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School of Commerce

Supply Chain Management Performance of HIV/AIDS Commodities in Public Health Facilities; The case of Benishangul-Gumuz Region, Ethiopia.

By

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Thesis submitted to the Addis Ababa University, College of Business and Economics, School of Commerce for the 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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Date…….

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgment.

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This is to certify that the thesis prepared by Henok Wegderes, entitled: Supply Chain Management Performance of HIV/AIDS Commodities in Public Health Facilities; The case of Benishangul-Gumuz region, Ethiopia and submitted to the Addis Ababa University, College of Business and Economics, School of Commerce for the partial fulfillment of the requirements for the Degree of Master of Arts in Logistics and Supply Chain Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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List of Abbreviation and Acronym

AIDS	Acquired Immune Deficiency Syndrome
ARV	Antiretroviral
ART	Antiretroviral therapy
ATLAS	Assessment Tool for Laboratory Services
CSA	Central Statistical Agency
CD4	T4 or helper lymphocytes, the quantitative count of these cells
DBS	Dry blood spot
EHRIG	Ethiopian Hospital Reform Implementation Guidelines
EID	Early infant diagnosis
FHAPCO	Federal HIV/AIDS prevention and Control Office
FMOH	Federal Ministry of Health
GHI	Global Health Initiative
GOE	Government of Ethiopia
HC	Health Centers
HCMIS	Health Commodity Management System
HIV	Human Immunodeficiency Virus
HSDP	Health Sector Development Program
HSTP	Health Sector Transformation Plan
JSI	John Snow, Inc
LIAT	Logistic Indicator Assessment Tool
LMIS	Logistic Management Information System
LSAT	Logistic System Assessment tool
PMTCT	Prevention Maternal to Child Transmission
RTK	Rapid Test Kits
VCT	Voluntarily Counseling and Testing

Abstract

Interrupted supplies and stockouts are the major challenges in the supply chain management of health commodity. Therefore, The aim of this study was to assess the supply chain management of Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome commodities in the perspective of achieving 90-90-90 strategy at hospital and health centers level in Benishangul-Gumuz, Ethiopia. A descriptive cross-sectional survey complemented by qualitative approach was conducted in 22 government owned health facilities (2 hospitals and 20 health centers) that provide Antiretroviral therapy, Laboratory and Prevention Maternal to Child Transmission service in Benishangul-Gumuz. The data was collected using semi structured questionnaires and observation check lists. The study revealed that 45% of people know their status,79% of people who know their status are accessing treatment and 87 % of people receiving treatment have suppressed viral load. Most of health facilities16(73%) were able to submit the requisition and report of Human Immuno-deficiency Virus/Acquired Immune Deficiency Syndrome commodities to Pharmaceutical Fund and Supply Agency according to the schedule, Therefore, More than three- fourth of the health facilities does not place an emergency order of Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome commodities at list once on the previous six month but it varies within product category , nearly half of the health facilities had an emergency order of Rapid Test Kits more than 2 times in the past 6 months. Stock out was high for AZT+3TC (60+30) which was 28%. Regarding the stock status of the three types of Rapid Test Kits on the day of visit 41% of facilities were stock out of one or more selected test kits, especially the stock out of VIKIA is high. Unlike Antiretroviral drugs, only 7(31%) of health facility had bin card for the selected test kits on the day of visit. In addition to product availability proper management and storage is crucial to ensuring the high quality of medicine on the hand of beneficiaries but study revealed that, only 7 health facilities fulfill 90% of storage criteria. And the overall data confidence on the three parameters; completeness, accuracy and timelines are 2.38 out 3, which is good regarding making logistic decision based on the data generated from the health facilities found in the region. The study concludes that there were frequent stock outs of Human Immunodeficiency Virus test kits and laboratory supplies, which are an indicator of weak supply chain and hindering factor on the achievement of the three 90'. The reporting and receiving system of Antiretroviral drugs were more organized compared to Human Immunodeficiency Virus test kits. It was also noted that in majority of the cases the professionals did not give emphases about the importance of Viral load testing for monitoring Antiretroviral due to capacity and distance barrier of testing sites.

Key words: HIV/AIDS, ARV drugs, RTKs, Viral Load, supply chain Management, 90'90'90

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The Researchers

CHAPTER ONE: Introduction

This chapter present the background of the study, statement of the problem and the objective of the study. And define the research question and scope of the study.

1.1. Background of the Study

Efficient public health supply chain performance is essential for assuring access to health supplies, and thus for positive health outcomes. This is particularly important in most countries in sub- Saharan Africa. Rapidly increasing health assistance from multilateral and bilateral donors has significantly benefited health programs but has also resulted in huge increases in the quantity and value of commodities flowing through public health supply chain to reach the targeted goal.

A wide range of pharmaceutical products are needed for diagnosis, treatment, care, and prevention of HIV/AIDS. These include, medicines to treat HIV infections, antiretroviral (ARV); medicines to prevent and treat opportunistic infections (OIs); medicines for palliative and supportive care; medicines to prevent and treat sexually transmitted infections (STIs); medicines to treat HIV-related cancers; diagnostic test kits for HIV, and OIs and laboratory reagents, supplies, and equipment.

In October 2014, in a bold effort to accelerate an end to the AIDS epidemic, UNAIDS proposed ambitious new targets to accelerate the HIV treatment scale-up in low- and middle-income countries. The targets described as ‘‘90-90-90. (UNAIDS,2014; UNAID,2015).

The world requires a reliable supply of greater volumes of HIV products in order achieve the scale required to achieve global targets. In the pursuit of the 90–90–90 target by 2020, the targeted scale-up of ARV medicines and Viral Load technologies will be pivotal to reach these targets. (UNAID,2015; Global Fund ,2016).

This study was conducted to assess the supply chain of ARV drugs, HIV test kits and Viral Load reagents in governmental hospitals and Health Centers in Benishangul-Gumuz region and to identify the possible gaps that exist in the supply chain of these commodities in the perspective of three 90’ strategy. This study would help decision makers and other stakeholders to have an insight about the supply chain of HIV/AIDS related commodities in governmental hospitals and health centers in other parts of the country.

1.2. Statement of the problem

2017/18 annual report of Benishangul-Gumuz region shows that, HIV-Positive population in all ages is around 7409, new HIV infection is 159 per year, Annual AIDS death is 325 and ART needs around 5306.

Interrupted supplies and stockouts are the major challenges in the supply chain management of health commodity So that, ensuring HIV/AIDS commodity security is essential to the success of HIV/AIDS prevention, care, and treatment programs of the region. Even though, Commodity security depends on a country's capacity to accurately forecast, adequately finance, effectively procure, and consistently deliver essential HIV/AIDS commodities to the people who need them.

Interruption of supplies and stock outs ARV drugs put individual patient at risk of disease progression and death, in drug resistance development, hampers progress towards universal access, and diminishes the credibility of ART in the eyes of patients, community and healthcare providers and generally put the public health in danger. (Pasquet. *et al*, 2010)

Challenges in forecasting HIV test kits include the multiple purposes of testing, the variability in HIV testing procedures, and the different types and brands of HIV test kits available in the market, HIV testing algorithms, and the most common purposes of testing in resource-limited settings, as well as specific guidance on the data collection and analysis required to determine which type(s) of data will be used to inform the assumptions on the demand for HIV testing services and future consumption of HIV test kits.(Butao. *et al*, 2009)

Although it has been over a decade since antiretroviral (ART) became accessible in resource-limited countries, most health information systems are still lagging. ART programs have made progress in collecting, reporting, and using data, but in many cases, monthly reports are incomplete and inaccurate, making it difficult to produce useful forecasts which is one of the indicators of supply chain management performance. (Brandon. *et al*, 2014)

1.3. Research questions

- How does the LMIS influencing on logistic decisions and availability of HIV/AIDS program commodities?
- How storage management is being practiced for HIV/AIDS program commodities look like at health facilities?
- How inventory management is being practiced for HIV/AIDS program commodities look like at health facilities?
- What are the major challenges associated to HIV/AIDS commodity supply chain management hindering the achievement of 90-90-90 target in the region?

1.4. Objective

1.4.1. General objective

The objective of the study is to evaluate the supply chain management performance of HIV/AIDS program commodities and its associated factors in public health facilities of Benishangul-Gumuz region of Ethiopia from the perspective of achieving the 90-90-90 target

1.4.2. Specific objectives

1. To assess the LMIS practice of HIV/AIDS commodities within selected public health facilities from the three data quality dimensions (Accuracy, Completeness and Validity) perspective.
2. To evaluate the storage practice of HIV/AIDS commodities in selected public health facilities
3. To assess the inventory management practice of HIV/AIDS commodities within selected public health facilities
4. To assesses challenges associated to HIV/AIDS program commodity management in the public health facility of Benishangul-Gumuz region that hindering the achievement of 90-90-90 target

1.5. Significance of the study

Findings from this study will help to formulate strategic plans that will help to minimize these problems to ensure constant and uninterrupted supply of HIV/AIDS commodities in the public health facilities and use as in put to develop a strategy to mitigate the obstacles to achieve sustainable development goal trough 90-90-90 initiative. Also, the findings from this study will be useful to health facility managers, donors and program supporting groups know the statues of the region on the initiatives and design intervention. And it will provide base line information for further studies in the area.

1.6. Scope of the study

The study focuses on supply chain management performance of HIV/AIDS program commodities and its associated factors in public health facilities of Benishangul-Gumuz region of Ethiopia. which target logistics management information system (LMIS), Inventory system, storage management of HIV/AIDS program commodities and factors associated with data quality. Thus, the target of assessment was public health facilities provide HIV testing and treatment in Benishangul-Gumuz region located in all zones of the region and special woreda (Assosa, Metekel and Kamashi zone and Mao-Komo special woreda) and review logistics management information system records & reports of pharmacy department. Due to time limitation the study was done on selected HIV/AIDS program commodities that wouldn't include all; laboratory commodities, ARVs, medical equipment, medical supplies, & supplementary foods. And it doesn't cover other factors like Socio-Economic situation, finance and political/government related which affects Supply chain management performance.

1.7. Limitation of the study

- Lack and incomplete logistic recording format for HIV/AIDS commodities in the visited health facilities.
- The study didn't include all the components of supply chain management mainly procurement, quantification and selection of HIV/AIDS commodity
- The study either partially or not include major stakeholders in the supply chain HIV/AIDS program commodities; Pharmaceutical Fund and Supply agency (partially), Benishangul-Gumuz regional health bureau (partially) and donors (non).

1.8. Definitions of key words

Acceptable storage condition: Stores that met at least 12 of the 14 criteria (90 percent of the criteria) set in ANNEX

Health Facilities: public health facilities including Hospital and Health centers

HIV/AIDS Commodities: All ARV drugs, Reagents for Viral load suppression control and kits used to test HIV status included but OIs, Preventive items and other Supplies do not include.

Logistics records: serve as the primary framework for every logistics system. The records are designed to capture critical logistics data at each level of the health system. The data captured on logistics records are then brought together to form logistics reports, which are used for crucial decision-making about resupply quantities, forecasting, and procurement decisions. It includes bin cards and stock record cards.

Stock out of HIV/AIDS Commodities: HIV/AIDS Commodities not available in stock and a balance of zero on bin cards on a day of visit and/or during last six months.

Supply chain management: "Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders." (Lambert & Cooper *et al*, 2000).

1.9. Organization of the study

The study will have organized into five chapter, as the first chapter will present information about the introductory part including background of the study, statement of the problem, research questions, objective of research, significance of the study, scope of the study and limitation of the study.

The second chapter will cover literature review regarding to supply chain for health commodity, availability of HIV/AIDS products, factor affecting availability of HIV/AIDS commodity and conceptual framework. The third chapter will explain research methodology on how the study will conducted. The fourth chapter is result, discussion and interpretation. The fifth chapter will be summary, conclusion and recommendation.

CHAPTER TWO: Related Literature Review

This section discusses pharmaceutical management framework of four interconnected and overlapping phases: selection, procurement, distribution, and use on HIV/AIDS program commodity management studies carried out in Sub-Saharan countries and other countries.

2.1. Theoretical Literature Review

The most recent edition of Managing Drug Supply, MDS-3, offers a pharmaceutical management framework of four interconnected and overlapping phases: selection, procurement, distribution, and use. Under this framework, a well-functioning pharmaceutical system should be efficient in each of these areas of operation.so that evaluating of these areas in any pharmaceuticals supply chain must be considered and this research expected to assess the critical areas of the framework regarding the implementation of the initiative on HIV/AIDS program. (Kemboni. *et al*, 2015).

An essential component of managing an ART program at the facility level is establishing SOPs for all departments that contribute to ART care, including the pharmacy and laboratory. SOPs act as a standard for defining and monitoring the quality of service delivery and facilitating training efforts; they are critical to the successful, rapid scale-up of safe and effective ART. (Brandon.*et al,* 2014)

2.1.1. Product selection

Product selection is a key element of the logistics cycle, product selection is directly linked to serving customers by defining what products are procured and used in the health system and the range of products that a customer can receive. Standardization enables programs to make decisions regarding several aspects of the products in question leading to the achievement of best value and the avoidance or proliferation of similar products. Limiting the variety of products that are used and available at public sector facilities can make the supply chain more manageable. (Agami. *et al,*2012)

2.1.2. Quantification of health commodities

Quantification is the process of estimating the quantities and costs of the products required for a specific health program (or service) and determining when the products should be delivered to ensure an uninterrupted supply for the program.

Quantification is a critical supply chain management activity that links information on services and commodities from the facility level with program policies and plans at the national level to estimate the quantities and costs of the commodities required for a health program. Accurate quantification and forecasting for ARVs and other HIV-related products not only decreases stock-outs, but also provides the evidence needed to advocate for and mobilize funding for the procurement of ARVs. (Brandon. *et al*, 2014)

An accurate quantification is essential for all health commodities but of very importance for HIV/AIDS related commodities because quantification of drug and health commodity requirements for HIV/AIDS programs is complex and uninterrupted access for patients must be ensured. There are certain common challenges associated with the quantification of ARV drugs and supplies mainly in low and middle-income countries. Data on ART services and ARV drug supply are limited and, when available, are often unreliable or insufficient to be used for quantifying ARV drug requirements. Health facility recording and reporting key logistics and service statistics or morbidity data that are required for forecasts are still in their infancy stage. (Aronovich. *et al*,2006; Windisch. *et al* ,2012)

Another challenge in forecasting HIV test kits include the multiple purposes of testing, the variability in HIV testing procedures, and the different types and brands of HIV test kits available. This companion guide provides instructions on how to forecast consumption of HIV test kits by purpose of testing, considering national HIV testing algorithms and HIV prevalence, as well as the use of HIV test kits for non-diagnostic purposes such as quality control, training, and sentinel surveillance. (USAID | DELIVER PROJECT Task order 1, 2009)

2.1.3. Inventory Management

An inventory is an idle /unused/ product hold on store for future service. Inventory control system informs the storekeeper when to order or issue, how much to order or issue, and how to maintain an appropriate stock level of all products to avoid shortage and oversupply. A survey was done in Addis Ababa public health facilities by Eyerusalem, showed that both HCs and Hospitals control their inventory by maximum minimum stock inventory system and there was frequent emergency order of ARV drugs in the six months period prior to the study. (Berhanemeskel. *et al*,2014)

Assessment of laboratory supply chain done in Malawi explained, some district and central hospitals were stocked out of machine reagents used for ARV monitoring tests on the day of the visit. 28 percent of the district-level laboratories were stocked out of CD4 reagents the central level had no stock outs of CD4 reagents. Chemistry reagent for glutamate oxaloacetate transaminase (a liver function test) (GOT) was stocked out in 60 percent of the district hospitals. Twenty percent of the district hospital laboratories did not have hematology reagents on the day of the visit. (Butao. *et al* ,2009)

Other study conducting on the management of laboratory reagents supply in Dominican Republic reported some causes of unavailability of stock as, high cost of laboratory reagents and accumulated indebtedness are the primary causes of shortages and stock-outs. Some 28 percent of all reagents were out of stock at the time the study was conducted for different reasons, primarily their high procurement cost. The lack of availability of these products limits timely diagnosis and treatment in public health facilities. (Embrey,2012)

Results of the study done in Addis Ababa showed that laboratory commodities for the diagnosis of diseases which have a significant public importance such as KHB, DBS kit, SGOT and CD4 reagents were out of the stock in significant number of facilities at the day of visit. The study also showed that 24 (96%) of facilities reported one or more reagents stocked out during the last six months. (Berhanemeskel *et al*, 2014)

2.1.4. Logistic Management Information System (LMIS)

LMIS is a system of records and reports, whether paper based or electronic used to aggregate, analyze, validate, and display data (from all levels of the logistics system) that can be used to make logistics decisions and manage the supply chain. A well-functioning LMIS provides decision-makers throughout a supply chain with accurate, timely, and appropriate data, such as stock on hand, losses and adjustments, consumption, demand, issues, shipment status, and information about the cost of commodities managed in the system. (USAID | DELIVER PROJECT Task order 4, 2012)

A study done in Addis Ababa public health facilities showed that in 13(76.5%) of HCs and all of hospitals the facilities report ending balance as the stock on hand kept in the store room only. These facilities considered the stock moved from the store as an actual consumption which might not reflect the actual consumption so ultimately affects forecasting at national level. The exact

accuracy of RRF data was between 40 and 50 percent for most of the products; with an average of 46 percent. Both hospitals and health centers usually receive products requested within one month or less. However, the perceived order fill rate the percentage of items that are filled, based on the ordered quantities with the correct products for both program (37 percent) and revolving drug fund (RDF) (14 percent) products was low. (Berhanemeskel. *et al*, 2014)

2.2. Empirical Literature Review

The principal goal of the emerging field of health logistic supply management is to improve and expand access to quality medicines. In low and middle-income countries, this is especially challenging due to a paucity of domestic financial resources, human resources, technical knowledge, political will, or uncoordinated health efforts between public, private, and international actors. Efficient and effective supply chains are critical to ensuring medicines are available when and where patients that need them, especially in low and middle-income countries where high costs may limit the supply of pharmaceutical. (Embrey.*et al*, 2012; Kemboi.*et al*, 2015)

Effective supply chain management is all about delivering the right product in the right quantity and in the right condition with the right documentation to the right place at the right time at the right price. Effective supply chains depend on end-to-end visibility of the right data of the right quality at the right time, in the hands of the right people in the right place, to make the right decision and take the right action. A hallmark of supply chain maturity is end-to-end visibility of supply and demand data that are used to make decisions and take effective action. (McCord *et al*,2011; Agami.*et al*,2012)

By having the program driven by the customer, it is hoped that excess inventories kept in order taking care of uncertainties and slow response will be significantly eliminated. The success of supply chain management rests with logistics with functional areas including: Network Design, Information Technology, Transportation, Inventory and Storage, Warehousing, Material handling, Loading and Unloading and Packaging and Re-packaging. (McCord. *et al*,2011)

Supply chain management is an important component of strong health systems and critical for the effective implementation of health programs. The United States Government's Global Health Initiative (GHI) seeks to achieve significant health improvements and foster sustainable,

effective, efficient, and country-led public health programs that deliver essential health care. (Cigolini.*et al*, 2004; Sporrong.*et al*, 2016)

A significant number of public sector programs in resource-poor countries urgently need enhanced capacity most supply chain management functions, including specifically in quantification, financing, procurement, and delivery of HIV/AIDS-related commodities. Perhaps the greatest challenge in achieving these targets will be ensuring that their reach is extended to all populations everywhere. It is therefore encouraging and appropriate that the 90-90-90 targets prioritize equity across populations, with specific focus on their achievement for children and adolescents. Successful provision of ART services depends not only on the continuous availability of high-quality antiretroviral (ARV) drugs but also on the supply of a range of HIV/AIDS program related commodities. HIV tests and other laboratory reagents; contraceptives; condoms; protective gear for infection prevention and health worker safety; and a host of consumable medical and laboratory supplies. (Allers.*et al*, 2006; UNAID, 2015)

Access is measured in terms of the availability and affordability of essential medicines, especially to the poor and in the public sector. Measuring the actual quality of medicines by testing samples can be expensive. Instead, the presence of expired medicines on pharmacy shelves and the adequacy of handling and conservation conditions of medicines are used as indicators of quality. (WHO,2007)

There are present and future challenges in terms of better measurement of pharmaceutical systems strengthening and programming to meet the needs of countries moving towards universal health coverage and working to achieve their specific Sustainable Development Goal (SDGs) due to increasing quantity as well as variety of pharmaceutical product in the market. USAID | DELIVER PROJECT Task order 1, 2011)

A major challenge to initiation and expansion of antiretroviral therapy (ART) services in resource-poor countries that have been most affected by the HIV/AIDS epidemic has been the limited capacity of health commodity supply chains to ensure a reliable supply of the products at service delivery sites to support HIV prevention, care, and treatment programs. Managing supply chains in support of laboratory services is a formidable challenge, especially in developing countries. With the introduction of ART, recognition of the importance of laboratory services has

grown because of the number of laboratory tests required to effectively monitor treatment. (Michael *et al*, 2014; USAID | DELIVER PROJECT Task order 1, 2009)

2.2.1. Supply Chain Management of HIV/AIDS commodities in Ethiopia

In Ethiopia ARVs have been quantified by HIV/AIDS prevention and control office (HAPCO) at the central level for all health care facilities receiving ARVs. There was generally poor reporting by health facilities, leading to incorrect quantities being distributed. A morbidity-based method of quantification was used for ARVs. Collecting the required data is a critical activity in the Preparation step of the quantification. Program-level data on the number of people tested for HIV and the results of the testing may be collected through the existing Health Management Information System (HMIS), and data on the consumption of HIV test kits may be collected through Logistics Management Information System (LMIS) reports. (Allers.*et al*, 2007)

A study by Kalvemark, (2016) In Ethiopia improvements seen in the country are not seen in rural areas, with the result that medicines are not available or are not stored properly in many rural locations. The problems are many, and include transportation, the difficulty of attracting and keeping health supply chain management personnel, poor communication and access to information.

A study by Eyesusalem, (2014) showed that, the percentage difference between ordered and received quantity was an indicative of interrupted supply chain and it showed that the current supply chain was not strong enough to fill the gaps. More than three fourth of the hospitals and HCs had stock out of one or more ARV drugs on the day of visit. The percentage of products stocked out was 12.8% and 17% in HCs and hospitals on the day of visit respectively. (Berhanemeskel. *et al* ,2014)

Ethiopia is on the way to developing a nationwide viable system for health supply chain management. However, there are still challenges on developing country specific strategies and programs for human resources in health supply chain management and commitments to financial support to strengthen the supply system of the country. (Sporrong. *et al*, 2016)

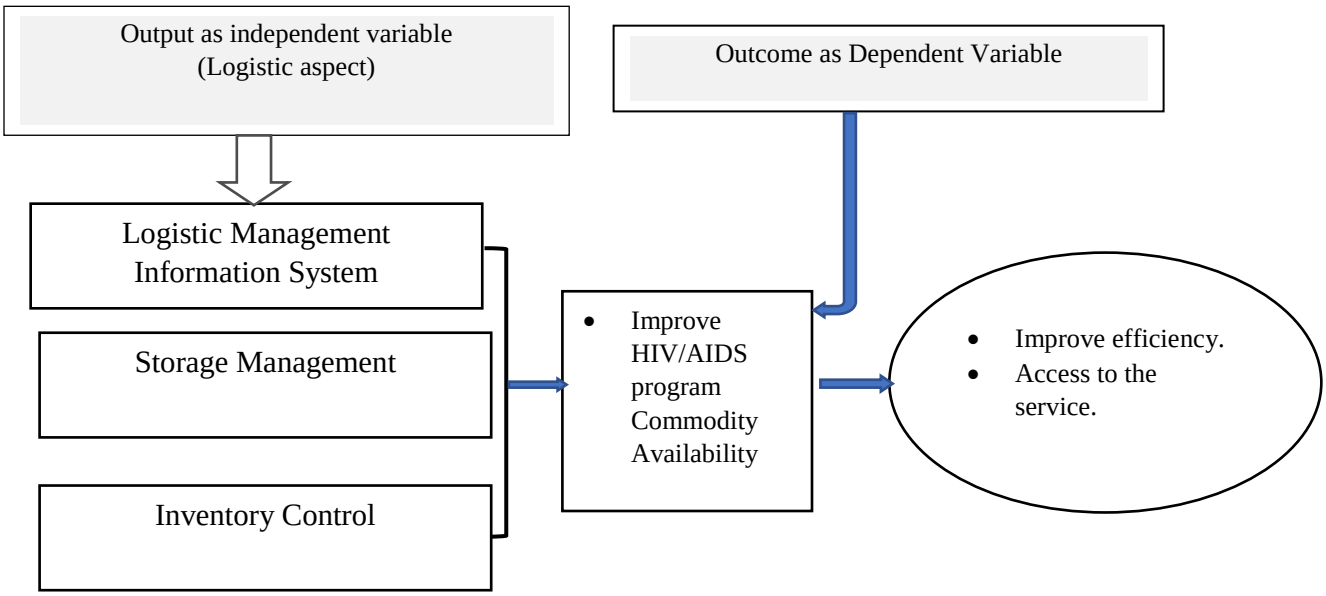
2.3. Conceptual framework of the study

Commodities are among the key inputs to any HIV/AIDS program, and logistics systems are among the key processes that enable program success. The figure below shows the main

mechanisms and sub-components of logistics processes, including logistics management, policies, human and organizational capacity, and financial resource mobilization. It also shows how logistics processes and functional outputs relate to the overall HIV/AIDS program commodity conceptual framework.

Based on the above discussion and finding on Literature review, the following conceptual framework is developed in which the dependent variable is availability and independent variables are aspect of supply chain and logistic cross functional determinants which are affecting availability of HIV/AIDS program products.

Figure 1: Conceptual Framework of Supply Chain Performance of HIV/AIDS program Products



Source: Adopted from Reproductive health commodity management conceptual framework

These processes and outputs result in product availability to clients - the main direct result of effective logistics systems. Logistics may involve HIV/AIDS products exclusively (in categorical programs), or an expanded range of HIV care and treatment or other health products. When a program mobilizes human, technical, and financial resources - with a minimum of external assistance - so that the program consistently ensures product availability, access to services, and quality of care consistently in a way that meets customer needs, the program achieves HIV/AIDS program commodity security. To the extent that logistics systems improve product availability and contribute to commodity security, they also contribute to increased use

of ART care and treatment services and ultimately to improved health outcomes. (Raja. *et al*, 2004)

Ensuring product availability requires attention to six rights: the right goods, in the right quantities, in the right condition, delivered to the right place, at the right time, for the right cost. The logistics system is often depicted as a cycle with components of product selection (the right goods), forecasting and procurement (the right quantities, cost), inventory management and distribution (right place, time, and cost), and provision to customers (right place, time, and cost). Information for decision-making is central to the cycle, and quality assurance and monitoring take place throughout. Meeting the needs of end users is the goal of health logistics systems, and attention to all six rights is essential to that effort. (USAID | DELIVER PROJECT Task order 1, 2009)

2.4. Identified literature gap

All literature reviewed for this study described that Supply chain is key strategic area requiring significant attention and effective management especially in the health system of any country. It is one of the most expensive activity and improving or optimizing the supply chain will have significant impact on performance in terms of improving access to life saving essential medicines and improving health outcomes. But almost all studies conducted evaluating the performance of SCM only using pharmaceuticals not view with program aspects especially not assessed the supply chain performance of HIV/AIDS program commodity in the perspective of 90-90-90 strategy and there is no empirical study conducted in the study area. So, this study will provide baseline evidence-based information on the supply chain management of HIV/AIDS program commodity in Benishangul-Gumuz region public health facilities.

CHAPTER THREE: Methodology of the Study

In this chapter the research methodology used in the study is described. The geographical area where the study was conducted, the study design and the population and sample are described. The instrument used to collect the data, including methods implemented to maintain validity and reliability of the instrument, are described.

3.1. Description of the study area

The Benishangul-Gumuz National Regional State is one of the 9 regional states of the Federal Democratic Republic of Ethiopia. It is in the western part of Ethiopia. The region has common boundaries with the State of Sudan in the north-east, with Amhara in the north-west and south west and with Oromia in the south.

Currently, the region has 2 general hospital, 1 regional Laboartory,33 Health Centers and 406 Health Posts. These health facilities provide comprehensive health care services and use pharmaceuticals to give health services. And ensuring the availability of affordable and quality pharmaceuticals sustainably to all public health facilities with in the region.

Benishangul-Gumuz regional health bureau (2014) annual report shows that, Benishangul-Gumuz regions has HIV-Positive population in all ages is 7409, new HIV infection is 159 per year, Annual AIDS death is 325 and ART needs is 5306.

Three PFSA hubs (Nekemte, Assosa and Bahir-Dar) and Regional health bureau is responsible for managing health commodity management, specific to HIV/AIDS; PFSA hubs were responsible for storing and distribution of commodities to service delivery points where as Benishangul-Gumuz National Regional State Health Bureau (BNRS-HB) is responsible for ensuring availability of high quality medicine for preventive and curative health services in the region through curative and rehabilitative case process -logistic team; even though with limited number of skilled supply chain professionals.

Regarding HIV/AIDS service 16 health facilities were provide HIV counselling and testing, 10 of them provide HIV treatment and care and only 9 health facilities provide both treatment and ART monitoring laboratory tests using CD4 enumeration but there is no facility that can provide Viral Load and Early infant diagnosis testing in the region as a monitoring and sites were referring samples to Bahir Dar and Nekemte Regional Laboratory.

To improve the pharmaceutical service and supply chain management, the Regional Health Burau (RHB) has taken important measures to fill the skill gap in supply chain and pharmacy service such as providing overview of supply chain management training, Integrated Pharmaceutical Logistic System (IPLS) supportive supervision skill training to regional and Woreda Health offices logistics officers, IPLS orientation to different level health managers being with Pharmaceutical fund and supply agency (PFSA) and partners.

Pharmaceutical fund and supply agency (PFSA) is a governmental pharmaceutical importer and distributor which is mainly involved in the supply of Antiretroviral (ARV)drugs and test kits to the health facilities and three PFSA hubs provide pharmaceuticals for facilities under Benishangul-Gumuz Region.

3.2. Study Design

The study employed both a facility based descriptive and cross-sectional design added to this, a retrospective record was reviewed. Accordingly, an observation was done to check for stock availability, stock discrepancies, store management and data quality at one specific point in time. Whereas, retrospective data used to answer questions on three dimension of data quality of stock records, order fill rates and historical stock outs.

3.3. Population of the study

The study population were all Benishangul-Gumuz region public health facilities providing voluntary and counseling and testing (VCT), prevention mother to child transmission (PMTCT) and antiretroviral (ART) service, health professionals working in the ART clinics, pharmacy and laboratory units of the health facility involved in the management of HIV/AIDS program commodities, all HIV/AIDS commodities, all logistic records and reports used for management of HIV/AIDS commodities in Benishangul-Gumuz region that fulfills the inclusion criteria of the study. And the study targeted on three health facilities providing HIV counselling and testing service only, ten facilities providing HIV/AIDS treatment and care only and nine facilities providing ART monitoring tests.

3.3.1. Source data

All Benishangul-Gumuz region public health facilities, health care professionals, logistic records and reports that used to manage the supply chain of pharmaceuticals in health facilities,

pharmaceutical used for provision of health service within the facility and PFSA Hubs were the source of primary data for this study.

3.4. Inclusion and exclusion criteria

3.4.1. Inclusion Criteria

- Public health facilities in Benishangul-Gumuz region providing VCT, PMTCT, ART services and ART laboratory monitoring.
- Logistic records and reports used in the system of the recent six month
- Professional who involved in the management of HIV/AIDS program commodities for the least one year in their respective health facilities.

3.4.2. Exclusion Criteria

- Health facilities that do not provide all VCT, PMTCT and ART service before six months from data collection period.
- Health facility since they do not provide the service
- Documents with incomplete information was excluded from the study.

3.5. Sample size and sampling procedures

3.5.1. Sampling size determination

For quantitative study: The sample size of health facilities was calculated by using the Logistic Indicators Assessment Tool (LIAT). The document developed by USAID/DELIVER PROJECT suggested that it would be enough to take 15% of the targeted health facilities as sample for the study. (USAID/DELIVER PROJECT, task 1, 2009). (35*15%=5.6 ~ 6) but six health centers may not be adequate according to the idea that a sample should be: as diverse as possible. Therefore, to comply with this idea, All the Hospitals, regional Laboratory and two PFSA hubs and twenty-two health centers (all the eight ART only, two hospitals, all nine Laboratory monitoring and three PMTCT sites only) taken and each from those under PMTCT sites only were selected randomly. And a total of 66 health professionals responsible on managing HIV/AIDS commodity and care and support was considered.

For qualitative study: Since a maximum of 12 interviewees are required for qualitative study because of information saturation, participants interviewed until it reaches a point of saturation i.e. up to 12. Accordingly, 12 health professionals from 12 different health facilities involved on

the management of HIV/AIDS program commodities (2 from each type of level of service in HIV/AIDS program Hospital, ART, Laboratory monitoring, Laboratory only, VCT and PMTCT sites only based on their proportion) and one experts from warehouse and distribution team from PFSA hubs supplying the region were included for in-depth interview.

3.5.2. Sampling Technique and Sampling Procedure

A total of 35 public health facilities involving in supply chain management of HIV/AIDS commodities to be used for public health care services in the region and serve as a sampling frame. Then, Census type sampling technique was used for ART and Laboratory monitoring sites; and all health facilities provide ART and Laboratory monitoring service in the region taken as a sample. So, these 19 health facilities were included purposively in the study. But for PMTCT sites the sample size of health facilities was calculated by using the Logistic Indicators Assessment Tool (LIAT) and from 16 PMTCT sites15 % of facility selected (16*15%=2.4) and in these situations, to produce survey estimates with the same precision as in a simple random sample, the sample size should be multiplied by the design effect (DEFF=1.2). so, (2.4*1.2 =2.88 with 5 % of non-responded to data collection 2.88*5%=0.14, and from PMTCT sites 3 sites were selected. (USAID/DELIVER PROJECT, task 1, 2009).

3.6. Study Variables

3.6.1. Dependent Variable

Product availability; on the Performance of supply chain management of HIV/AIDS program in respective of 90-90-90.

3.6.2. Independent Variables

Logistic Management Information System**,** Storage Management and Inventory Control are variable that can measure the logistic performance of a supply system.

3.7. Data collection instrument and methods

3.7.1. Data collection instrument

The main instruments used for data collections were structured questionnaires, unstructured interviews and checklists. For logistic system and performance assessment a standardized tool adapted from USAID/Deliver Project for supply chain assessment and contextualized according to Ethiopian perspective was used. Therefore, it contained 10 ARV drugs, 3 Test kits and 13 VL/EID and CD4 reagents to collect the information from facilities. The qualitative part was

obtained by using semi-structured face-to-face interview with key informants with some investigations.

3.7.2. Data collection methods

The research involved data collection from primary and secondary sources. The primary data collected through questionnaires (both open and closed ended), checklist and unstructured interviews. In depth Personal interviews conducted to obtain the underlying information on factors affecting the supply chain performance of HIV/AIDS program commodities that hinder to achieve 90-90-90 targets. The data collection was performed by pharmacy professionals from the regional health bureau and NGOs working in the region that are not part of study population. Principal investigator was involved in the overall coordination of the data collection and control the quality of the data.

3.7.3. Data entry and analysis

The collected data were manually checked for completeness and consistencies before being entered into the computer. The quantitative data entered and analyzed by using SPSS version 21. Both descriptive statistics like frequency and percentage employed to analyze the data. The data is summarized and presented visually by frequency tables and percentages (proportions). The generated descriptive statistics is complemented by narratives.

3.8. Ethical Consideration

Ethical approval is obtained from the Ethics Review board of Addis Ababa university college of business and economics school of commerce and given to the Benishangul-Gumuz regional Health bureau. Verbal consent from all respondents before enrolling them as the respondents of the study is obtained. During the consent process, the respondents were obtained information regarding the purpose of the study, why and how they are selected as the respondents of the study, and what was expected from them. They were also being informed; they can withdraw from the study at any time during the interview process. Participants were also being assured about confidentiality of the information that obtained during the study. To assure the anonymity of the respondents' personal identifiers was not used during the data collection.

CHAPTER FOUR: Result, Discussion and Interpretation

A total of 22 health facilities were visited during this assessment; of which 2 were hospitals and 20 were health centers located in Benishangul-Gumuz region. The selected health facilities had an experience on ART, Laboratory monitoring and VCT service provision for more than three years. Since the beginning of the program in Ethiopia, both ART, VCT services and laboratory testing for monitoring of ARV has been provided for free in all governmental health facilities. The HIV/AIDS service was integrated with other service in the health facilities. And all health facilities had been used single reporting and requisition formats for HIV/AIDS related commodities and program products but for budget they were used different formats. Similarly, transporting of HIV/AIDS program commodities to service delivery points (Health centers and Hospital) is mandated to sole supplier called Pharmaceutical Funding and Supply Agency (PFSA).

4.1. Socio-demographic characteristics of the respondents

Sixty-two (94 %) of the respondents were in the age group of 23-52 years, with a mean age of 34.2 years and the mean year of service in health sector was 5.4. Almost all 66(100 %) of the respondents were more than 3 years of experience ,66(100%) had completed higher education and hold a minimum diploma. Out of the total respondents 20(30 %) were Pharmacy professional,18(27%) laboratory professional,8(12%) Health officer,12(18%) nurse and 8(12%) are midwifery and general practitioner.

Table-1, socio- demographic distribution of the study group in Benishangul-Gumuz region of Health facility,2018.

Variable Category		Number (n=66)	Percent
Age	23-27	3	5%
	28-32	11	17%
	33-37	24	36%
	38-42	23	35%
	43-47	4	6%
	48-52	1	2%
Sex	Male	48	73%

	Female	18	27%
Professional	Pharmacist	20	30%
	Nurse	12	18%
	Medical doctor	4	6%
	Midwifery	4	6%
	Laboratory	18	27%
	Health officer	8	12%
Educational level	Diploma	10	15%
	First degree	53	80%
	Second degree	3	5%
Marital status	Married	38	58%
	Single	22	33%
	Divorce	3	5%
	Widowed	3	5%

4.2. HIV/AIDS Program commodity availability

4.2.1. Availability of HIV Rapid Test Kits (RTKs)

Ensuring uninterrupted supplies of HIV Rapid Test Kits (RTKs) in health facilities is crucial in the provision of targeted HIV testing and counseling services and achieve the three 90's targets. As part of this effort, Federal ministry of health in collaboration with PFSA has been supporting the availability of RTKs to health facilities through direct provision of RTKs to health facilities and providing technical assistance on the health supply chain system.

The Ethiopian HIV testing algorithm includes three Rapid Test Kits (RTKs): Beijing Wantai (screening test), Uni-gold (confirmatory test) and Vikia (tie-breaker test). And stock outs of these HIV RTKs in any health system represent a critical system failure because stock outs can result in patients going without knowing his/her HIV status and reduced confidence in the health system.

To assess the stock availability of Wantai Beijing, Uni-gold and Vikia of the facilities, stock on hand of RTKs were collected on the day of the visit at the health facility store and testing units.

Therefore, the finding shows that, only 28 % of all health facilities assessed had all the three types of RTKs in the day of visit. In this regard, the availability of RTKs in the public health facilities were 76 %, 72 % and 28 % for Wantai Beijing, Uni-gold and Vikia on the day of visit respectively.

This indicates that most the health facilities had Wantai Beijing and Uni-gold on the day of visit; While only 28 % of the health facilities (N=7) had Vikia on the day of visit. Which indicates that there is variance between the availability of Vikia in health facilities implying for substantial improvement in the supply of RTKs for achieving the first 90' in the region (Fig. 2).

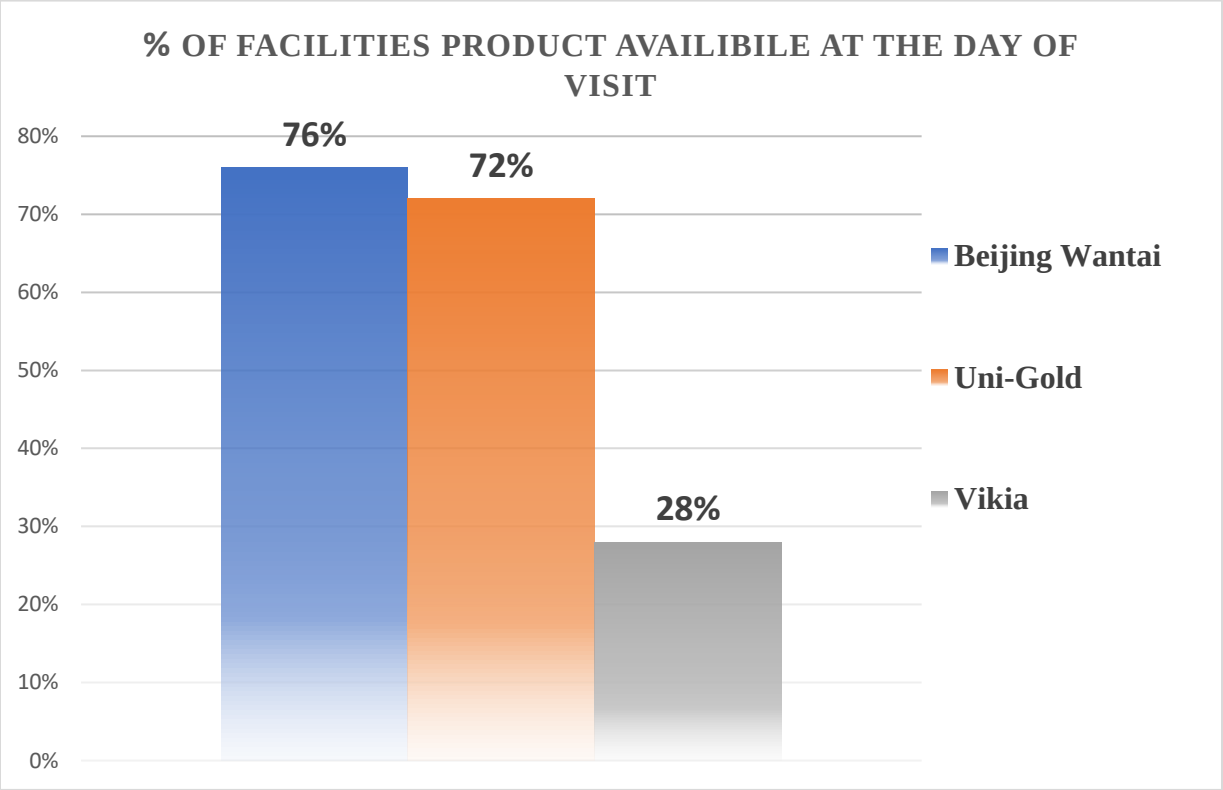


Figure 2: RTKs stock status of Health facilities in the day of visit, Benishangul-Gumuz,2018

Based on the result of the study 45% of people living with HIV in Benishangul-Gumuz know their status. Which mean that the region either not approaching or away striking distance of having 90 % of people living with HIV tested at least once (Fig. 14). Similarly, a study showed that, there are only about 45% of people living with HIV in sub-Saharan Africa know their status. (Staveteig. *et al*.2004).

The gap between current results and the 90 %target underscores the need for more frequent testing and more focused, strategic targeting of testing services to ensure 90 % knowledge of

HIV status on an ongoing basis, including among adolescents, key populations and other groups who are currently being left behind. The other point should the region focused on the continuous availability of all type of RTKs to ensuring uninterrupted testing service and reach target one, the data of the study shows high variation of percentage stock out for RTKs using for screening, confirmatory and tie-breaker from 24%-72%. Most of health facilities in the study not used RRF frequently to report consumption and order of RTKs. The respondents mentioned that this due to resupply not based on their request which not trigger them to do so, as a result the supply of RTKs is not stable as ARVs and also the study revealed that, stock of 24%,28% and 72% for Beijing Wanti, Uni-Gold and Vikia respectively at the day of Visit, similar study done by Berhanemeskel *et al*., showed that, the stock status of test kits;7(36.8%) of the HCs were fully stocked on the day of visit while 2(10.5%) of them were stock out of all the three test kits selected. All the hospitals were stocked out one or more test kits on the day of visit.

Even though the health facility controls their inventory by maximum minimum stock inventory system there were frequent emergency order of HIV/AIDS commodity in the six months period prior to the study. Most of health facility 8 (36%) had one or more emergency order which aggravated more on RTKs. This might be associated with that of either poor inventory of test kits or un proportional supplies of RTKs not based on facility consumption. More over this emergency order associated with lack of regular reporting of RTKs from facility and on time supply based on facility demand from PFSA. As shown in the study all facilities don't have stock of test kits between two to four months of stock for all type RTKs of this can conclude that the supply system of the region on RTK is not stable.

To provide clients with high quality products, each facility must have safe, protected and organized storage areas to ensure efficient handling and use of products; in contrary, this assessment revealed that the overall storage condition of health facility was only 31% of facilities full filled 90% of storage criteria and the rest are not properly managed its pharmacy store and leads to inefficient handling and use of drugs. Similarly, a study done in Sera Leon also states that the storage condition observed in district and PHUs was not generally in a good condition. Expired drugs and kits were stored together with the usable commodities which bring a shortage of space in the health facilities. (Allers. *et al.*, 2007).

4.2.2. Availability of Antiretroviral (ARV)

HIV treatment is a cornerstone of the AIDS response, helping to prevent AIDS-related deaths and avert new infections. It also helps people living with HIV to live close-to-normal lifespans, thereby ensuring its availability has paramount on the achievement the second 90' strategy. And the finding of this study shows that unlike with RTKs 100% of facilities provide ART service had TDF+3TC+EFV (300+300+600) mg at the day of visit and 89%, 94% of them was available for AZT+3TC+NEV (300+150+200) mg and NEV 200mg respectively (Fig. 3).

Regarding the ART service for pediatrics the availability was 94% and 72% for AZT+3TC+NEV (60+30+50) mg and AZT+3TC (60+30) mg at the day of visit respectively.

Similar with this, study done in Oromia National Regional State showed that availability of first line ARV drugs was 100% and 95% at HC and Hospitals respectively and another study done in Ethiopia showed that stock outs had been non-existent or minimal for ARVs (Alemayehu, 2009). This study also showed that, in the past 6 months, most health facilities was not faced stock for Adult ARV drugs. And, study done by Shewarega. *et.al.* 2015; majority of the health facilities had most of the essential pharmaceuticals in stock on the day of the visit; availability was above 90 percent for most products at all levels of the facilities and IPLS implementation levels

Differently, study done by Berhanemeskel. *et al. 2014*, in Addis Ababa more than three fourth of the hospitals and HCs had stock out of one or more ARV drugs on the day of visit. The percentage of products stocked out was 12.8% and 17%in HCs and hospitals on the day of visit respectively. Also, a WHO survey in 2009 revealed that 36 (38%) out of 94 reporting countries had documented at least one stock out of antiretroviral (ARV) drugs in health facilities.

Table 2 : frequency of product availability

Product Availability Frequencies

Product Availability	Responses		Percent of Cases
	N	Percent	
TDF+3TC+EFV (300_300_600)	22	24.7%	100.0%
AZT+3TC+NEV (300+150+200)	16	18.0%	88.89 %
NEV (200)	21	23.6%	94.4%
AZT+3TC (60+30)	13	14.6%	72.1%
AZT+3TC+NEV (60+30+50	17	19.1%	94.3%

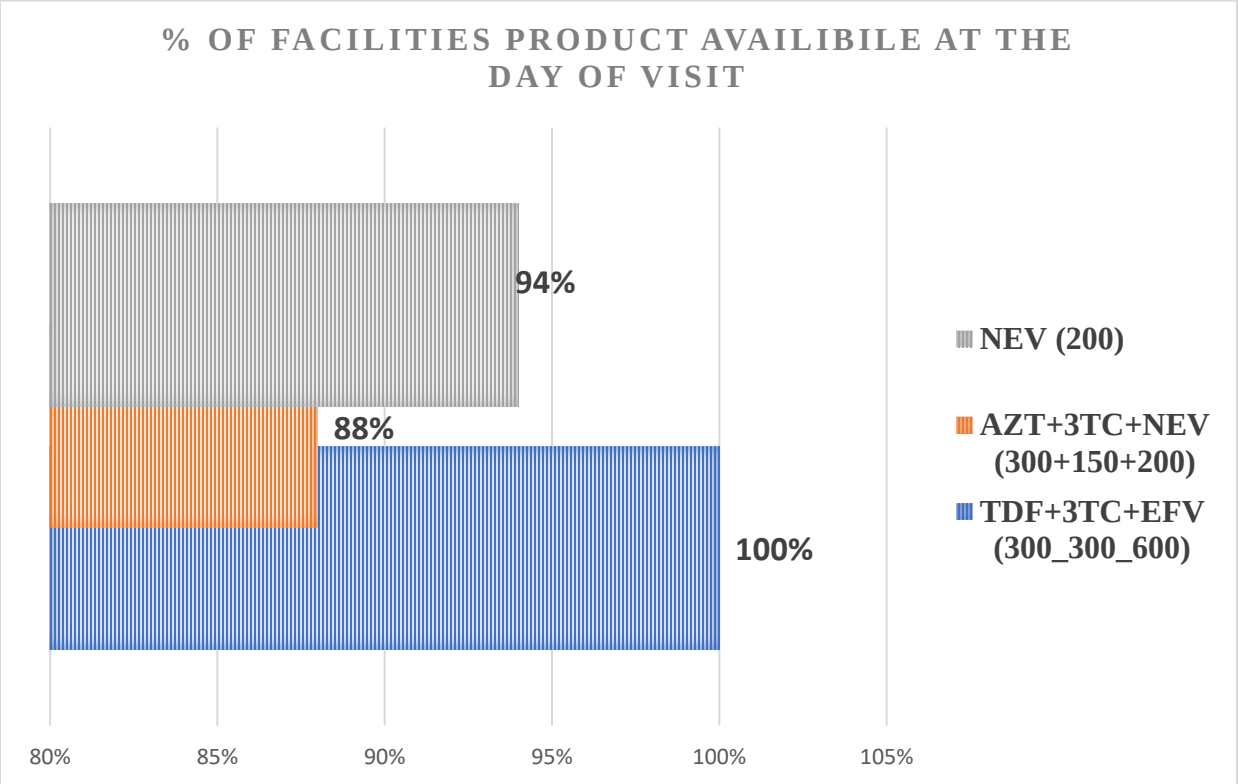


Figure 3: ARV stock status of Health facilities in the day of visit, Benishangul-Gumuz,2018

Therefore, the finding from 22 health facilities revealed that the regional treatment coverage levels is on the right track which is 79 % of people who know their status are accessing treatment, putting the region on pace to reach the second prong of the 90-90-90 target if progress continues.

Even though the overall availability ARV for adult more than 90 % but the inventory system was not consistence for instance; only 6 (27%), 0 (0%) and 3 (13%) of facilities manage their month of stock between two to four months for TDF+3TC+EFV, AZT+3TC+NEV and NEV respectively, which indicate that only few facilities will have enough stock until the next refill.

4.2.3. Viral Load Reagents product availability

To meet the 90-90-90 target and thereby lay the foundation to end the AIDS epidemic, every person starting HIV treatment will need to have access to viral load testing. Viral load monitoring is essential for HIV treatment optimization.

The study revealed that 87 % of patients on ART tested for Viral Load shows viral supersession (<1000 copy/ml of blood) but others receiving the treatment either doesn't know their viral status or result high viral copy per ml of blood.

Unlike of other HIV/AIDS commodities Viral load testing is much more affected by other supplies like sample collecting materials in addition of the main reagents and assessing of these supplies in sample referral sites is critical, and as shown below only 24% of facilities had PPT (Plasma preparation Test tube) and 88% of had EDAT test tube, but All facilities 100% were availed the main reagent used for Viral Load/EID testing at the day of visit.

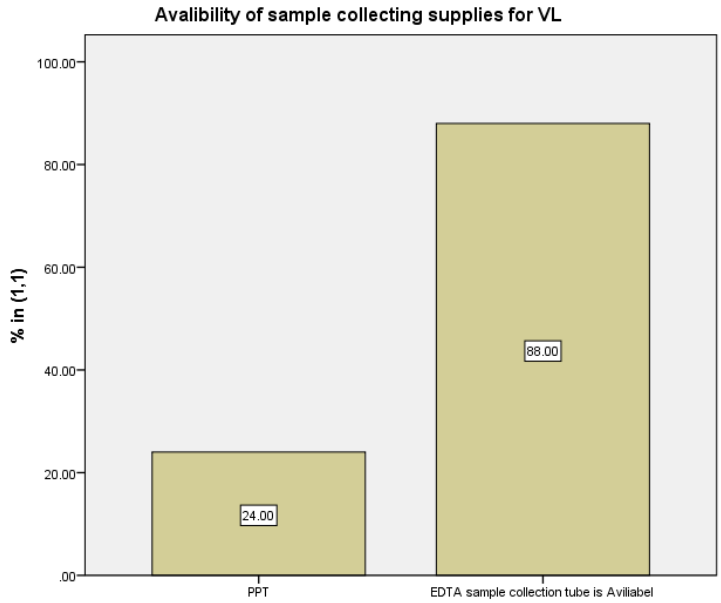


Figure 4: PPT and EDTA stock status of Health facilities in the day of visit, Benishangul-Gumuz,2018

And the unavailability sample collecting supplies for viral load testing lead service interruption, delay of result and overall affect the quality of service provide to the patient. Even though, the finding of the result indicated that the region is on the right track on achieving the 3rd 90' by 2020 but as shown below regional unmet need from total number of patients expected to receive ART monitoring in a region based on country's guidelines is vary across facility from 100 % to 40 %(Fig. 5).

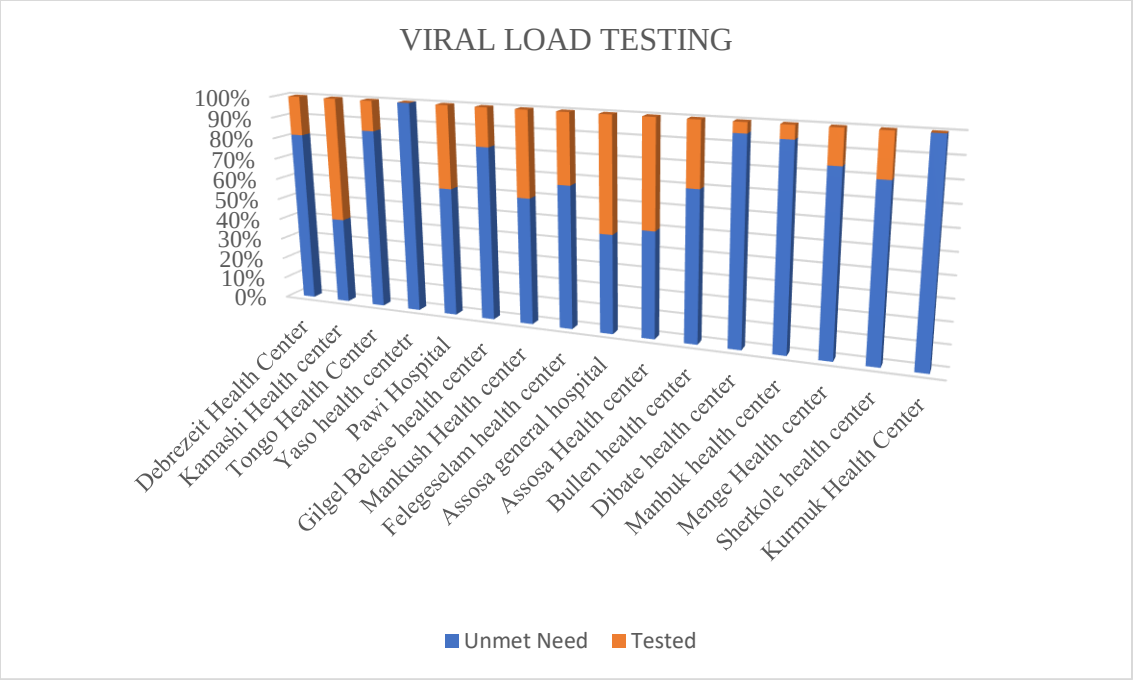


Figure 5:facility unmet need for viral load testing, Benishangul-Gumuz,2018

But similar with this study countries have also succeeded in achieving high levels of viral suppression, demonstrating the feasibility of a target of 90% viral suppression among all people receiving anti-retroviral therapy by 2020. Nationally in Rwanda, for example,83% of people receiving antiretroviral therapy were found to be virally suppressed after 18 months of therapy in 2008-2009. (Elul. *et al*. 2013).

Therefore, to evaluate the 3rd 90' in the perspective of supply management, so as shown above the availability of sample collection materials for viral load testing is not promising and some respondents complaining that there is delays of results and poor communication with testing sites due to distance barrier. Similarly, from this finding, projections by the Clinton Health Access Initiative (CHAI) indicate that the current pace of viral load diagnostic scale-up of Low and Middle-Income Countries is unlikely to meet future target.

4.3. Logistic Management and Information System (LMIS) of HIV/AIDS commodity

In 7 of the selected health facilities they used both computerized HCMIS and paper-based recording and reporting tools. In addition to these RRF and Internal Facility Reporting and

Requisition (IFRR) were used to facilitate and control stock movement between PFSA and facility and within the facility itself.

Concerning the ARV drugs all health facilities were using Report and Requisition Format (RRF) to report consumption and to order ARV drugs needed. They submit the report to Pharmaceutical Fund and Supply Agency (PFSA) hub. They used facility personnel and vehicle to submit their report and request. The RRF is a pre-printed format containing different logistic data which were classified as report part (Beginning balance, Quantity received, Loss/adjustment, ending balance, Calculated consumption and Days of stock out) and requisition part (Maximum stock, Quantity needed to reach maximum and Quantity ordered) In majority of the health facilities RRF was prepared and reported by the store manager alone. Even though they were supposed to submit the report every two months; between the 1st and the 10th day of the reporting month, there were few facilities which failed to do so. They had mentioned negligence as a main reason for not being able to submit their RRF on time. In line with this; they had recalled lack of the RRF and work load as additional factors for the delay in submitting the RRF.

LMIS data quality, it was only done for HIV/AIDS commodity have use and update bine cards and those health facilities either not used or not update bin cards is not included.

LMIS data quality was checked by using bin cards of ARV and RTKs, ending balance on the bin-card was checked with physical count in the day of visit. And if there is a difference of ending balance for one or more items, the respondent was asked to explain the discrepancy.

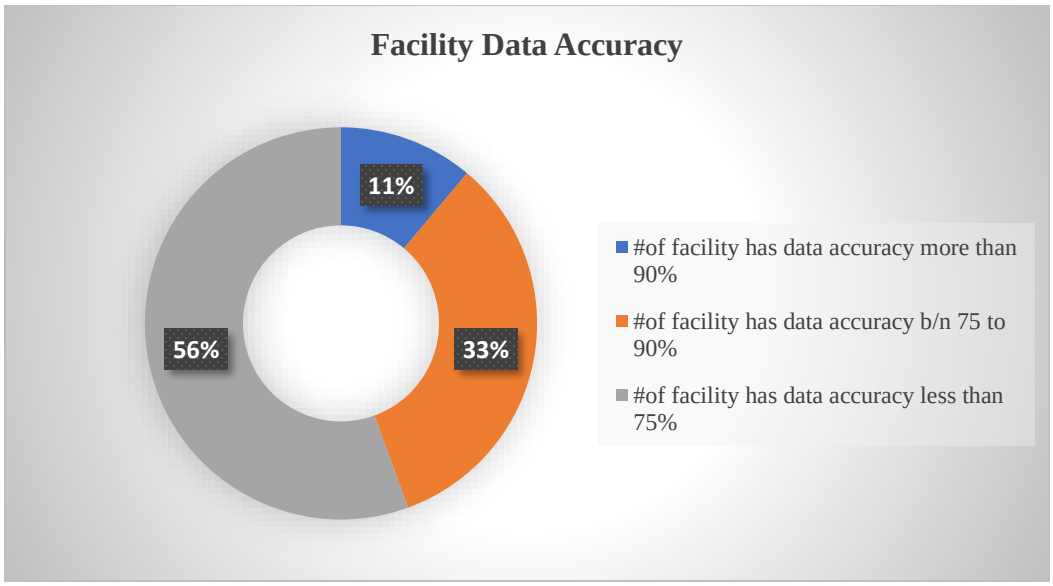


Figure 6 : Facility Data accuracy rate/percentage, Benishangul-Gumuz 2018

As shown above on Fig.6, 11% of assessed facility has 90% data accuracy where as 56 % of them score less than 75 % of accuracy in their stock management. And they reasoned out for the discrepancy due to the ending balance as the SOH found in the store room and dispensing unites and negligence (forgetting different brands).

Majority of the facilities 16(72%)of health facilities were able to submit their last report according to the schedule while the data availability and Accuracy were 50% and 36.6% respectively. And different from this, study conducted by Shewarega *et.al.* 2015, also showed that, nearly 77 percent of hospitals and health centers had bin cards within 10 percent accuracy. But study conducted by Berhanemeskel. *et al.*2014, showed that, majority of the store keepers, 78.9% in health facilities said they sent their report on time always.

As shown below, the study revealed that the data confidence of the region on the three-perspective completeness, accuracy and timelines is found 2.38, which indicate that the logistic decision generated based on the data generated from health facility is good.

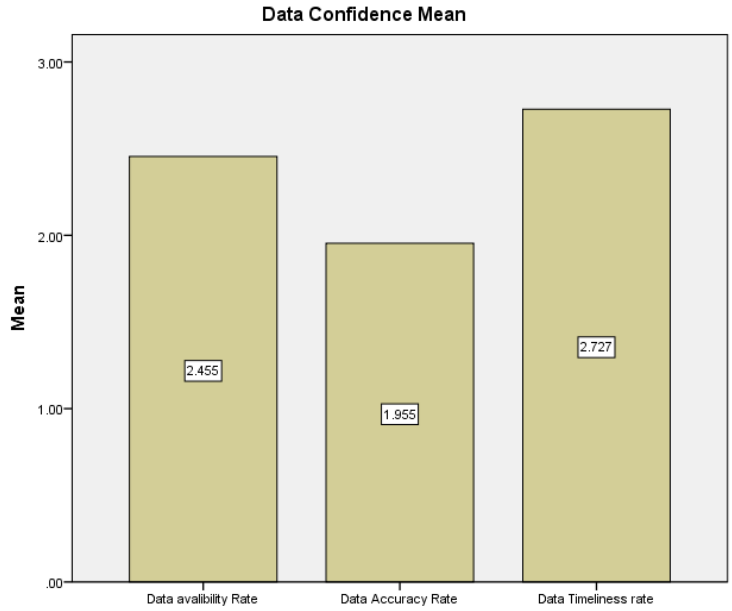


Figure 7: Mean Value of data confidence in availability, accuracy and timelines perspective

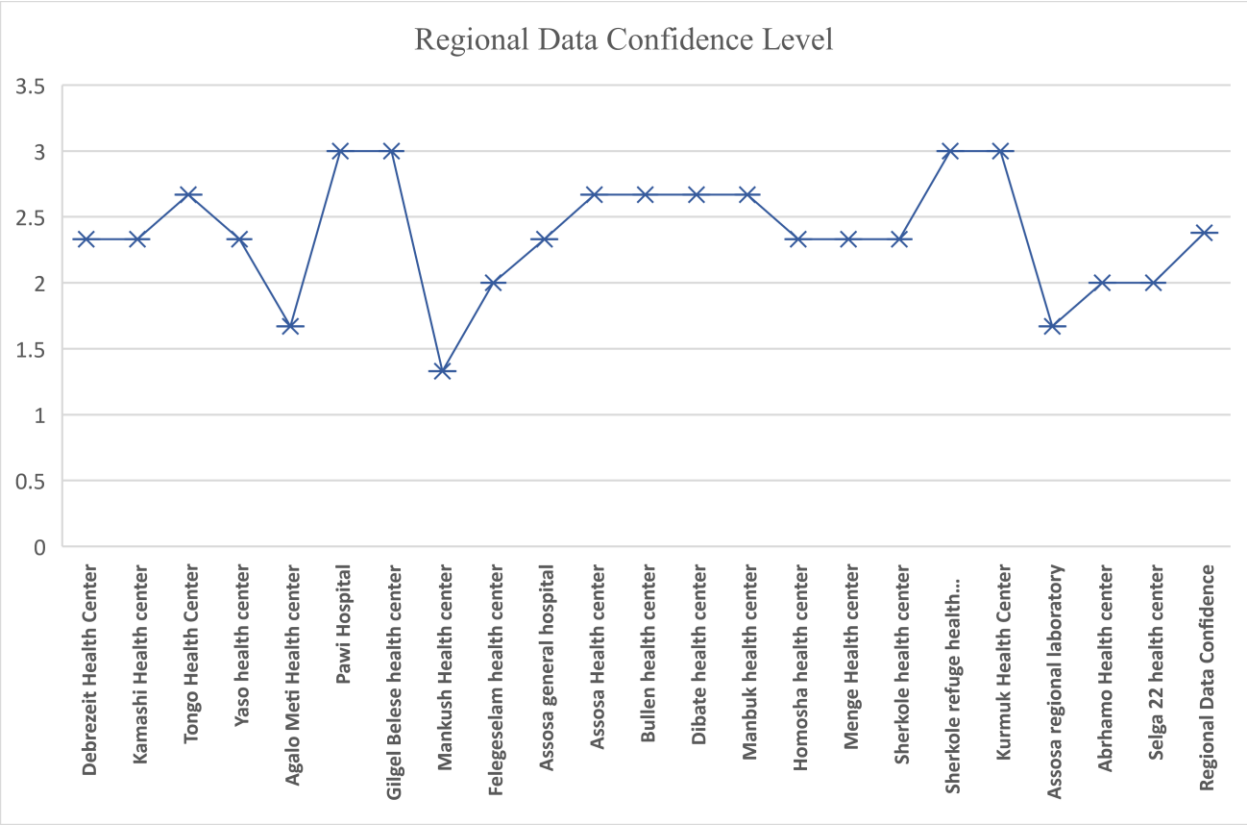


Figure 8:Level of data confidence at facility and regional level, Benishangul-Gumuz 2018

One of the attribute of Poor LMIS is place emergency order frequently so, measuring of the frequency of emergency order placed in the health facility is important to evaluate system level performance health supply chain. The result of the study indicated that 38% of assessed health facilities was placed one emergency order at list for one type of HIV/AIDS commodities in the last six months (Fig. 9).

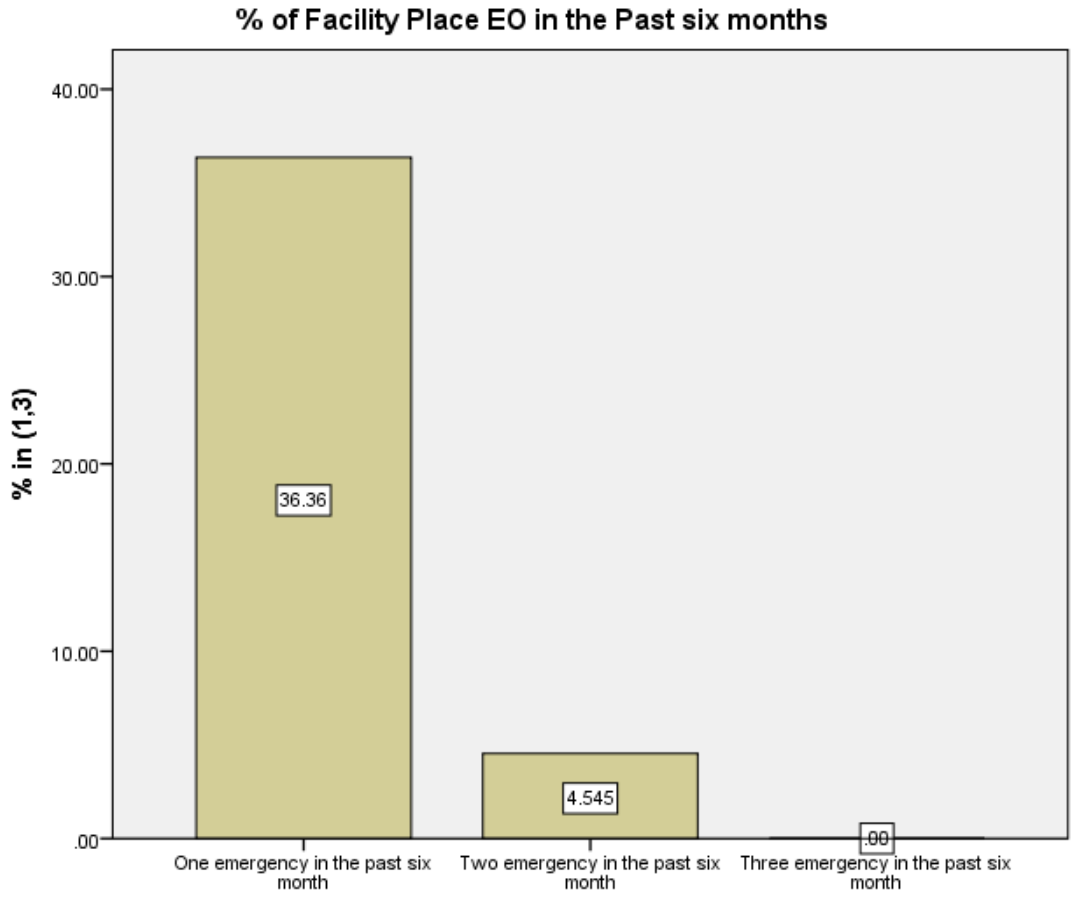


Figure 9: facility with frequency EO in the last six months prior to study

Frequency of emergency order not only the attribute of poor logistic management information system but also helps to evaluate the overall performance of facility level logistic system in pharmaceutical management. Similarly, study done by Berhanemeskel *et al*. showed that, majority of health centers 16(84.2%) had one or more emergency order while all of hospitals had emergence order of ARV drugs more than three times in the past six months.

And compare with result from interviews with facility personnel indicated that approximately half the facilities placed at least one emergency order in the six months preceding the study is complement with retrospective finding.

This might be associated with poor data quality, less response time, inadequate quantification and un proportional supply from central level. Literature said that an accurate quantification is essential for all health commodities but are of very importance for HIV/AIDS related commodities because quantification of drug and health commodity requirements for HIV/AIDS programs is complex and uninterrupted access for patients must be ensured.

4.4. Storage practices of HIV/AIDS commodities

The stores of 22 health facilities were assessed during the study time. There was 1 HCs which didn't have bin card for ARV drugs and 7 health facilities either not used or update Bin-card for RTKs. The average percentage of updated bin card of ARV drugs and RTK was 80.9% and 46.6% in health facilities respectively. The study showed that, in the past 6 months bin cards were updated for ARV and RTK in 7(19%) of health facilities on the day of visit. While the remaining health facilities have one or more HIV/AIDS commodity not updated bin cards.

Similarly, study conducted by Shewarega *et.al.* 2015; showed about half the assessed facilities (55 percent) met at least 80 percent of the storage criteria (9 out of 11); with health center stores (63 percent) higher than hospitals (43 percent) and health posts (29 percent).

Therefore, the qualitative data obtained by observation checklist showed that appropriate arrangement of products with visible expiry dates and identification labels, FEFO organization of product and accessibility of products for counting; cleanliness of the store, and thermometer usage were the major challenges in many of the health facilities. Additionally, there was sign of rodents and insects in most of health facilities, utilization of expiry tracking chart was also very minimal and expired test kits were found on the shelves of one health facility on the day of visit. Unlike this, majority of the health facility maintained the outer cartoon of the product in good condition and they were able to separate expired and damaged product from usable product either in the store room or in separate store. Moreover, the observation revealed that cartoons and products were protected from direct sunlight; stores were locked, and the keys were maintained with the store manager, roofs were maintained in good condition to avoid sunlight and water

penetration. And the overall Storage management practice of assessed facility shown on (Fig. 10).

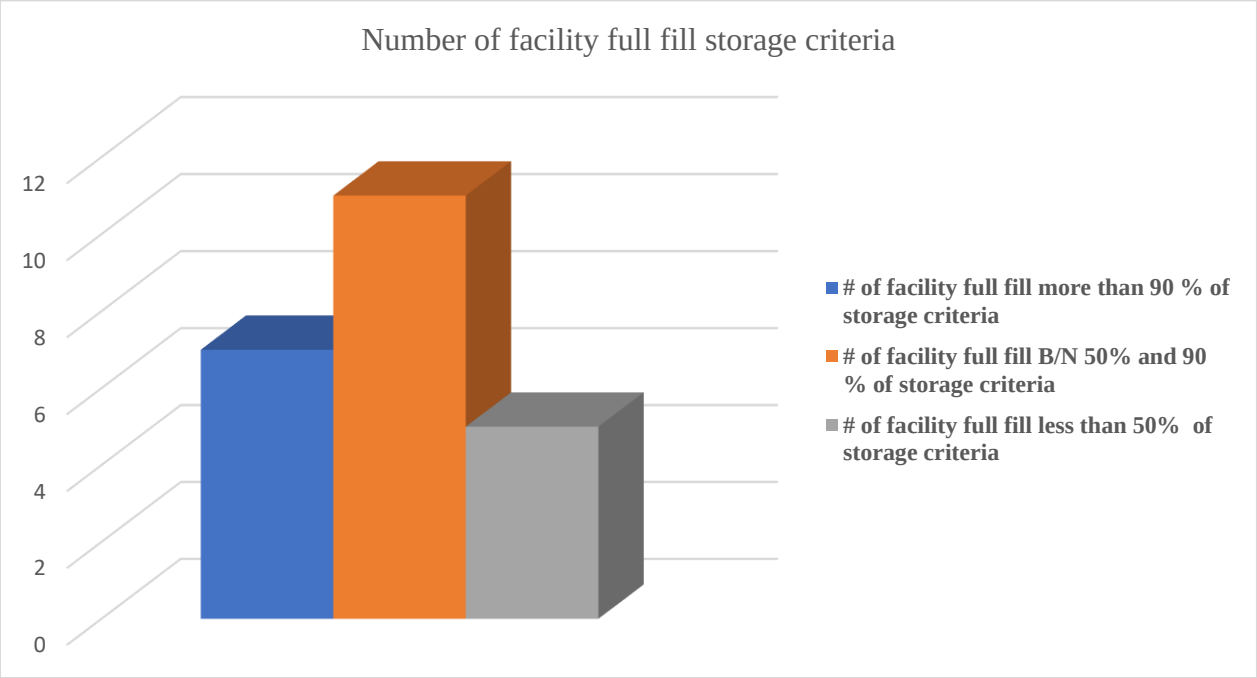


Figure 10: Number of facility full fill storage criteria

4.5. Inventory management practice of HIV/AIDS commodities

Ethiopia implemented Integrated Pharmaceuticals Logistic System (IPLS) throughout the country using Max-Min inventory control forced-ordering system, which is the trigger for ordering is the end of the review period. This means that all facilities are required to report on a fixed schedule (every other month at health centers and hospitals) for all products. In addition, all products are re-supplying each time a report is completed. In emergencies, an emergency order can be placed. In the system the maximum months of stock, the minimum months of stock and emergency order points for the health facility logistics system are 4 months,2month and 0.25 month. This study is revealed that only 6 (27%),3(14%) and 1(5%) facilities were stock within max-min in the day of visit for TDF+3TC+EFV, NEV and Beijing Wanti respectively. (Fig.11) Similarly, study conducted by Shewarega *et.al.* 2015 showed that most facilities are not stocked according to the recommended 2–4 months of stock. For almost all products assessed, overstocking is more common than understocking.

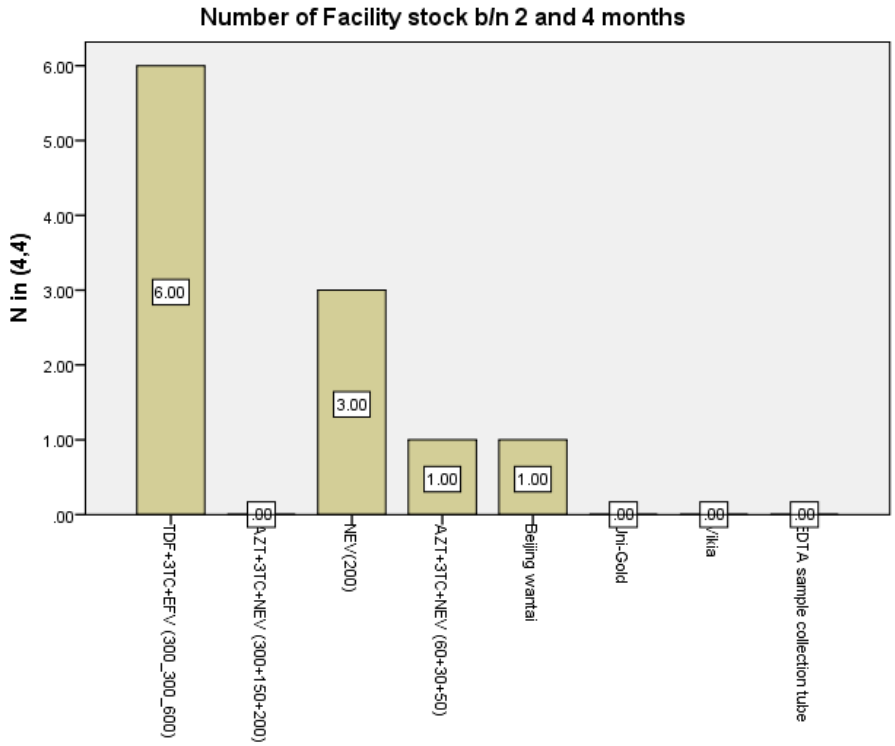


Figure 11: Facilities within 2 and 4 months of stock on the day of visit, Benishangul-Gumuz 2018

Therefore, only three products in ten study facilities didn't have risk of stock out and expiry due to surpluses of item to be managed.

Whereas 11(50%) of facility over stock with NEV and 9(41%) were either stock out or on emergency point for Vikia at the day of visit(Fig.12,13).

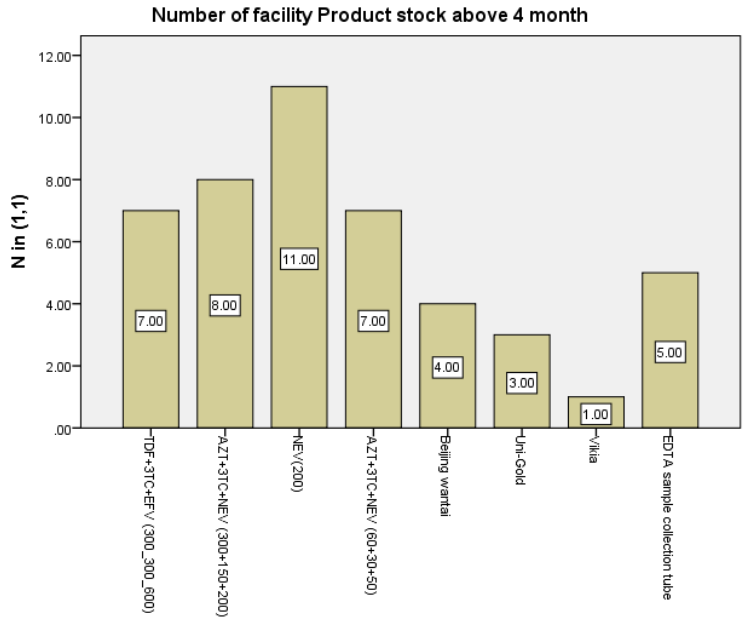


Figure 12: Facilities with above 4 months of stock on the day of visit, Benishangul-Gumuz 2018

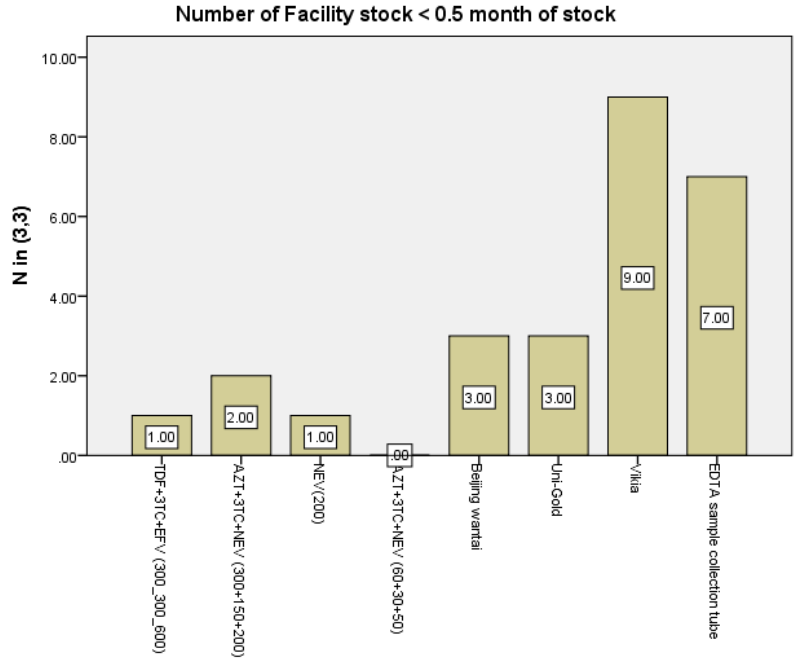


Figure 13 Facilities with less than 2 weeks of stock on the day of visit, Benishangul-Gumuz 2018

Generally, the study has provided valuable information that can help measure the level of supply management of HIV/AIDS commodity towards achieving of the three 90' at public-sector health facilities and to identify areas to be strengthened. For instance, findings show that availability and utilization of the logistics management information system (LMIS) formats necessary for recoding and reporting purposes were found to be reasonable; but, there is certainly room for improvement, and discrepancies were observed by level of facility and product types. However, in a considerable percentage of facilitates, data quality is an issue.

And finally, the above many reasons, resulted to only 45% of people know their status, 79% of people who know their status are accessing treatment and 87 % of people receiving treatment have suppressed viral load in Benishangul-Gumuz region as shown below. (Fig.14).

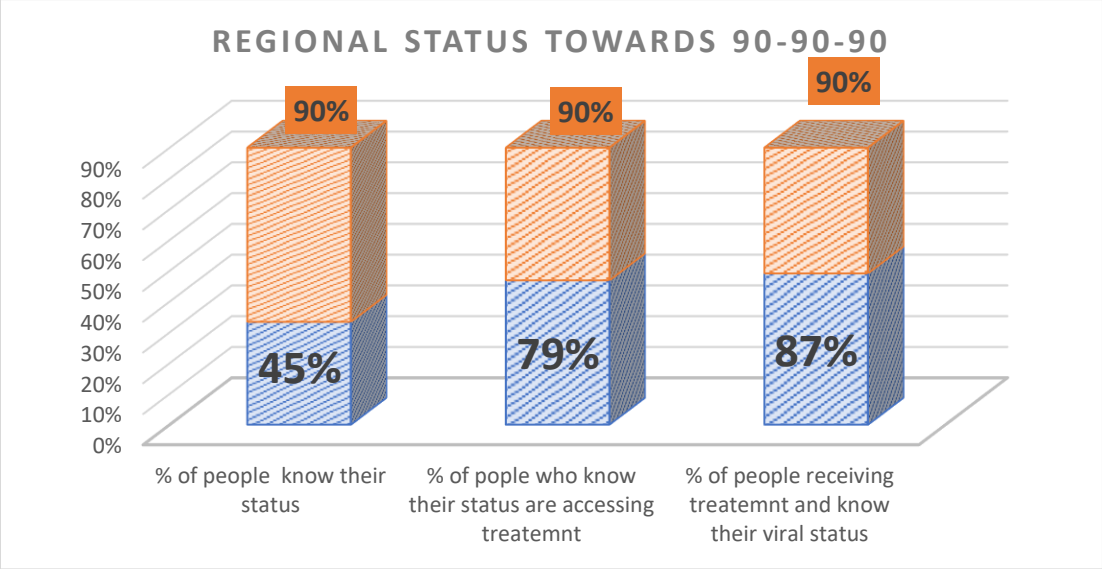


Figure 14: Benishangul-Gumuz regional status towards achieving the 90-90-90 strategy

CHAPTER FIVE: Summary, Conclusions and Recommendation

5.1. Summary

Ensuring uninterrupted supplies of HIV Rapid Test Kits (RTKs), ARV and supplies for Viral Load testing in health facilities is crucial in the provision of targeted HIV testing and counseling services, helping to prevent AIDS-related deaths and avert new infections and HIV treatment optimization. As part of this effort, Benishangul-Gumuz regional health bureau and PFSA hubs has been supporting the availability of RTKs to health facilities through direct provision of RTKs to selected high yield health facilities and providing technical assistance on the health supply chain system through its implementing partners.

Even though it has been more than a decade since testing, treatment and monitoring services were started but still there is compliant on it coverage and frequent service interruption of Testing and monitoring of HIV/AIDS. Majority of the facilities have monitoring tools but not updated regularly, therefore, they were not able to calculate stock on hand for how long it last.

As shown in the study there is shortage of RTKs in some facilities. The stock status of ART drugs was controlled relatively in better way than RTKs in health facilities. Nearly 27% of facilities maximum minimum inventory control system for ARV drugs while only 1(4.5%) did use for HIV test kits the remaining is prone to stock outs. 100% of facilities provide ART service had TDF+3TC+EFV (300+300+600) mg at the day of visit and 89%, 94% of them was available for AZT+3TC+NEV (300+150+200) mg and NEV 200mg respectively.

Regarding Viral load testing, the regional unmet need from total number of patients expected to receive ART monitoring in a region based on country's guidelines is vary across facility from 100 % to 40 %, which indicates that even though it is in the right track towards 3rd 90' but the denominator not addressed well.

5.2. Conclusions

The study has provided valuable information that can help to evaluate the supply chain performance of HIV/AIDS commodities in the perspective of three 90’ at public-sector health facilities and to identify areas to be strengthened.

Findings show that the logistics management information system (LMIS) of HIV/AIDS commodity management were found to be crucial for improving the availability of HIV/AIDS commodities; but, discrepancies were observed by level of facility and product types. Therefore, in a considerable percentage of facilitates, data quality is an issue.

Meeting the standard storage criteria, another important indicator for proper implementation of good storage practices, was a challenge for a significant percentage of health facilities, particularly at health center level

Overall, the availability of HIV/AIDS commodity is generally good for ARV, with some variation by level of facility and product type. However, across products, most facilities are not stocked according to the recommended two to four months of stock. For almost all products assessed, overstocking was higher than understocking, which might lead to stock being wasted or expire.

The study found out that availability is paramount for reaching the target in 2020, Therefore, Supply chain activities and clinical services work hand to hand for provide quality service on testing and treatment to reach the target in 2020.

5.3. Recommendations

To improve the supply chain management performance of HIV/AIDS program commodities and achieve the three 90’ by 2020, the Benishangul-Gumuz regional health bureau, professionals, facilities, and other concerned bodies is urged to consider the following recommendation based on the findings of the study:

- All facilities should prepare and send reports accurate, complete and regularly, since it is the main factor that affects the supply chain quantification of HIV/AIDS commodities which also hinder towards achieving the target
- To build on existing supply chain capacity of the health professional, mechanisms that ensure the current and new health professional working in health logistic management receive direct training in logistics are also needed.

- The study results show that the storage condition for a significant percentage of health facilities did not meet the standard criteria. The FMOH, PFSA, Benishangul-Gumuz Regional Health Bureau (BGRHB), and partners have been supporting health facilities to upgrade their storage conditions by supplying various types of shelves and other warehouse equipment. This effort should be strengthened and resource mobilization from other sources should be identified to reach more health facilities. Some of the storage issues could also be addressed by reinforcing good logistics management practices and maintaining key storage conditions, such as first-to-expire and visibility of identification labels and expiry dates.
- To increase access to viral load testing in all settings, the country should in place easy reliable and efficient technology to the region.

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Annexes: Questionnaire

Annex I. ARV commodity supply management questionnaire and Observation check list Consent form.

Dear sir/madam I am_____. I am from Addis Ababa university, college of business and economics, school of commerce with a research team to assess supply chain management performance of HIV/AIDS commodities the perspective of achieving 90-90-90 strategies. This interview is part of the research and the information you provide will be a very important input in the understanding of the topic at hand and will help the investigators to suggest solutions to solve possible problems to be discovered from the study. The interview will only take 30-45 minutes and you have a right not to answer any question that you don't want to respond to. You can also stop the interview at any time if you want to do so. If you have any questions about this study, you can ask at any point in the interview. So, are you willing to participate in this study?

Yes_____ No_____

Annex II. HIV/AIDS program commodity Questionnaire and Observation Check List

Date of visit: _____

Section I. General Information

Health Facility Information	
Health Facility Name	Facility Type
	□ ART□PMTCT□ Lab only **□ Lab monitoring □ Hospital**
HIV/AIDS	
Number of Pt on ARV (on treatment) _____ **Number client tested for HIV in the last six months_____ plan_____** **Number of HIV pts get Viral Load testing in the last six months_____** **Number of HIV pts get CD4 testing in the last six months_____**	
Facility Telephone	Facility Telephone
Region	
□Benishangul-Gumuz	

Assessor Names, Posts and Organizations			
Name	Position	Organization	Telephone

Section II: HIV/AIDS program commodity Supply Management (Service, Training, Store Management and Requisition, Internal Management System, Management Follow Up), Circle any relevant options

No	Description	Choices	Remark
1	**ART service (for ART coordinator)**		
101	How long have ART services been offered at this facility?	Years……. Months…….	
102	Is a copy of the updated standard treatment guidelines available at this facility? (Ask to see a copy of the guidelines. Mark Yes only if you see the guidelines.	1.Yes 2. No	
103	Is there a document that lists all the recommended	1.Yes 2. No	

	ARV drug regimens to be prescribed and dispensed at this facility?		
104	What report do you use for reporting this information to a higher level? (Ask to see a copy of the report.)		
105	How often is this report submitted to the higher level? (Circle all that apply.)	1. Monthly 2. Bi-monthly 3. Quarterly 4. Semi-annually	
106	Which type of testes frequently used to initiate ARV for clients. (Ask to see ten patient records)	1. CD4 2. EID 3. Viral Load 4. Clinical chemistry 5. Hematology 6. Other	
107	Which type of testes frequently used to monitor ARV treatment. (Ask to see ten patient records)	1. CD4 2. EID 3. Viral Load 4. Clinical chemistry 5. Hematology 6. Other	
2	**ART Pharmacy (for pharmacy Head)**		
201	Do you have training on managing HIV/AIDS commodity management? (please specify) 1. 2.	1.Yes 2. No	
202	For how long of a supply is dispensed to patients when they come for resupply?	Months ……. Days……	
203	Where do you record information on the quantities of ARV drugs dispensed (consumption)?	1. Daily ART registrar 2. Patient Records 3. Pharmacy register 4. Bin-Card 5. Not recorded 6. Other	
204	Where do you record information on the quantities of ARV drugs in stock (stock on hand)?	1. Daily ART registrar 2. Patient Records 3. Pharmacy register 4. Bin-Card 5. Not recorded 6. Other	
3	**Reporting and Ordering**		
301	What report do you use for reporting to higher level? Ask to see the copy of the report) write the name of LMIS here. 1.	1. 2. 3. 4.	

	2. 3.		
302	Is there different LMIS format for reporting in your facility (Yes if you only see the format, otherwise No)	1.Yes 2. No	
303	Verify the type of data collected in the LMIS report (look at the LMIS report to verify)		
a.	Received	1.Yes 2. No	
b.	Issues	1.Yes 2. No	
c.	Consumption	1.Yes 2. No	
d.	Stock on hand/ Ending balance/	1.Yes 2. No	
e.	Loss/adjustment	1.Yes 2. No	
f	Other (specify)		
304	Who prepares the orders/reports for ARV drugs for this facility	1. Head of pharmacy 2. Store manager 3. Other	
305	When was the last time you submitted the report on consumption and stock on hand of HIV/AIDS program commodity at this facility? (see & take copy)	1. Never 2. Within the last month 3. Two month ago 4. More than two month ago	
306	How often are you supposed to submit reports to the higher level?	1. Monthly 2. Bimonthly 3. Quarterly 4. Semi-annually 5. Annually 6. Other	
307	Are you able to submit you report on time? (please check the date of at list six report)	1. Always 2. Most of the time 3. Sometimes 4. Never	
308	What factors influence not being able to submit your report on time?	1. Take too long time 2. Not enough time b/n reports 3. Lack of reporting format 4. Approval process to long 5. Lack of appropriate Data Acquisition 6. Other…….	
309	What factors affect the quantities you order	1. Number of pts on ARV 2. Storage Capacity 3. Stock available 4. Other ……...	
310	Do all Unites receive HIV/AIDS program	1.Yes	

	commodities from pharmacy store only?	2. No	
311	Does the facility have Internal Resupply System to monitor the utilization of HIV/AIDS program commodities?		
312	If "NO" to above, why? Mention what type of system does the facility uses to monitor HIV/AIDS program commodities utilization system	…… …… …… …… ……	
313	How many emergency orders for ARV drugs were placed in the past 6 months?	1. None 2. 1 3. 2 4. 3 5. More than 3 6. Don't know	
314	How do you send your Report /Order to the higher level	1. Postal Mail Service 2. HMIS Route 3. Internet 4. Fax 5. Physical Delivery 6. Telephone 7. Physical collection 8. Other…….	
4	**Receiving/ Distribution/ Transportation**		
401	How often do you receive supplies?	1. Weekly 2. Biweekly 3. Monthly 4. Bimonthly 5. Other (specify)	
402	Do you keep a copy of your proof of delivery? (take copy of Delivery)	1.Yes 2. No 3. Don't know	
403	Do you receive the quantities of HIV/AIDS program commodity that you order?	1.Always 2. Sometimes 3. Don't know	
404	Who is responsible for transporting HIV/AIDS program commodity to your facility?	1.Supplier 2. facility itself 3. Other…….	
405	On average, approximately how long does it take from the time the facility places an order until the ARV drugs are received?	1.Less than 2 weeks 2. 2 weeks to 1 month 3. Between 1 and 2 months 4. More than 2 months	

5. Storage Condition:

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

	Description	Yes	No	Remark
501	Products are arranged on shelves with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible			
502	HIV/AIDS commodities are stored and organized to FEFO procedures and are accessible for counting and general stock management.			
503	Outer cartons are in good condition (not crushed, perforated, stained, or otherwise visibly damaged).			
504	There is separate store for expired and damaged products, andprocedures exist for removing them from inventory			
505	Damaged and expired products are separated from usable products in the storeroom, and procedures exist for removing them from inventory.			
506	Expired and damaged products are store with other products haphazardly			
507	HIV/AIDS commodities are stored in a dry, well-lit, wellventilated storeroom. (Visually inspect roof, walls, and floor ofstoreroom.)			
508	Cartons and products are protected from direct sunlight.			
509	There is no evidence of rodents or insects in the storage area. (Visually inspect the storage area for evidence of rodents[droppings] or insects that can damage or contaminate theproducts.)			
510	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel.			
511	Roof is maintained in good condition to avoid sunlight and water penetration.			
512	Storeroom is clean, with all trash removed, no evidence of food and drinks, products stored on sturdy shelves/bins, and boxes organized neatly.			
513	Current storage space is sufficient for the existing products			
514	Does the facility store use Expiry tracking chart/tool			

6. Stock Data for ARV Drugs (for the past 6 month and day of the visit):

INSTRUCTION:

Column:

1. Name of each ARV drug that will be checked.
2. Record Unit of issue (Pack) or tab
3. Record the total quantity received (from PFSA)
4. Take three recent months average of consumption
5. Take only stock found at store
6. Record if the facility is experiencing a stock out of the product on the day of the visit, according to the physical inventory; answer Y for yes or N for no.
7. Take quantity of product expired within one year.
8. Check if the bin card is available for each product; answer Y for yes or N for no. If another type of record is used (e.g., stores ledger), note, and continue to gather stock information using another type of record.
9. Check if the bin card has been updated within the last 30 days; answer Y for yes or N for no. Note: If the balance was 0 the last time the bin card was updated, and the facility has not received any resupply of ARV drugs, consider the bin card up-to-date
10. Record whether the facility has had any stock outs of the product during the last six completemonths before the day of the visit: answer Y for yes or N for no.
11. Record total number of days the product stocked out during the six complete months before the day of the visit according to the bin cards.
12. Record how many timesthe product stocked out during the six complete months before the day of the visit according to the bin cards.
13. Reason(s) for stock outs. For any product that experienced a stock out in the last six complete months before the survey, record the specific reason(s) for the stock out.
14. If a Maximum/Minimum Inventory Control System has been established, fill in the maximum and minimum months of stock and order interval in the spaces provided at the bottom of the table

Comments from the table

10 * Reason for Stock out:

   1. didn't receive order
   2. did not order onetime
   3. don't know how to order
   4. didn't receive the quantity order
   5. supplier stock out

11. other

Product	Code	Units of count	Quantity received in the last six months of ordered	Average month of consumption?	(SOH) Physical inventory— Store room and DU	Stock out today? (Y/N)	Quantity of expired products	Bin- card available? (Y/N)	Bin- card updated. (Y/N)	Stock out most recent 6 months (Y/N)	What is the maximum number of days out of stock for the last six months	How many times the product stock out for the last six months
1		2	3	4	5	6	7	8	9	10	11	12
ADULT FIRST LINE												
TDF+3TC+EFV (300+300+600)												
AZT+3TC+NVP (300+150+200)												
NVP 200												
ADULT SECOND LINE												
ATV/R (300+100)												
LPV/R (200 + 50)												
PEDIATRIC FIRST LINE												
AZT+3TC (60+30)												
AZT+3TC+NVP (60+30+50)												
PEDIATRIC SECOND LINE												
ATV/R (100+25)												
LPV/R (80+ 20) ML												

Table 1.Stock Data for ARV Drugs (for the past 6 month and day of the visit):

7. Stock Data for HIV test kits, CD4 and VL/EID reagents (for the past 6 month and day of the visit):

INSTRUCTION:

Column:

1. Name of each HIV test kits, CD4 reagents and VL/EID test reagents that will be checked.
2. Record Unit of issue (Pack) or tab
3. Record the total quantity received (from PFSA)
4. Take three recent months average of consumption
5. Take only stock found at store
6. Record if the facility is experiencing a stock out of the product on the day of the visit, according to the physical inventory; answer Y for yes or N for no.
7. Take quantity of product expired within one year.
8. Check if the bin card is available for each product; answer Y for yes or N for no. If another type of record is used (e.g., stores ledger), note, and continue to gather stock information using another type of record.
9. Check if the bin card has been updated within the last 30 days; answer Y for yes or N for no. Note: If the balance was 0 the last time the bin card was updated, and the facility has not received any resupply of ARV drugs, consider the bin card up-to-date
10. Record whether the facility has had any stock outs of the product during the last six complete months before the day of the visit: answer Y for yes or N for no.
11. Record total number of days the product stocked out during the six complete months before the day of the visit according to the bin cards.
12. Record how many times the product stocked out during the six complete months before the day of the visit according to the bin cards.
13. Reason(s) for stock outs. For any product that experienced a stock out in the last six complete months before the survey, record the specific reason(s) for the stock out.
14. If a Maximum/Minimum Inventory Control System has been established, fill in the maximum and minimum months of stock and order interval in the spaces provided at the bottom of the table

Comments from the table

13.* Reason for Stock out:

1. didn’t receive order
2. did not order onetime
3. don’t know how to order
4. didn’t receive the quantity order
5. supplier stock out

Product	Code	Units of count	Quantity received in the last six months of ordered	Average month of consumption?	(SOH) Physical inventory— Store room and Laboratory unit	Stock out today? (Y/N)	Quantity of expired products	Bin- card available? (Y/N)	Bin- card updated. (Y/N)	Stock out most recent 6 months (Y/N)	What is the maximum number of days out of stock for the last six months	How many times the product stock out for the last six months
1		2	3	4	5	6	7	8	9	10	11	12
Beijing Wantai												
Uni-Gold												
Vikia												
ppt (plasma preparation tube)												
DBS kits												
Abbott EID - Real Time HIV-1 Amplification Reagent												
Abbott VL - Real Time HIV-1 Amplification Reagent												
COBAS TaqMan EID-KIT CAP/CTM HIV-1 Qual 48T CE-IVD												
COBAS TaqMan VL-CAP/CTM HIV-1 V2.0 Quan EXPT-IVD												
Nunk Tube												
pimma cartilage												
Single tube cd4 reagent												
EDTA sample collection tube												

8. LMIS Data Quality: Usable Stock on Hand at Time of Most Recent LMIS Report

Checking whether health facilities report stock on hand (SOH) that is kept in the storeroom only or in the storeroom and all other places with the SOH in the LMIS report includes ARV drugs kept in the storeroom and all other places, this is generally between the LMIS form (2) and the balance from the bin card (3).

INSTRUCTIONS

Column:

1. Ask the store manager, if there are products out of the following products and add last place.
2. Obtain the most recent LMIS report for the selected products, and record the SOH from the LMIS report
3. Write the quantity of usable SOH from the stock records at the time of the selected LMIS report.
4. Note the reasons for any discrepancy.

Product	Usable Stock on Hand at Time of Most Recent LMIS Report		
	Ending balance on recent LMIS report	Ending balance on the bin-card from time of LMIS report	Reasons for discrepancy
ADULT FIRST LINE			
TDF+3TC+EFV (300+300+600)			
AZT+3TC+NVP (300+150+200)			
NVP 200			
ADULT SECOND LINE			
ATV/R (300+100)			
LPV/R (200 + 50)			
PEDIATRIC FIRST LINE			
AZT+3TC (60+30)			
AZT+3TC+NVP (60+30+50)			
PEDIATRIC SECOND LINE			
ATV/R (100+25)			
LPV/R (80+ 20) ML			

Table 2.Usable Stock on Hand at Time of Most Recent LMIS Report for ARV

Product	Usable Stock on Hand at Time of Most Recent LMIS Report		
	Ending balance on recent LMIS report	Ending balance on the bin-card from time of LMIS report	Reasons for discrepancy
BEIJING WANTAI			
UNI-GOLD			
VIKIA			
PPT (PLASEMA PREPARATION TUBE)			
DBS KITS			
ABBOTT EID - REAL TIME HIV-1 AMPLIFICATION REAGENT			
ABBOTT VL - REAL TIME HIV-1 AMPLIFICATION REAGENT			
COBAS TAQMAN EID-KIT CAP/CTM HIV-1 QUAL 48T CE-IVD			
COBAS TAQMAN VL-CAP/CTM HIV-1 V2.0 QUAN EXPT-IVD			
NUNK TUBE			
PIMMA CARTILAGE			
SINGLE TUBE CD4 REAGENT			
EDTA SAMPLE COLLECTION TUBE			

Table 3Usable Stock on Hand at Time of Most Recent LMIS Report for Laboratory test

9. Check lists for inventory accuracy rate

Instruction

Ask the store keeper or manger to show stock card or Bin card used for controlling inventory in their store. Then first collect Stock card or Bin card from the store manager, then register the stock balance from Bin card or Stock card in column “B” and physically count each product and record in column “C” if there is discrepancy ask the reason from the store manager.

S. NO	LIST OF PRODUCTS	A	B	C	D
		BINCARD/STOCK CARD AVAILABLE (Y/N)	STOCK BALANCES RECORDED ON A STOCK CARD/BIN CARD	ACTUAL INVENTORY ON HAND	REASONS FOR DISCREPANCY
	TDF+3TC+EFV (300+300+600)				
	AZT+3TC+NVP (300+150+200)				
	NVP 200				
	ATV/R (300+100)				
	AZT+3TC (60+30)				
	AZT+3TC+NVP (60+30+50)				
	BEIJING WANTAI				
	UNI-GOLD				
	VIKIA				
	PPT (PLASEMA PREPARATION TUBE)				
	DBS KITS				
	ABBOTT EID - REAL TIME HIV-1 AMPLIFICATION REAGENT				
	ABBOTT VL - REAL TIME HIV-1 AMPLIFICATION REAGENT				
	COBAS TAQMAN EID-KIT CAP/CTM HIV-1 QUAL 48T CE-IVD				
	COBAS TAQMAN VL-CAP/CTM HIV-1 V2.0 QUAN EXPT-IVD				
	PIMMA CARTILAGE				
	SINGLE TUBE CD4 REAGENT				
	EDTA SAMPLE COLLECTION TUBE				

10. Data Availability (Completeness)

Tracer Product	*A. Is this product offered at this facility? (1=Yes, 0=No)*	*B. What is/ are the required stock monitoring tool(s) for this product*	*C. Are all the required monitoring tools available? (1=Yes, 0=No)*	*For items D-K, enter 1 if the data for the tracer product has been entered on the monitoring tool (with the correct unit of measure) within the last month. Enter 0 if data element is missing, blank, incorrectly noted as "0", or has the incorrect unit of measure. For ending balance (F) SDP has to fill both the dispensary unit (DU) and store balance.*							
				D. Beginning Balance	*E. Quantity Received*	*F. Ending balance*	*G. Calculated consumption*	*H. Days out of stock*	*I. Maximum stock quantity*	*J. Quantity needed to reach max*	*K. Quantity ordered*
Most used first line adult ARV Efavirenz-Lamivudine-Tenofovir disoproxil fumarate 600+300+300MG/tablet											
Most used second line adult ARV Atazanavir-Ritonavir 300+100MG/tablet											
Most used first line pediatric ARV Lamivudine-Zidovudine-Nevirapine 30+60+50MG/tablet											
First RTK (Wantie/Collodial Gold)											
Second RTK (Unigold)											
Tie-Breaker RTK (Vikia)											
PPT (Plasma preparation tube of 100 (for plasma based test)											
Dry Blood Spot (DBS) kit sample collection bundle of 20 tests											
Molecular, m2000 RealTime PCR, HIV-1 Amplification Reagent Kit, 96 tests, Qualitative, (4 Packs x 24) Assays											
Molecular, COBAS, TaqMan, CAP/CTM HIV v2.0, Qualitative, 48 tests											
Comments:											

11. Data ACCURACY

Data Accuracy Method Codes:

RRF-B: *Most recently reported RRF ending balance compared to manual bin card*	***CS-B:*** *Current stock on hand data from bin card compared to physical count*
RRF: *RRF only (No score for accuracy: n/a)*	***N/A:*** *No tools available (Accuracy score for all elements: "0")*

Tracer Product	*A. Select method of data accuracy assessment based on tools available (mark with code selected from above list)*	*B. Is stock level data accurate? (1=Yes, 0=No) (Ending balance between the two selected sources match)*	*C. Number of units of discrepancy between RRF and bin card*		*D. Verification factor (RRF and bin card) =C2/C1*	E. *Number of units of discrepancy between bin card and physical stock count*		*F. Verification factor (Bin card and physical count) =E2/E1*
			C1. RRF ending balance	*C2. Bin card ending balance as of RRF completion date*		*E1. Physical stock count*	*E2. Bin card ending balance*	
Most used first line adult ARV Efavirenz-Lamivudine-Tenofovir disoproxil fumarate 600+300+300MG/tablet								
Most used second line adult ARV Atazanavir-Ritonavir 300+100MG/tablet								
Most used first line pediatric ARV Lamivudine-Zidovudine-Nevirapine 30+60+50MG/tablet								
First RTK (Wantie/Collodial Gold)								
Second RTK (Unigold)								
Tie-Breaker RTK (Vikia)								
PPT (Plasma preparation tube of 100 (for plasma-based test)								
Dry Blood Spot (DBS) kit sample collection bundle of 20 tests								
Molecular, m2000 RealTime PCR, HIV-1 Amplification Reagent Kit, 96 tests, Qualitative, (4 Packs x 24) Assays								
Molecular, COBAS, TaqMan, CAP/CTM HIV v2.0, Qualitative, 48 tests								
Comments:								

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

On product availability, store management and supply of HIV/AIDS commodities?

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