency	Percent
AACAHB	32	66.7
Sub City	35	72.9
Lead Hospital	2	4.2
Partners supporting HIV Program	15	31.3
How often in the last 6 months?	Frequency	Percent
Monthly	5	10.4
Quarterly	13	27.1
Bi-annually	2	4.2
Irregularly (No schedule)	25	52.1
Did the supervision help you to improve SCM of HIV Rapid Test Kits?	Frequency	Percent
Yes	42	93.3
No	3	6.7
Total	45	100

The Addis Ababa City Administration Health Bureau has the mandate to provide technical assistance and supervision in logistics management including stock management, ordering, and reporting functions of hospitals and health centers (EPSA, 2017). 93.8% of the health facilities responded that they have been mentored and supervised on the management of HIV RTK in the last six month prior to data collection. 66.7% of the facilities received mentorship and

supervision from AACAHB and 31.3% of them from partners supporting HIV program and 72.9% of health centers received from respective Sub cities.

Regarding the frequency of mentorship/ supervision 52.1% of the health facilities responded irregularly (without schedule) supervision being provided by the supporting body. Only 27.1% of the facilities indicated that the support provided quarterly. Most of the facilities (93.3%) witnessed that the mentorship/ supervision they got from the AACAHB or partners has helped them in a way to improve the SCM of HIV rapid test kits. The result is consistent with the response of the key informant that the AACAHB and respective sub cities has the mandate to provide mentorship/ supervision. Due to different reasons the bureau as well as sub cities didn't provide as per the schedule where each has to provide mentorship/ supervision for hospital and health centers at least quarterly.

4.8. Supply Chain Management Practice: Inventory Management Practices at the Pharmacy store

Table 13: Supply Chain Management Practice: Inventory Management Practices, AACAHB, 2020

Do you conduct physical inventory of HIV RTK in the store?	Frequency	Percent
Yes	48	100
How often do you conduct physical inventory?	Frequency	Percent
Weekly	4	8.3
Bi-weekly	12	25
Monthly	12	25
Bi-monthly	12	25
Quarterly	4	8.3
Annually	4	8.3
Total	48	100

When do you review HIV RTK stock?	Frequency	Percent
When receiving	32	66.7
While issuing	41	85.4
When generating RRF	36	75
Other (When needed)	1	2.1
What recording tool do you use to record HIV RTK SCM transaction?	Frequency	Percent
Bin card	47	97.9
Stock card	9	18.8
Dagu-2 software	27	56.3
Dagu-1 software	4	8.3
Excel spreadsheet	8	16.7

All health facilities responded that they have been conducting physical inventory as part of monitoring the supply chain management of pharmaceuticals but frequency of the physical inventory vary greatly that the majority do it bi-weekly (25%), bi-monthly (25%), and monthly (25%). The respondents mentioned that they have been reviewing the stock of HIV RTK while issuing to testing units (85.4), while receiving (66.7%), when generating RRF for reporting (75%), and when needed (2.1%). Most of the health facilities (97.9%) use bin card to record HIV RTK supply chain transactions and Dagu-2 software (56.3%). According to the key informant health facilities that has functional auditable pharmaceutical transaction and services (APTS) system conduct physical inventory quarterly. But those who doesn't have functional APTS system conduct physical inventory irregularly. Those health facilities who do have active DAGU monitor pharmaceuticals including HIV RTK whenever they want, most of the time while receiving, issuing.

Table 14: Supply Chain Management Practice: ordering of RTK, AACAHB, 2020

What is minimum stock level the facility used to reorder HIV test kits?	Frequency	Percent
Monthly	12	25
Bi-monthly	32	66.7

Quarterly	2	4.2
Other (15 days)	2	4.2
Total	48	100
Was there an emergency order in the last six months for HIV RTK?	Frequency	Percent
Yes	37	77.1
No	11	22.9
Total	48	100
Reason for emergency ordering of HIV RTK	Frequency	Percent
Longer lead time	18	48.65
Late delivery of RRF to EPSA hub	12	32.43
Other (Stock out, expiry, less delivery, service expansion)	7	18.92
Have you ever encountered stock out in the last six months for HIV RTK?	Frequency	Percent
Yes	36	75
No	12	25
Total	48	100
How did you manage the stock out?	Frequency	Percent
By EO	20	55.56
Borrowing from other facilities	13	36.11
Didn't do anything	3	8.33

As per EPSA (2019) health facilities should order pharmaceuticals, medical supplies, reagents and HIV RTK when they are left with minimum of two months of stock; according to the respondents only 66.7% of the health facilities order HIV RTK when they have minimum of two months of stock. Some of the facilities (25%) ordered HIV RTK when they have a month stock on hand. Due to longer lead time of HIV RTK delivery from EPSA (48.65%), late delivery of RRF to EPSA (32.43%) and stock out due to service expansion (18.92%), 75% of respondents reported that they have encountered stock out of HIV RTK in the last six month. And 75% of

the health facilities have encountered HIV RTK stock out in the last six month and they have managed it by placing an emergency order (55.56%), by borrowing from other health facilities (36.11%) and 8.33% of the facilities didn't do anything. When compared to the study done by Narkotey (2012) this study has higher emergency reporting rate where 34.8% of health facilities in Ghana ordered an emergency order while 26.1% of inventory managers borrow from other health facilities.

4.9. Supply Chain Management Practice: Logistics Management Information System (LMIS) practices at pharmacy units

Table 15: Supply Chain Management Practice: HIV RTK Logistics Management Information System (LMIS) practices at pharmacy units

Who did supply HIV RTK is the last 6 months?	Frequency	Percent
AACAHB	3	6.3
Respective Sub City	10	20.8
EPSA No1	25	52.1
EPSA No2	23	47.9
Other (Borrowed from other HF)	1	2.1
Which LMIS format did you use for reporting and ordering HIV rapid test kits?	Frequency	Percent
RRF	48	100
Just letter indicating stock out	5	10.4
What HIV Rapid Test kits data are reported on LMIS?	Frequency	Percent
Stock on hand (Useable)	43	89.6
Quantity received	40	83.3
Consumption	37	77.1
Losses	38	79.2
Adjustments	39	81.3
HIV test report (services report)	36	75

Who is responsible in reporting and ordering HIV Rapid test kits in this facility?	Frequency	Percent
Store Manager	46	95.8
Pharmacy Head	2	4.2
Total	48	100
How often do you report HIV Rapid test kits for your respective supplier?	Frequency	Percent
Monthly	3	6.3
Bi- monthly	43	89.6
Quarterly	2	4.2
Total	48	100

When asked about who supplied HIV RTK in the last six month, all of them responded that they received HIV RTK from their respective EPSA hub (52.1% from EPSA hub-1 and 47.9% from EPSA hub-2. Some also received from respective sub cities (20.8%) and AACAHB (6.3%). The facilities use RRF (100%) logistics management information system format to report and order HIV RTK and the data items that are reported most of the time according to respondents are stock on hand (useable) (89.6%), quantity received (83.3%), consumption data (77.1%), losses (79.2%), adjustments (81.3%), and HIV test report (75%) but IPLS survey showed that only 90% of hospitals and 78.3% of health centers are using RRF to report and resupply HIV RTK. According to EPSA (2017) the store managers have the responsibility to generate RRF, the finding also showed that store managers are the ones that are responsible (95.8%) to prepare and report and order HIV RTK bi-monthly (89.6%) but the study done by Mekonen (2019) showed that 87.5% facilities generate RRF by store manager where 33.33%, 29.2%, and 25% of the health facilities received quarterly, bi-monthly, and monthly respectively, the difference is may be due to the fact that currently HIV RTK SCM is integrated in IPLS.

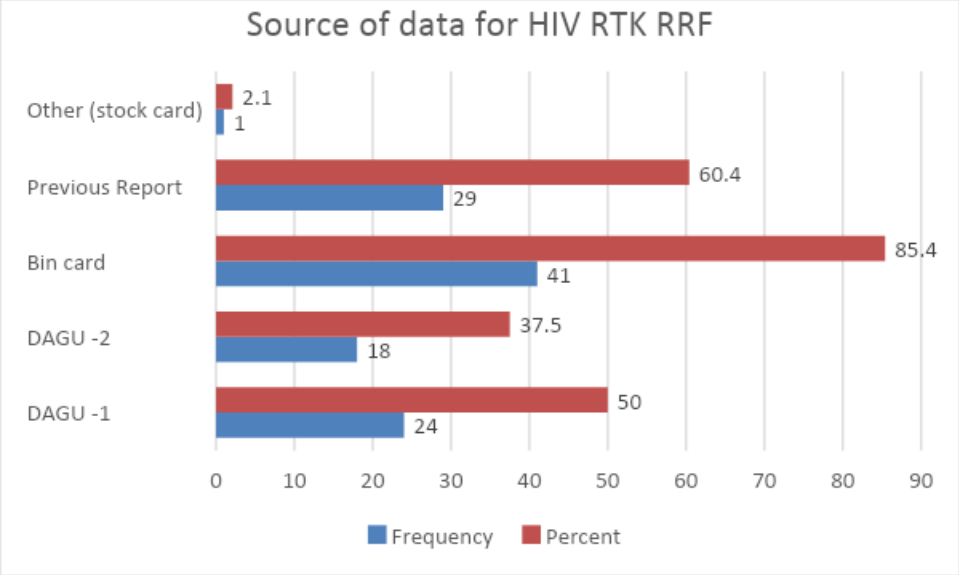


Figure 8: Source of data for HIV RTK RRF, AACAHB, 2020

According to the study bin card (85.4%), previous report (60.4%), Dagu software (version 1and 2) are the main source of information when generating RRF.

As per the key informant, there is a good trend of utilizing logistics forms, at least partially. But, the main problem is with timeliness, completeness and quality of data (at least accuracy and validity). There is good inventory management of health products by DAGU. But, the RRF/IFRR is not fully integrated with DAGU (for the HIV RTK). But, other logistics data of the kits' is captured by the software. The RRF can capture both stock status and consumption of RTK. But, there is some gap in its accuracy. Since there is a strong direction from the bureau/EPSA not to provide with RTK for a facility that do not submit RRF, most facilities regularly submit their bimonthly RRF. Since the HIV RTK RRF is new and not integrated with other program commodities RRF, there is sometimes dalliance of RRF submission. In order to strengthen the HIV rapid test kits LMIS, integration with the existing system, making it to be generated automatically from the DAGU, and training staff working on the SCM of HIV RTK is crucial.

The HIV RTK supply chain management is monitored regularly via SCM M&E which includes: Desk review (checking the RRF's trend, previous Vs current data, timeliness, completeness, validity, and accuracy), Supportive Supervision (mentorship) (site visit), and Review Meeting (quarterly and bi annual)

Table 16: Supply Chain Management Practice: HIV RTK RRF reporting rate, AACAHB, 2020

Did you submit HIV RTK report recently?	Frequency	Percent
Yes	48	100
Reported on time?	Frequency	Percent
Yes	40	83.3
No	8	16.7
What is/are the reasons for late reporting?	Frequency	Percent
Workload	5	62.5
Lack of reporting format (RRF)	1	12.5
Other (DAGU failure)	2	25
Have you ever placed an emergency orders in the past 6 months for HIV Rapid Test kits?	Frequency	Percent
Yes	20	41.7
No	28	58.3
Total	48	100
How many emergency orders were placed in the past 6 months for HIV Rapid Test kits?	Frequency	Percent
One	8	40
Two	6	30
Three or more	6	30

All of the facility in this study have submitted the recent report and 83.3% of the report were submitted on time as per the schedule set by EPSA (2017). Work load (62.5%), Dagu failure (25%) and lack of reporting format (12.5%) were the reason mentioned by the respondents. 41.7% of the facilities have placed an emergency order for HIV RTK one time (40%), two times (30%), and three or more time (30).

According to the key informant there is a data validation system with in the LMIS (consumption data cross checked with test performed data, the data on RRF cross checked with data sent

through HMIS,). Since the facilities are required to report their stock status, consumption and test performance, pilferage and diversion significantly reduced (customers are being benefited instead of denied service due to stock out, wastage being minimized …)

To the contrary, the pull system of distribution is not end to end. The allocation system followed from national up to the regional level. Then, pull system from regional to HF level. This, sometimes create shortage at regional level. The kits are supplied by the government channel only. No private suppliers exist. This created lower flexibility on the supply side (against the demand of the city.

Hence, to ensure the availability of RTK in all testing sites in the facility, IFRR implemented in the HF. This contributed to the availability and proper utilization of the kits at different testing points. And many stakeholders participated from the design phase of the new system to its implementation and M&E part.

4.10. Supply Chain Management Practices: Distribution and transportation practices at pharmacy units

Table 17: HIV RTK Distribution and transportation practices at pharmacy units, AACAHB, 2020

How often do you receive supplies?	Frequency	Percent
Monthly	1	2.1
Bi- monthly	42	87.5
Whenever EPSA hub delivers	5	10.4
Total	48	100
Who is responsible for transporting HIV Rapid test kits to your facility?	Frequency	Percent
Respective EPSA hub Vehicle	44	91.7
Sub city Vehicle	3	6.3
AACAHB Vehicle	1	2.1

Facility Vehicle	15	31.3
Who is responsible in distributing HIV Rapid test kits to testing units currently?	Frequency	Percent
Laboratory Unit	2	4.2
Pharmacy Store Manager	37	77.1
HTS/VCT focal person	9	18.8
Total	48	100
By what LMIS format does testing units report and resupplied HIV Rapid test kits?	Frequency	Percent
RRF	6	12.5
IFRR	42	87.5
Total	48	100
What data does the testing units report on the reporting formats?	Frequency	Percent
-Beginning balance	39	81.3
Quantity received	40	83.3
Losses	41	85.4
Adjustment	39	81.3
Stock on hand (Ending balance)	48	100
What are the data sources for the report?	Frequency	Percent
Bin card (Manual)	44	91.7
Previous report	38	79.2

The majority of the facilities receive HIV RTK bi-monthly (87.5%) as per EPSA manual for IPLS and most of the time HIV RTK is delivered to each facility from respective EPSA hubs by using EPSA vehicle (91.7%). Pharmacy store managers (77.1%) are responsible in most of the facilities in distributing HIV rapid test kits to testing units followed by HTS/VCT focal person (18.8%). The testing units use IFRR (87.5) as per IPLS standard to report and resupply which is similar to Mokenen (2019) and slightly higher the study done by Tilahun *et al* (2016) and all of the facilities reported stock on hand (100%), beginning balance (81.3%), quantity received

(83.3%), losses (85.4%), and adjustment (81.3%). Source of data for the IFRR are bin card (91.7%) and previous report (79.2%). Though, as per EPSA (2017), every health facilities should use IFRR form to report and resupply internally. As far as the type of data concerned on the IFRR, the key informant responded that beginning balance, quantity received, loss, adjustment, stock on hand, and test performance data should be reported.

Table 18: HIV RTK SCM challenges seen in the eyes of the respective pharmacy heads, AACAHB, 2020

External Challenge	**Frequency**	**Percent**
Delivery of near expiry RTK from EPSA	5	10.4
RTK stock out	6	12.5
Late delivery (longer lead time)	7	14.5
RTK not supplied as per RRF	6	12.5
Internal Challenges	**Frequency**	**Percent**
Poor Documentation	4	8.3
Late reporting	6	12.5
Inaccurate data reporting	9	18.75
Inadequate storage space	2	4
Transportation	1	2
Weak internal reporting system	1	2

As per the pharmacy heads, near expiry HIV RTK delivery (10.4%), longer lead time (12.5%) insufficient supply of HIV RTK are among the challenges they faced. The respondents also mentioned that inaccurate data reporting (18.75%), late reporting from DU's (12.5%), poor documentations are the challenges they encounter internally that affects the HIV RTK supply chain management. According to Mekonen (2019), false positive for Stat pack +ve and Abon -ve (31.82%), shortage of HIV TTK (27.7%), lack of training (2.27%), Package of Abon not suitable for distribution (2.7%) were mentioned as external challenge. While, unavailability of Abon and SD Bioline (21.43%), lack of commitment (7.14%), poor recording and reporting (7.14%) were listed as internal challenge.

The key informant also indicated that Pack size of HIV RTK created a huge problem, for instance, the second test (ABON) contains 40 pcs (tests). But, the HFs may not need this much in a long period of time (two years). This has two implications: expiry on one hand and shortage on the other (200 packs: 200*40 = 8000 pcs for 200 HFs. Supplying this huge test may not be feasible for the city administration). In order to mitigate the challenges on HIV RTK SCM practices in health facilities, the respondent recommended packing less tests in a single pack, implement pull system end to end maintain continuous and strong M&E on HIV RTK SCM. The respondents mentioned that the bureau is playing the leading role in harmonizing the HIV RTK reporting, distribution, inventory management, and test performance of health facilities. The bureau is also playing a mediating role between HFs and the supplying agency (EPSA).

4.11. Operational performance of HIV RTK Supply Chain Management

Table 19: Operational performance of HIV RTK Supply Chain Management, AACAHB, 2020

Reliability (N=48)	Mean	Std. Deviation
You provide the right quantity of HIV RTK for testing units as per their request	3.73	1.143
You provide the HIV RTK with correct packaging for testing units	4.417	1.068
Providing HIV RTK which has high quality	3.318	0.945
You give vouchers (model-22) having complete information for testing units during issuing of HIV RTK	3.727	0.647
Grand Mean	3.798	0.950
Responsiveness (N=48)	Mean	Std. Deviation
You issue HIV RTK for testing units as per their schedule	3.833	1.136
You provide the HIV RTK on time after their requisition	4.000	1.129
You deliver the item of HIV RTK testing units requested	3.875	1.248
Grand Mean	3.900	1.171
Agility (N=48)	Mean	Std. Deviation

You adapt quickly to a system of stock managing when there is stock out	4.083	1.145
You adapt quickly to a system of stock managing when new HIV test kits arrived	4.104	1.096
You monitor the overall HIV RTK Value at Risk (VAR)	3.875	1.160
Grand Mean	3.989	1.143

For the operational performance of HIV RTK SCM assessment 5-point Likert scale questionnaire was filled by the respondents by selecting the extent of their agreement for the question from the choice provided with the scale 5, 4, 3, 2, and 1 for the strongly agree, agree, neutral, disagree, and strongly disagree respectively. As quoted by Gebreyesus (2016), based on the response of the respondents, Mean score range of 1-1.5, 1.5-2.5, 2.5-3.5, 3.5-4.5, and mean above 4.5 means that the respondents were strongly disagree, disagree, neutral, agree, and strongly agree respectively.

According to the result of this study respondents are greed (grand mean=3.798) for the operational performance of reliability, that facilities provide the right quantity of HIV RTK for testing units as per their request, the distribution unit provide the HIV RTK with correct packaging for testing units, Providing HIV RTK which has high quality, give vouchers (model-22) having complete information for testing units during issuing of HIV RTK; which is the same with the research done by Mekonen (2019) with grand mean 4.19.

The responders also agreed for the operational performance responsiveness (grand mean =3.9), where the facilities issue HIV RTK for testing units as per their schedule, provide the HIV RTK on time after their requisition, and deliver the item of HIV RTK testing units requested, similar with the study by Mekonen (2019). Regarding the operational performance of agility, the respondents also agreed (grand mean =3.989) that they adapt quickly to a system of stock managing when there is stock out, adapt quickly to a system of stock managing when new HIV test kits arrived, and monitor the overall HIV RTK Value at Risk (VAR) which is also similar to Mekonen (2017) (grand mean = 4.24) though the grand mean was lower in this study.

4.12. Major challenges of HIV RTK supply chain management practices

Table 20: Major challenges of HIV RTK supply chain management practices, AACAHB, 2020

Company environment	Mean	Std. Deviation
Lack of appropriate storage area that is suitable to maintain the quality of HIV RTKs negatively affects the HIV RTKs Supply chain management performance	4.187	1.065
Unavailability of suitable dispatch unit to provide the on time HIV RTK delivery to DU's negatively affects the HIV RTKs Supply chain management performance	4.104	1.096
Lack of storage area suitable to monitor the overall HIV RTKs Value at Risk (VAR) negatively affects the HIV RTKs Supply chain management performance	4.229	0.831
Grand Mean	4.173	0.997
Top management commitment	Mean	Std. Deviation
Lack of top management commitment for resource provision negatively affects the HIV RTKs Supply chain management performance	3.854	1.051
Lack of top management commitment to provide timely training and development to the staff negatively affects the HIV RTKs Supply chain management performance	4.167	0.907
Lack of top management commitment to provide appropriate leadership negatively affects the HIV RTKs Supply chain management performance	4.229	0.972
Grand Mean	4.083	0.972
Mutual understanding and Trust	Mean	Std. Deviation
Lack of mutual understanding and trust with the supplier in availing HIV RTK which has high quality negatively affects the HIV RTKSs Supply chain management performance	4.208	0.713
EPSA does not delivers HIV RTK for your facility as per RRF	3.833	1.190
There is lack of collaboration between your facility and EPSA to adapt quickly to a system of stock managing when there is RTKs stock out	4.291	0.849
Grand Mean	4.110	0.917

Information Sharing and Flow	Mean	Std. Deviation
Lack of providing the necessary receipt voucher to the supplier (EPSA) negatively affects the HIV RTKs Supply chain management performance	4.708	0.581
Lack of appropriate HIV RTK information sharing mechanism with EPSA negatively affects the HIV RTKs Supply chain management performance	4.500	0.652
Lack of the right information sharing and flow negatively affects the HIV RTKs Supply chain management performance	4.500	0.652
Grand Mean	4.569	0.628
Consumers demand	Mean	Std. Deviation
Lack of providing high quality HIV testing as per the consumers demand negatively affects the HIV RTKs Supply chain management performance	4.291	0.682
Unable to provide HIV testing on time as per the consumers demand negatively affects the HIV RTKs Supply chain management performance	4.229	0.856
Lack of adapting mechanism when HIV RTK stock out occurs negatively affects the HIV RTKs Supply chain management performance	4.229	0.856
Grand Mean	4.249	0.798
Information Technology	Mean	Std. Deviation
Lack of automated system to supply the right amount of HIV RTK for testing units negatively affects the HIV RTKs Supply chain management performance	4.062	1.060
Lack of automated system to manage the on time supply of HIV RTK for testing units negatively affects the HIV RTKs Supply chain management performance	4.291	0.824
Lack of automated system affects the overall monitoring of HIV RTK value at risk	4.167	0.974

Grand Mean	4.173	0.952
Supply chain relationships	Mean	Std. Deviation
Lack of good supply chain relation with EPSA negatively affects the HIV RTKs Supply chain management performance	4.187	0.733
Lack strong supply chain relation with EPSA to manage the on time supply of HIV RTK negatively affects the HIV RTKs Supply chain management performance	4.270	0.764
Not having strong supply chain relation with EPSA to adapt quickly to a system of stock managing when there is stock out negatively affects the HIV RTKs Supply chain management performance	4.125	0.866
Grand Mean	4.125	0.787
Human Resource	Mean	Std. Deviation
Lack of enough supply chain experts to supply the right amount of HIV RTK as per request negatively affects the HIV RTKs Supply chain management performance	4.104	1.015
Lack of supply chain experts to manage the on time supply of HIV RTK negatively affects the HIV RTKs Supply chain management performance	4.167	0.930
Unable to ensure the appropriate mix of supply chain experts to quickly adapt HIV RTK stock out negatively affects the HIV RTKs Supply chain management performance	4.104	1.036
Grand Mean	4.125	0.993
Education and Training	Mean	Std. Deviation
Unable to provide supply chain management related capacity building so as to supply the right amount of HIV RTK as per request negatively affects the HIV RTKs Supply chain management performance	3.812	0.981
Lack HIV RTK SCM related training to manage the on time supply of HIV RTK to the DU's negatively affects the HIV RTKs Supply chain management performance	4.104	0.928
Lack of the skill and knowledge how to adapt and manage the HIV RTK	4.270	0.791

stock out negatively affects the HIV RTKs Supply chain management performance		
Grand Mean	4.062	0.9

As indicated in the above table 19, all of the respondents agree (grand mean =4.173) that the lack of proper facility environment (grand mean =4.173), lack of top management support (grand mean = 4.083), and lack of mutual understanding and trust with supplier (grand mean =4.110) negatively affects the supply chain performance of HIV RTK.

Regarding HIV RTK information sharing and flow 100% of the mean score is 4.5 and above with grand mean 4.569, indicating that all of the respondents strongly agree that lack of information sharing and flow negatively affects the supply chain performance of HIV RTK. All of the respondents also agree (grand mean =4.229) consumers demand affects the supply chain performance of HIV RTK. Respondents agree that lack of automated system (grand mean = 4.173) affects to supply the right amount, to manage the on time supply and overall monitoring of HIV RTK supply chain performance.

The respondents agree that supply chain relationships (grand mean = 4.125), Human resources (grand mean = 4.125), and Education and training (grand mean = 4.062) affects positively and significantly the performance of HIV RTK supply chain management.

When asked about the major challenges of HIV RTK supply chain management practices in health facilities under AACAHB; the key informant responded that as far as the health facility environment concerned; testing is performed at different points within a facility (on average 6-8 testing points exist within a health center, 20 – 30 testing points exist within a hospital). This increased the number of packs required at the facility level. By its nature, test kit could not be delivered in pcs (since there is only one buffer for a pack that contains 20 (stat pack), 40 (Abon) and 25 (SD Bioline) pcs of test kits). Thus, the number of testing points should be multiplied by pack of test kits. For instance, a minimum of 8 packs for a health center.

The top management is very much committed since there is a high concern from the city administration to deliver results. But, some managers are not committed as expected. When

mutual understanding and Trust is concerned in HIV RTK SCM, there is sometimes misunderstanding b/n program unit/prescribers/clinicians and the logistics team of the facilities. There is blaming of one another when there are problems on stock availability.

Regarding information Sharing and Flow, on the paper, there is written procedure, but on practice there is gap on communication b/n individuals and organizations. Communicating wrong person/organization is a common problem. This delays a solution to be given for a problem if the right person/org was communicated. The other problem here is in relation to data quality. Even though there is improvement in this regard, there is still gap in this area. This is causing some of the shortages being observed at national/regional/HF level. Data visibility is another problem. There is a project undertaken a by a partner (JSI) to solve this problem. But, still the data visibility is not realized yet. If there was 100% data visibility (at each level), SCM decisions would have been more data driven.

4.14. Correlation between HIV RTK supply chain performance and factors affecting the HIV RTK supply chain performance

In order to analyze the correlation between HIV RTK supply chain performance and factors affecting the HIV RTK supply chain performance, a bivariate correlation, Spearman's correlation was used.

Table 21: Correlation analysis of SCM performance and factors affecting (N=48), AACAHB, 2020

SCMP		EU	EDT	HR	SCRP	IT	CD	ISF	MUT	TMC
EU	Pearson Correlation	0.427**								
	Sig. (2-tailed)	0.002								
EDT	Pearson		0.021							

	Correlation									
	Sig. (2-tailed)		0.890							
HR	Pearson Correlation			0.034						
	Sig. (2-tailed)			0.820						
SCRP	Pearson Correlation				0.259					
	Sig. (2-tailed)				0.075					
IT	Pearson Correlation					0.198				
	Sig. (2-tailed)					0.178				
CD	Pearson Correlation						0.508**			
	Sig. (2-tailed)						0.000			
ISF	Pearson Correlation							0.314*		
	Sig. (2-tailed)							0.030		
MUT	Pearson Correlation								0.373**	
	Sig. (2-tailed)								0.009	
TMC	Pearson Correlation									0.442**
	Sig. (2-tailed)									0.002
** Correlation is significant at the 0.01 level (2-tailed)										
* Correlation is significant at the 0.05 level (2-tailed)										

Where,

SCMP=SCM Performance EDT=Education and Training

HR=Human Resource SCRP=Supply Chain Relationship

IT=Information Technology CD=Consumers Demand,

ISF=Information Sharing and Flow MUT=Mutual Understanding and Trust

EU=Environmental Uncertainty TMC=Top Management Commitment

Null Hypothesis 1 (H1): Environmental uncertainties negatively and significantly affects the HIV RTK supply chain management performance

The Non parametric, Spearman's Correlation shows there is a statistical significance showing positive correlation between HIV RTK SCM performance and Health Facility Environment (N=48, sig (2-tailed) =0.002, P<0.05); Therefore, accepted!

Hypothesis 2 (H2): Top management commitment positively and significantly affects the HIV RTK supply chain management performance

The Non parametric, Spearman's Correlation shows there is a statistical significance showing positive correlation between HIV RTK SCM performance and Top Management Commitment (N=48, sig (2-tailed) =0.002, P<0.05); Therefore, accepted!

Hypothesis 3 (H3): Mutual understanding and Trust positively and significantly affects the HIV RTK supply chain management performance

The Non parametric, Spearman's Correlation shows there is a statistical significance showing positive correlation between HIV RTK SCM performance and Mutual Understand and Trust (N=48, sig (2-tailed) =0.009, P<0.05); Therefore, accepted!

Hypothesis 4 (H4): Information Sharing and Flow positively and significantly affects the HIV RTK supply chain management performance

The Non parametric, Spearman's Correlation shows there is a statistical significance showing positive correlation between HIV RTK SCM performance and Information Sharing and Flow (N=48, sig (2-tailed) =0.030, P<0.05); Therefore, accepted!

Hypothesis 5 (H5): Consumers demand positively and significantly affects the HIV RTK supply chain management performance

The Non parametric, Spearman's Correlation shows there is a statistical significance showing positive and strong correlation between HIV RTK SCM performance and Consumers Demand (N=48, sig (2-tailed) =0.000, P<0.05); Therefore, accepted!

Hypothesis 6 (H6): Information Technology positively and significantly affects the HIV RTK supply chain management performance

Though the facilities agree (Grand mean = 4.173) that Information Technology affects the HIV RTK SCM performance, the Non parametric, Spearman's Correlation shows there is no statistical significance correlation between HIV RTK SCM performance and Information Technology (N=48, sig (2-tailed) =0.178, P>0.05); Therefore, Rejected!

Hypothesis 7 (H7): Supply Chain Relationship positively and significantly affects the HIV RTK supply chain management performance

Though the facilities agree (Grand mean = 4.125) that Supply Chain Relationship affects the HIV RTK SCM performance, the Non parametric, Spearman's Correlation shows there is no statistical significance correlation between HIV RTK SCM performance and Supply Chain Relationship

(N=48, sig (2-tailed) =0.075, P>0.05); Therefore, Rejected!

Hypothesis 8 (H8): Human Resource positively and significantly affects the HIV RTK supply chain management performance

Though the facilities agree (Grand mean = 4.125) that Human Resource affects the HIV RTK SCM performance, the Non parametric, Spearman's Correlation shows there is no statistical significance correlation between HIV RTK SCM performance and Human Resource (N=48, sig (2-tailed) =0.820, P>0.05); Therefore, Rejected!

Hypothesis 9 (H9): Education and Training positively and significantly affects the HIV RTK Supply Chain Management Performance

Though the facilities agree (Grand mean = 4.062) that Education and Training affects the HIV RTK SCM performance, the Non parametric, Spearman's Correlation shows there is no statistical significance correlation between HIV RTK SCM performance and Education and training (N=48, sig (2-tailed) =0.820, P>0.05); Therefore, Rejected!

4.14. Storage and storage conditions

Table 22: Storage guideline in the facility, AACAHB, 2020

No.	Description	Yes	Percent
01.	Products are arranged systematically (pharmacological/ alphabetical)	**43**	**89.6**
02.	Products are arranged so that identification labels are visible.	**44**	**91.7**
03.	The products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) issuing.	**46**	**95.8**
04.	Cartons and products are in good condition, not crushed due to mis-handling. If cartons are open, determine if products are wet or cracked.	**46**	**95.8**
05.	Damaged and/or expired products/HIV RTK are separated from usable products and removed from Shelf	**48**	**100**
06.	Products are protected from direct sunlight	**48**	**100**
07.	Cartons and products are protected from water during all seasons	**48**	**100**

08.	Storage area is always free from harmful insects and rodents. (Check the storage area for traces of rodents [droppings or insects].)	**46**	**95.8**
09.	Security devices (grilles for windows and doors made of glass, and lock and key) are in place	**44**	**91.7**
10	Products that need cold temperature are stored in a functional refrigerator.	**48**	**100**
11.	Storeroom is maintained in good condition (clean, all trash removed, strong shelves, organized boxes)	**44**	**91.7**
12.	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).	**25**	**52.1**
13.	Products are stacked at least 10 cm off the floor.	**36**	**75**
14.	Products are stacked at least 30 cm away from the walls	**32**	**66.7**
15.	Products are stacked no more than 2.5 meters high.	**34**	**70.8**
16.	Fire safety equipment is accessible (any item identified as being used to promote fire safety should be considered).	**41**	**85.4**
17.	Products are stored separately from insecticides and chemicals.	**46**	**95.8**
	Mean	**42.29**	**88.1**

Table 23: materials needed for proper storage, AACAHB 2020

S.N	Are the following equipment's available in the store?	**Yes**	**Percent**
1	Shelves	**46**	**95.8**
2	Pallets	**47**	**97.9**
3	Dust Bin	**44**	**91.7**
4	Trolley	**32**	**66.7**
5	Cold boxes	**40**	**83.3**
6	Refrigerator	**48**	**100**
7	Wall thermometer	**40**	**83.3**
8	Fire extinguisher	**41**	**85.4**
9	Ladder	**37**	**77.1**
10	Table and Chair	**48**	**100**
	Mean	**42.3**	**88.12**

From the table 27, about 42 (87.5%) facilities fulfilled 88.1% of the storage guideline subsequently fulfilling the requirements of EPSA (2017) guideline for storage of pharmaceutics, where the guideline states that facilities who score 80 and above percent of the requirements storage guideline has good storage system. When compared to the national IPLS survey by EPSA (2019) only 21.8% of hospitals and health centers fulfills the requirement. But almost half

of the facilities in this study (52.1%) indicated that the current space and organization is not sufficient for existing products and needs reasonable expansion.

According to the key informant even though the size of the storage conditions not very sufficient, it is not in the worst scenario, especially when it comes to HIV RTK storage. The design of stores (including their location), in most cases, is not as per the standard or in a way that provide us with maximum efficiency. The availability of equipment and furniture is moderate which needs improvement. This is because there is centralized storage and inventory management system in our HFs. Therefore, it enables efficient utilization of resources (HR, infrastructure, warehouse handling equipment etc,). Hence, sticking to storage guidelines, better placed (situated) stores with appropriate size and design, automated system of inventory management, automated LMIS, needed to improve the HIV RTK storage system.

CHAPTER FIVE

5. Summary of Major Findings, Conclusion, and Recommendations

This chapter presents summary of major findings along with concluding remarks based on individual findings. In addition, recommendations based on findings in specific objective areas were presented.

5.1. Summary of Major Findings

HIV RTK SCM practice

- All supply chain personnel working in the pharmacy units were all pharmacy professionals.
- Only half of the health facilities testing units perform all test (1st 2nd and 3rd) when needed and 89.6% (43) provide PICT, PMTCT and VCT all together

- Almost all of the facilities that do not provide all the tests in every test units responded that shortage of Abon and SD Bioline (95.66%) was the main reason followed by expiry of HIV RTK.
- The majority of the respondents were neutral (mean =3.437) the availability of all the three tests (Stat pack, Abon and SD Bioline) whenever needed which was in line with fact that almost all of the facilities that do not provide all the tests in every test units
- Regarding the RTK quality most of the respondents agreed (mean = 4.083) that the rapid test kits have the acceptable level of quality.
- According to the result of the study 71.4% of respondents at the laboratory unit encountered HIV testing service interruption in the last 6 months prior to data collection
- As per EPSA (2019) health facilities should order pharmaceuticals, medical supplies, reagents and HIV RTK when they are left with minimum of two months of stock; according to the respondents only 66.7% of the health facilities order HIV RTK when they have minimum of two months of stock.
- Due to longer lead time of HIV RTK delivery from EPSA (48.65%), late delivery of RRF to EPSA (32.43%) and stock out due to service expansion (18.92%), 75% of respondents reported that they have encountered stock out of HIV RTK in the last six month.
- The facilities use RRF (100%) logistics management information system format to report and order HIV RTK
- All of the facility in this study have submitted the recent report and 83.3% of the report were submitted on time as per the schedule set by EPSA (2017).
- The majority of the facilities receive HIV RTK bi-monthly (87.5%) as per EPSA manual for IPLS and most of the time HIV RTK is delivered to each facility from respective EPSA hubs by using EPSA vehicle (917%).
- Pharmacy store managers (77.1%) are responsible in most of the facilities in distributing HIV rapid test kits to testing units followed by HTS/VCT focal person (18.8%). The testing units use IFRR (87.5) as per IPLS standard to report and resupply

HIV RTK SCM performance

- Respondents agreed (grand mean=3.798) for the operational performance of reliability, that facilities provide the right quantity of HIV RTK for testing units as per their request, the distribution unit provide the HIV RTK with correct packaging for testing units,

Providing HIV RTK which has high quality, give vouchers (model-22) having complete information for testing units during issuing of HIV RTK

- The responders also agreed for the operational performance responsiveness (grand mean =3.9), where the facilities issue HIV RTK for testing units as per their schedule, provide the HIV RTK on time after their requisition, and deliver the item of HIV RTK testing units requested,

Factors that affect HIV RTK SCM performance

- The Non parametric, Spearman's Correlation shows there is a statistical significance positive correlation between HIV RTK SCM performance and Health Facility Environment (N=48, sig (2-tailed) =0.002, P<0.05); Top Management Commitment (N=48, sig (2-tailed) =0.002, P<0.05); Mutual Understand and Trust (N=48, sig (2-tailed) =0.009, P<0.05); Information Sharing and Flow (N=48, sig (2-tailed) =0.030, P<0.05); Consumers Demand (N=48, sig (2-tailed) =0.000, P<0.05); Therefore, accepted!
- Though the facilities agree that Information Technology, Supply Chain Relationship, Human Resource, and Education and Training affects the HIV RTK SCM performance, the Non parametric, Spearman's Correlation shows no statistical significance correlation. Therefore, Rejected!

HIV RTK SCM facilitators

- Majority of the pharmacy heads (91.7) and store managers (83.3) have taken the integrated pharmaceutical logistic system (IPLS). And 67.7% of the store managers also took store management training.
- Most (93.8%) of the health facilities responded that they have been mentored and supervised on the management of HIV RTK in the last six month prior to data collection.
- Most of the facilities (93.3%) witnessed that the mentorship/ supervision they got from the AACAHB or partners has helped them in a way to improve the SCM of HIV rapid test kits.

5.2. Conclusion

Although significant number of health facilities provide PICT, PMTCT and VCT all together only half of the health facilities testing units perform all test (1st, 2nd and 3rd) due to shortage of Abon and SD Bioline and stock out expiry of HIV RTK.

All health facilities have been conducting physical inventory as part of monitoring the supply chain management of pharmaceuticals but frequency of the physical inventory vary greatly that the majority do it bi-weekly, bi-monthly, and monthly. Most of the time health facilities under study have been reviewing the stock of HIV RTK while issuing to testing units, while receiving, and when generating RRF for reporting. Most of the health facilities use bin card to record HIV RTK supply chain transactions and Dagu-2 software (56.3%).

One third of the health facilities do not order HIV RTK when they have minimum of two months of stock as per IPLS. This may lead to stock out of HIV RTK and cause HIV testing interruption. Due to longer lead time of HIV RTK delivery from EPSA, late delivery of RRF to EPSA and stock out due to service expansion, health facilities have encountered stock out of HIV RTK in the last six month.

The majority of the facilities receive HIV RTK bi-monthly as per EPSA manual for IPLS and most of the time HIV RTK is delivered to each facility from respective EPSA hubs by using EPSA vehicle. Pharmacy store managers are responsible in most of the facilities in distributing HIV rapid test kits to testing units. The testing units use IFRR as per IPLS standard to report and resupply HIV RTK.

Near expiry HIV RTK delivery, longer lead time, and insufficient supply of HIV RTK are among the challenges health facilities faced currently. Inaccurate data reporting, late reporting from DU's, poor documentations are the challenges they encounter internally that affects the HIV RTK supply chain management.

The operational supply chain performance (Reliability, Responsiveness, and Agility) of HIV RTK is moderately good for every component. As a result, though, customer service, inventory management, storage, distribution, logistic management information system is good and the supply chain management performance is reliable, responsive and agile, shortage of HIV RTK (especially Abon and SD Bioline) pose the biggest challenges of health facilities.

The Non parametric, Spearman's Correlation shows there is a statistical significance positive correlation between HIV RTK SCM performance and health facility environment, top management commitment, mutual understand and trust, information sharing and flow, and consumers demand. Though the respondents agree that information technology, supply chain relationship, human resource, and education and training affects the HIV RTK SCM performance, the Non parametric, Spearman's Correlation shows no statistical significance correlation with HIV RTK SCM performance.

Though most of the time irregular, majority of the health facilities have been mentored and supervised on the management of HIV RTK by AACAHB, EPSA, and partners supporting HIV program the last six month prior to data collection.

5.3. Recommendations

Based on the finding of the study the following points are recommended to enhance the HIV RTK supply chain management performance and to alleviate the challenges identified.

- **HIV RTK SCM practice**
  - Only half of the health facilities testing units in this study perform all test (1st, 2nd and 3rd) due to shortage of Abon and SD Bioline and stock out expiry of HIV RTK. Hence, increase the availability of the 2nd and 3rd test by limiting the testing unit and or increase the supply
  - To decrease the loss of HIV RTK due to expiry, increase testing by planning HIV testing campaign so as to find positives in MARPS, or transfer to other health facilities if unable to use before expiry date of the HIV RTK
  - Conduct periodic HIV RTK physical inventory as per the recommendation of EPSA so as to monitor the availability of HIV RTK at all times without interruption and order accordingly when necessary.
  - EPSA should deliver HIV RTK having long expiry date with optimum lead time
- **LMIS**
  - Every HIV testing unit should use bin card to make transaction visible and transparent and it has to be updated.

- HIV testing units should use IFRR form when requesting RTK and it should be complete, accurate, and legal.
- The use of Dagu software as a data source was limited for most of the health facilities due to software failure. Have mutual plan with stakeholders to improve the functionality of Dagu 2 so as to manage HIV RTK data transaction and generate important information for informed decision making.
- The HIV rapid test kits RRF should be integrated with the other program medicines RRF so as to decrease the late delivery of RRF to EPSA.
- Strengthen the HIV RTK data validation system with in the LMIS (cross checking consumption data with test performed data, and the data on RRF with data sent through HMIS)

Storage condition

- Even tough, most of the facilities fulfill the minimum requirement of storage condition set by EPSA, significant number of facilities still lack the storage requirement. Therefore, the AACAHB should closely follow health facility to improve the pharmaceutical storage condition.

Factors that affect HIV RTK SCM performance

- The Non parametric, Spearman's Correlation test shows that there is a statistical significance positive correlation between HIV RTK SCM performance and health facility environment, top management, mutual understand and trust, information sharing and flow, and consumers demand. Therefore, health facilities give due attention for these factors so that they don't affect HIV RTK supply management performance negatively.
- The health facilities should also follow the impact of information technology, supply chain relationship, human resource, and education and training, though it is not statistically significant, respondents agreed that they affect the HIV RTK SCM performance.

HIV RTK SCM facilitators

- Supply chain management capacity building, such as IPLS, should be provided for pharmacy personnel and for those working at HIV testing sites to improve the HIV RTK supply chain management performance.
- The AACAHB and EPSA in collaboration with other partners working in HIV program should provide mentorship and supportive supervision.

5.4. Future Research Directions

Even though there are 104 health facilities in Addis Ababa City Administration Health Bureau, the investigation of this research was conducted only on 48 health facilities because of some limitations. Thus, the researcher would like to recommend the next researches to include the rest of health facilities (56) to get more data on factors affecting HIV RTK SCM performance. Furthermore, beneficial if the study involves health facilities that provide HIV testing across the country. In addition, it is also the researcher's recommendation to include the Cost Asset Management Efficiency perspective of SCOR model in the upcoming studies to get more precise results about the performance of HIV RTK SCM.

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Annexes

Addis Ababa University

School of Commerce

Graduate Program in Logistics and Supply Chain Management

Dear Respondents

"Good day.

My name is Gizaw Thomas, currently I am conducting a research on *"Factors affecting the HIV Rapid Test Kits Supply Chain Management Performance: the case of Government Health Facilities in Addis Ababa, Ethiopia"*. This survey is being done in selected health facilities *for the partial fulfillment of Masters of Arts degree from the School of Commerce, Addis Ababa University.* This survey is being done in selected health facilities. Your facility is one of them. The research will provide an empirical snapshot of the current supply chain management performance and challenge of HIV rapid test kits situation at health facility level in Addis Ababa and provide baseline information to track changes and improvements in supply chain management performance over time. Hence, I would like to appreciate your cooperation to respond to my questionnaire and interview. Your participation is completely voluntary. You can refuse to answer any questions and/or withdraw from the study at any time. All of the information collected will be kept strictly confidential. No one other than the researcher will have access to your responses. Your personal identifiers such as your name and that of your health facility will not be used. The principal investigator will not refer to individual respondents or individual facilities in the report, but rather will describe the overall picture of all facilities.

Sincerely,

Gizaw Thomas Mobile: +251-913-27-17-16 Email: gizoyee@yahoo.com

Do I have your permission?

Yes ☐ No ☐ If Yes, Continue

Facility type: Hospital ☐ Health Center ☐

Health facility code: _____

Interviewer: Gizaw Thomas

Date of Interview:_____

Annex 1: Supply Chain Management Practice: Customer Services related Questionnaire to HTS/VCT Focal Person

Unit: _____

Responsibility: _____

1. Gender Male ☐ Female ☐
2. How long have you been working as counseling and testing services provider at this facility?
   1.3 years ☐ 4-7 years ☐ 8-10 years ☐ Above 10 years ☐
3. Do you know the current HIV testing algorithm in your facility? **If your answer is "No"** Go to Q 4 Yes ☐ No ☐
4. If yes to Q2, what are the tests in the algorithm?
   First test Stat Pack ☐ Second test Abon ☐ Third test SD Bioline ☐
   Other (Specify):_____
5. What service of HIV testing being provided at this facility?
   PICT ☐ PMTCT ☐ VCT ☐ Other_____
6. Do you provide VCT services for all volunteers? (Other than MARPS)
   Yes ☐ No ☐
7. Where is HIV testing being performed at this facility? (More than 1 possible)
   OPD case team ☐ TB clinic ☐ Inpatient wards ☐ VCT room ☐
   ANC ☐ Laboratory ☐ Others (specify):_____
8. Do all test being performed at every HIV test sites? Yes ☐ No ☐
9. If No to Q7, Why? Shortage of Stat Pack ☐ Shortage of Abon ☐
   Shortage of SD Bioline ☐ Other (Specify):_____
10. Do you have HTS and positive yield target? Yes ☐ No ☐
11. If Yes to Q9, how much is this year HTS and positive yield target for this facility?
    HTS target:_____ +ve target:_____ I don't know ☐
12. Percentage of HIV testing performance of past six month (up to 2nd quarter)?

Total test: _____HTS target:_____Number of confirmed +ve:__Expected +ve :_____

13. Have you encountered any challenges regarding SCM of HIV RTK?

    Yes ☐ No ☐

14. If yes, what are the challenges you encountered?

    What are the challenges: _____

Annex 2: Supply Chain Management Practice: Customer Services related Questionnaire to laboratory Focal Person

Unit: _____

Responsibility: _____

1. Gender Male ☐ Female ☐
2. How long have you been working as counseling and testing services provider at this facility?

   1.3 years ☐ 4-7 years ☐ 8-10 years ☐ Above 10 years ☐
3. Do you provide HTS service at this unit? Yes ☐ No ☐ , if no go to, 15
4. Have you trained on HTS? Yes ☐ No ☐
5. From which unit do you get the HIV RTKs currently?

   Medical store ☐ Laboratory unit ☐ Other (Specify):_____
6. Do you use bin card for HIV RTKs recording? Yes ☐ No ☐ if no go to, 10
7. IF yes, for question "7", is it updated? Yes ☐ No ☐
8. If No Q "7", Why? Do not have bin card ☐ Do not know how ☐

   I don't have time ☐ Other (Specify): _____
9. If No for question No "7", what formats do you use to monitor HIV RTK utilization?

   Tally sheets ☐ HTS Register for HIV RTKs ☐ Other (specify):_____
10. Do you provide HIV Testing service (HTS) today? Yes ☐ No ☐
11. Did you have HTS interruption in the last 6 months? Yes ☐ No ☐
12. If yes for question "11", how many times in the last 6 months?

    Once ☐ Twice ☐ Three times ☐ Four and above ☐
13. What was the reason to stop delivering HTS in the last 6 months? (More than 1 reason possible) HIV kits stock out in the facility ☐ Kits available but not issued ☐

    No useable stock (Expired) ☐ Other (specify):_____
14. Which test kits are often stocked out? (More than 1 reason possible)

Stat Pack ☐ Abon ☐ SD Bioline ☐

15. What are the challenges of HIV Rapid Test kit Supply Chain Management? (on availability quantification, distribution, storage, reporting, transportation of these kits, HTS customer service)
    External Challenge: _____
    Internal Challenges: _____

Annex 3: Supply Chain Management Practice: Customer Service Management practices

With regard to customer service, please thick 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 = strongly agree, 4 = agree, 3= neutral, 2= disagree, 1 = strongly disagree.

S.N	Customer service	5	4	3	2	1
1	All the three tests are available whenever needed at all test sites					
2	All HIV Rapid test kits have quality					
3	HIV Rapid test kit is always available on time when customer need					
4	The store manager is always available to refill test kits					
5	You receive voucher (model-22) on time					

Annex 4: Questionnaire to identify facilitators/ drivers of HIV Rapid test kits' supply chain management (Supportive supervision Practices and workforce at pharmacy units)

Health facility code: _____

Date: _____

1. Gender Male ☐ Female ☐
2. What is your profession? Pharmacist ☐ Druggist ☐ Other (Specify):_____
3. How long have you been working as counseling and testing services provider at this facility?
   1.3 years ☐ 4-7 years ☐ 8-10 years ☐ Above 10 years ☐

4. How many staffs are working in the Pharmacy units? ____
5. Did you have Supply Chain Management related training? Yes ☐ No ☐ if no go to, 7
6. If yes, for question "5", can you mention the type of training that you took?
   IPLS ☐ Supply Chain over View ☐ SCM M and E ☐ LCM ☐ Quantification and forecasting ☐ Other (Specify):_____
7. Did you receive supportive supervision (mentorship) on management of HIV Rapid test kits in last 6 months? Yes ☐ No ☐ if no go to, 11
8. If yes, for question "7" who provided the support? AACAHB ☐ Sub City ☐ Lead Hospital ☐ Partners supporting HIV Program ☐Other (Specify): _____
9. If yes for question "7" how often in the last 6 months? Monthly ☐ Quarterly ☐ Bi-annually ☐ Irregularly (No schedule) ☐ Other (specify):_____
10. Did the supervision help you to improve SCM of HIV Rapid Test Kits? ? Yes ☐ No ☐
11. What are the challenges of HIV Rapid Test kit Supply Chain Management? (on availability quantification, distribution, storage, reporting, transportation of these kits, HTS customer service)
    External Challenge: _____
    Internal Challenges: _____

Annex 5: Supply Chain Management Practice: Inventory Management Practices at the Pharmacy store (Self-Administered Questionnaire related to Pharmacy Store Manager)

Health facility code: _____

Unit: _____

1. Gender Male ☐ Female ☐
2. What is your profession? Pharmacist ☐ Druggist ☐ Other (Specify):_____
3. How long have you been working as counseling and testing services provider at this facility?
   1.3 years ☐ 4-7 years ☐ 8-10 years ☐ Above 10 years ☐
4. Did you take store management training? Yes ☐ No ☐

5. Did you take Supply Chain Management related training? Yes ☐ No ☐
6. If yes, for question "5", can you mention the type of training that you took?
   IPLS ☐ Supply Chain over View ☐ SCM M and E ☐ LCM ☐ Quantification and forecasting ☐ Other (Specify):_____
7. Do you conduct physical inventory of HIV RTK in the store? Yes ☐ No ☐
8. If yes for question "7" how often do you conduct physical inventory?
   Weekly ☐ Bi-weekly ☐ Monthly ☐ Bi-monthly ☐ Quarterly ☐ Annually ☐
9. When do you review HIV RTK stock? When receiving ☐ While issuing ☐ When generating RRF ☐ Other (specify):_____
10. What recording tool do you use to record HIV RTK SCM transaction? Bin card ☐ Stock card ☐ Dagu-2 software ☐ Excel spreadsheet ☐Other (Specify): _____
11. What is minimum stock level the facility used to reorder HIV test kits?
    Monthly ☐ Bi-monthly ☐ Quarterly ☐ Other (specify):_____
12. Have you ever encountered emergency order level in the last six months for HIV RTK? Yes ☐ No ☐ , if no go to 14
13. If yes to question "12", what was the reason? Longer lead time ☐ Late reporting ☐ Late delivery of RRF to EPSA hub ☐ Other (specify):_____
14. Have you ever encountered stock out in the last six months for HIV RTK? Yes ☐ No ☐ , if no go to 16
15. If yes to question "14", how did you manage the stock out? By EO ☐ Borrowing from other facilities ☐ Didn't do anything ☐ Other (specify):_____
16. What are the challenges of HIV Rapid Test kit Supply Chain Management? (on availability quantification, distribution, storage, reporting, transportation of these kits, HTS customer service)
    External Challenge: _____
    Internal Challenges: _____

Annex 6: Supply Chain Management Practice: Logistics Management Information System (LMIS) practices at pharmacy units

1. Who did supply HIV RTK is the last 6 months? AACAHB ☐ Respective Sub City ☐ EPSA No1 ☐ EPSA No2 ☐ Other (Specify):_____
2. Which LMIS format did you use for reporting and ordering HIV rapid test kits? RRF ☐ Just letter indicating stock out ☐ Via email ☐ Other (Specify):___
3. What HIV Rapid Test kits data are reported on LMIS? Stock on hand (Useable) ☐ Quantity received ☐ Consumption ☐ Losses ☐ Adjustments ☐ HIV test report (services report) ☐ Other (Specify):_____
4. Who is responsible in reporting and ordering HIV Rapid test kits in this facility? Store Manager ☐ Supply Chain Manager ☐ Pharmacy Head ☐Store Manager Other (Specify):_____
5. How often do you report HIV Rapid test kits for your respective supplier? Monthly ☐ Bi- monthly ☐ Quarterly ☐ Whenever Stocked out ☐ Other (Specify)__
6. What are the data sources for the report? DAGU-2 ☐ DAGU-1 ☐ Bin card (Manual) ☐ Previous report ☐ Other (Specify):_____
7. Did you submit HIV RTK report recently? Yes ☐ No ☐ , if no go to 9
8. If yes for question "7", is it reported on time? Yes ☐ No ☐
9. If No for question "8", what is/are the reasons? Power interruption ☐ Workload ☐ Lack of reporting format (RRF) ☐ Other (Specify):_____
10. Have you ever placed an emergency orders in the past 6 months for HIV Rapid Test kits? Yes ☐ No ☐ , if no go to 12
11. If yes to question "10", how many emergency orders were placed in the past 6 months for HIV Rapid Test kits? One ☐ Two ☐ Three or more ☐ Never placed an emergency order ☐ Other (specify):_____
12. What are the challenges of HIV Rapid Test kit Supply Chain Management? (on availability quantification, distribution, storage, reporting, transportation of these kits, HTS customer service)
    External Challenge: _____
    Internal Challenges: _____

Annex 7: Supply Chain Management Practices: Distribution and transportation practices at pharmacy units

1. How often do you receive supplies? Monthly ☐ Bi- monthly ☐ Quarterly ☐Whenever EPSA hub delivers ☐ Other (Specify):_____
2. Who is responsible for transporting HIV Rapid test kits to your facility? Respective EPSA hub Vehicle ☐ Sub city Vehicle ☐ AACAHB Vehicle ☐ Facility Vehicle ☐ Other (Specify):_____
3. Who is responsible in distributing HIV Rapid test kits to testing units currently? Laboratory Unit ☐ Pharmacy Store Manager ☐ HTS/VCT focal person ☐

Other (Specify):_____

4. By what LMIS format does testing units report and resupplied HIV Rapid test kits?
   RRF ☐ IFRR ☐ Old model 20 ☐ Model 20/Health ☐ Other (Specify):_____
5. What data does the testing units report on the reporting formats?
   Beginning balance ☐ Quantity received ☐ Losses ☐ Adjustment ☐
   Stock on hand (Ending balance) ☐ Other (Specify):_____
6. What are the data sources for the report?
   Bin card (Manual) ☐ Previous report ☐ Other (Specify):_____
7. What are the challenges of HIV Rapid Test kit Supply Chain Management? (on availability quantification, distribution, storage, reporting, transportation of these kits, HTS customer service)
   External Challenge: _____
   Internal Challenges: _____ \

Annex 8: Operational performance of HIV RTK Supply Chain Management

Regarding the supply chain performance (Reliability, Responsiveness and Agility) of your health facility, please thick the appropriate box to indicate the extent to which you agree or disagree with each statement. The item scales are five-point Likert scales with 5 = strongly agree, 4 = agree, 3= neutral, 2= disagree, 1 = strongly disagree.

S.N	Reliability Statement	1	2	3	4	5
1	You provide the right quantity of HIV RTK for testing units as per their request					
2	You provide the HIV RTK with correct packaging for testing units					
3	Providing HIV RTK which has high quality					
4	You give vouchers (model-22) having complete information for testing units during issuing of HIV RTK					
	Responsiveness Statement	**1**	**2**	**3**	**4**	**5**
1	You issue HIV RTK for testing units as per their schedule					
2	You provide the HIV RTK on time after their requisition					
3	You deliver the item of HIV RTK testing units requested					
	Agility Statement	**1**	**2**	**3**	**4**	**5**
1	You adapt quickly to a system of stock managing when there is stock out					
2	You adapt quickly to a system of stock managing when new HIV test kits arrived					
3	You monitor the overall HIV RTK Value at Risk (VAR)					

Annex 9: Major challenges of HIV RTK supply chain management practices

Regarding the challenges that affect the HIV RTK supply chain performance (Company environment, Top management commitment, Mutual understanding and Trust, Information Sharing and Flow, Consumers demand, Information Technology, Supply chain relationships, Human Resource, and Education and Training) of your health facility, please thick the appropriate box to indicate the extent to which you agree or disagree with each statement. The item scales are five-point Likert scales with 5 = strongly agree, 4 = agree, 3= neutral, 2= disagree, 1 = strongly disagree.

S.N	Company environment	1	2	3	4	5
1	Lack of appropriate storage area that is suitable to maintain the quality of HIV RTKs negatively affects the HIV RTKs Supply chain management performance					
2	Unavailability of suitable dispatch unit to provide the on time HIV RTK delivery to DU's negatively affects the HIV RTKs Supply chain management performance					
3	Lack of storage area suitable to monitor the overall HIV RTKs Value at Risk (VAR) negatively affects the HIV RTKs Supply chain management performance					
	Top management commitment	**1**	**2**	**3**	**4**	**5**
1	Lack of top management commitment for resource provision negatively affects the HIV RTKs Supply chain management performance					
2	Lack of top management commitment to provide timely training and development to the staff negatively affects the HIV RTKs Supply chain management performance					
3	Lack of top management commitment to provide appropriate leadership negatively affects the HIV RTKs Supply chain management performance					
	Mutual understanding and Trust	**1**	**2**	**3**	**4**	**5**
1	Lack of mutual understanding and trust with the supplier in availing HIV RTK which has high quality negatively affects the HIV RTKSs Supply chain management performance					
2	EPSA does not delivers HIV RTK for your facility as per RRF					
3	There is lack of collaboration between your facility and EPSA to adapt quickly to a system of stock managing when there is RTKs stock out					
	Information Sharing and Flow					
1	Lack of providing the necessary receipt voucher to the supplier (EPSA) negatively affects the HIV RTKs Supply chain management performance					

2	Lack of appropriate HIV RTK information sharing mechanism with EPSA negatively affects the HIV RTKs Supply chain management performance					
3	Lack of the right information sharing and flow negatively affects the HIV RTKs Supply chain management performance					
	Consumers demand					
1	Lack of providing high quality HIV testing as per the consumers demand negatively affects the HIV RTKs Supply chain management performance					
2	Unable to provide HIV testing on time as per the consumers demand negatively affects the HIV RTKs Supply chain management performance					
3	Lack of adapting mechanism when HIV RTK stock out occurs negatively affects the HIV RTKs Supply chain management performance					
	Information Technology					
1	Lack of automated system to supply the right amount of HIV RTK for testing units negatively affects the HIV RTKs Supply chain management performance					
2	Lack of automated system to manage the on time supply of HIV RTK for testing units negatively affects the HIV RTKs Supply chain management performance					
3	Lack of automated system affects the overall monitoring of HIV RTK value at risk					
	Supply chain relationships					
1	Lack of good supply chain relation with EPSA negatively affects the HIV RTKs Supply chain management performance					
2	Lack strong supply chain relation with EPSA to manage the on time supply of HIV RTK negatively affects the HIV RTKs Supply chain management performance					
3	Not having strong supply chain relation with EPSA to adapt quickly to a system of stock managing when there is stock out negatively affects the HIV RTKs Supply chain management performance					
	Human Resource					
1	Lack of enough supply chain experts to supply the right amount of HIV RTK as per request negatively affects the HIV RTKs Supply chain management performance					
2	Lack of supply chain experts to manage the on time supply of HIV RTK negatively affects the HIV RTKs Supply chain management performance					
3	Unable to ensure the appropriate mix of supply chain experts to quickly adapt HIV RTK stock out negatively affects the HIV RTKs Supply chain management performance					
	Education and Training					
1	Unable to provide supply chain management related capacity					

	building so as to supply the right amount of HIV RTK as per request negatively affects the HIV RTKs Supply chain management performance					
2	Lack HIV RTK SCM related training to manage the on time supply of HIV RTK to the DU's negatively affects the HIV RTKs Supply chain management performance					
3	Lack of the skill and knowledge how to adapt and manage the HIV RTK stock out negatively affects the HIV RTKs Supply chain management performance					

Annex 10: Data Abstraction-formats and Observation Check lists

Table 1: Stock Status

Groundwork: Be sure you have access to the

- Usable and Expired HIV RTK
- Bin cards for the HIV RTK
- The store personnel who manages the HIV RTK stock

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

S.N	Tracer Drugs (TD)	Units of count	Source of HIV RTK	Bincard available? (Y/N)	Bincard updated. (Y/N)	Balance on bincard (#)	Stock-out more than 2 months? (Y/N)	Number of stock-outs (most recent 12 months) (#)	Total number of days of stock-out (s) (#)	Total units issued (most recent 12 months) (#)	Number of months of issue data available(#)	Physical count(in storeroom) (#)	Stock-out today? (Y/N)	Quantity of expired products(#)
	1	2	3	4	5	6	7	87	9	10	11	12	13	14
1	Stat Pack	20												

2	Abon	40												
3	SD Bioline	25												

Comments:

Column:

1. *Name of the HIV RTK _____*
2. *Unit*
3. *Source of the HIV RTK*
4. *If the bin card is available, answer Y for yes or N for no.*
5. *If the bin card had been updated within the last 30 days, answer Y for yes or N for no. Note: If the bin card was last updated with the balance of 0 and the facility has not received any resupply, consider the bin card up-to-date.*
6. *Record the balance on the bin card. Note: If the answer to column 4 is N, record NA in this column.*
7. *Record if the facility has had any stock out of the HIV RTK during the most recent 12 full months before the survey, answer Y for yes or N for no. Note: If the answer to column 4 is N, record NA in this column.*
8. *Record how many times the HIV RTK stocked out during the most recent full 12 months before the survey. Note: If the answer to column 4 is N, record NA in this column.*
9. *Record the total number of days the HIV RTK was stocked out during the most recent full 12 months before the survey. Note: If the answer to column 4 is N, record NA in this column. If the HIV RTK was stocked out from both sources, note the specific dates of stock outs in the comments section.*
10. *Record the quantity of HIV RTK issued from the store during the most recent 12 months before the survey. Note: If the answer to column 4 is N, record NA in this column.*
11. *Record the number of months the issued data represents; record the months for which there is any data recorded, including 0. Note: If column 4 is N, record NA in this column.*
12. *Physical count (Record the quantity of HIV RTK)*
13. *Record if the facility is experiencing a stock out of the product on the day of the visit, according to the physical count (# 12), answer Y for yes or N for no.*
14. *Record the quantity of expired products. Count all expired products on the day of the visit. If there are products that are near expiry (within one week), note in the comments section.*

TABLE2: Quantity Ordered and Quantity Received

Name of HIV RTK	Unit	Quantity Ordered for Last Order Period	Date Order Placed	Quantity Received in Last Order	Date Order Received
1	**2**	**3**	**4**	**5**	**6**
Stat Pack					
Abon					
SD Bioline					

Comments:

Column:

1. *Name of HIV RTK*
2. *Unit*
3. *Enter the quantity ordered for the last order period for which products should have been received (i.e., don't include open orders whose expected receipt date has not arrived)*
4. *Enter the date the order was placed*

5. *Enter the quantity received in the last order*

6. *Enter the date the order was received*

Table 3: Storage and storage conditions

No.	Description	Yes	No	Comments
01.	Products are arranged systematically (pharmacological/ alphabetical)			
02.	Products are arranged so that identification labels are visible.			
03.	The products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) issuing.			
04.	Cartons and products are in good condition, not crushed due to mis-handling. If cartons are open, determine if products are wet or cracked.			
05.	Damaged and/or expired products/HIV RTK are separated from usable products and removed from Shelf			
06.	Products are protected from direct sunlight			
07.	Cartons and products are protected from water during all seasons			
08.	Storage area is always free from harmful insects and rodents. (Check the storage area for traces of rodents [droppings or insects].)			
09.	Security devices (grilles for windows and doors made of glass, and lock and key) are in place			
10	Products that need cold temperature are stored in a functional refrigerator.			
11.	Storeroom is maintained in good condition (clean, all trash removed, strong shelves, organized boxes)			
12.	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).			
13.	Products are stacked at least 10 cm off the floor.			
14.	Products are stacked at least 30 cm away from the walls			
15.	Products are stacked no more than 2.5 meters high.			
16.	Fire safety equipment is accessible (any item identified as being used to promote fire safety should be considered).			
17.	Products are stored separately from insecticides and chemicals.			
18.	Are the following equipment available in the store?			
	Shelves			
	Pallets			
	Dust Bin			
	Trolley			
	Cold boxes			

	Refrigerator			
	Wall thermometer			
	Fire extinguisher			
	Ladder			
	Table and Chair			

(PFSA, 2017)

Annex 11: Interview Guide

1. How do you assess the HIV RTK SCM practice (Customers services practices, Logistics management practices, Inventory management, and Distribution management) in health facilities under Addis Ababa City Administration Health Bureau giving emphasis to the strengths and limitations?

   Probing (1): With respect to:
   - a. Availability of RTK in all testing sites in the facility
   - a. LMIS efficiency regarding RTK SCM practice
   - b. Collaboration with stakeholders

   Probing (2): What conditions have facilitated or hindered the HIV RTK SCM practice and what barriers did you encounter?
   Probing (3): What is your recommendation for improving the HIV RTK SCM practice in those facilities?
   Probing (4): What is the role of AACAHB regarding the above points?

2. How do you rate the performance of HIV RTK supply chain management in health facilities under Addis Ababa City Administration Health Bureau (With respect to Responsiveness, Agility and Flexibility)?

   Probing (1): What conditions have facilitated for the performance of HIV RTK supply chain management and what barriers do you encountered?

   Probing (2): What is your recommendation for improving the performance of HIV RTK supply chain management further?

   Probing (3): What is the role of AACAHB regarding the above points?

3. What are the major challenges of HIV RTK supply chain management practices in health facilities under Addis Ababa City Administration Health Bureau?

   Probing (1): With respect to:

   - Facility environment
   - Top management commitment
   - Mutual understanding and Trust
   - Information Sharing and Flow
   - Consumers demand
   - Information Technology
   - Supply chain relationships
   - Human Resource
   - Education and Training

   Probing (1): What is the role of AACAHB regarding the above points?

4. What are the facilitators or drivers of HIV Rapid test kits' supply chain management performance?

   Probing (1): Internal facilitators or drivers

   Probing (1): External facilitators or drivers

5. How do you assess the pharmaceutical store and storage condition in the health facility giving emphasis to the Strengths and limitations?

   Probing (1): With respect to:

   a. The size and design of the store
   b. Equipment and furniture
   c. Handling RTK

   Probing (2): What facilitates for the current level of strength in the storage and storage practice in the facility and what barriers do you encountered?

Probing (3): What is your recommendation for improving the pharmaceutical store and storage practice further? How do you assess the LMIS in managing RTK in the health facility giving emphasis to the strengths and limitations?

Probing (1): With respect to:

I. Using logistics forms?

II. Using computer software (DAGU)?

III. Reporting of the stock status and consumption of RTK?

Probing (2): What conditions facilitates for using LMIS in managing RTK and what barriers do you encountered?

Probing (3): What is your recommendation for improving the LMIS further?

6. Is there any mechanism to monitor the performance of RTK SCM in those facilities under Addis Ababa City Administration Health Bureau?

   Probing (1): how?

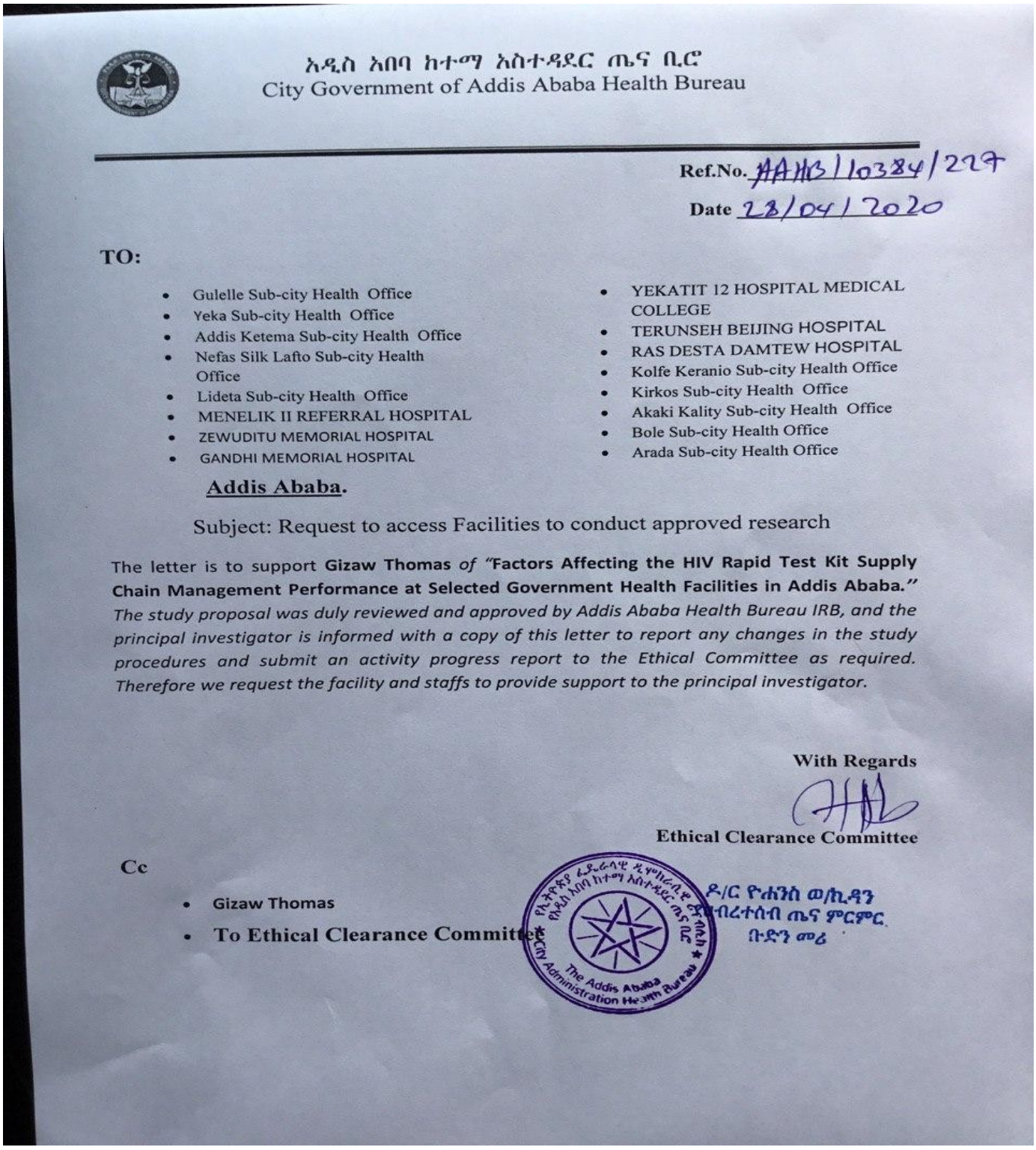
   Probing (2): how often?

7. Is there anything more you would like to add?

_____

I will analyze the information you and others gave me and submit a draft report to my advisor at the School of Commerce, Addis Ababa University in the coming weeks. I will be happy to send you a copy to review, if you are interested. Thank you for your time and cooperation.

Annex 12: Ethical Clearance Letter



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City Government of Addis Ababa Health Bureau

Ref.No. AAHB/10384/227
Date 28/04/2020

TO:

- Gulelle Sub-city Health Office
- Yeka Sub-city Health Office
- Addis Ketema Sub-city Health Office
- Nefas Silk Lafto Sub-city Health Office
- Lideta Sub-city Health Office
- MENELIK II REFERRAL HOSPITAL
- ZEWUDITU MEMORIAL HOSPITAL
- GANDHI MEMORIAL HOSPITAL
- YEKATIT 12 HOSPITAL MEDICAL COLLEGE
- TERUNSEH BEIJING HOSPITAL
- RAS DESTA DAMTEW HOSPITAL
- Kolfe Keranio Sub-city Health Office
- Kirkos Sub-city Health Office
- Akaki Kality Sub-city Health Office
- Bole Sub-city Health Office
- Arada Sub-city Health Office

Addis Ababa.

Subject: Request to access Facilities to conduct approved research

The letter is to support **Gizaw Thomas** *of* **"Factors Affecting the HIV Rapid Test Kit Supply Chain Management Performance at Selected Government Health Facilities in Addis Ababa."** *The study proposal was duly reviewed and approved by Addis Ababa Health Bureau IRB, and the principal investigator is informed with a copy of this letter to report any changes in the study procedures and submit an activity progress report to the Ethical Committee as required. Therefore we request the facility and staffs to provide support to the principal investigator.*

With Regards

Ethical Clearance Committee

Cc

- **Gizaw Thomas**
- **To Ethical Clearance Committee**

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ዶ/ር ዮሐንስ ወ/ኪዳን
የኢ-ከተሰብ ጤና ምርምር
ቡድን መሪ