INVENTORY MANAGEMENT PRACTICES, PERFORMANCES AND CHALLENGES OF PROGRAM MEDICINES IN PRIMARY HEALTHCARE FACILITIES OF HADIYA ZONE, SOUTHERN ETHIOPIA

By

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Declaration

I, Mengistu Girma declare that, this study is prepared for the partial fulfilment of the requirement for MA in Logistics and Supply Chain Management entitled **''Inventory Management Practice, Performance and Challenges of Program Medicines in Hadiya Zone Primary Healthcare Facilities, Southern Ethiopia''** is prepared with my own effort. This thesis is my original work and has not been presented for a Degree in any other University and I have made it independent with the close advice and guidance of my advisor.

Mengistu Girma

Signature_____

Date _____

Certification

This is to certify that Ato Mengistu Girma has carried out this work on the topic entitled **‘‘Inventory Management Practice, Performance and Challenges of Program Medicines in Hadiya Zone Primary Healthcare Facilities, Southern Ethiopia’’** under my supervision. This work is original in nature and it is sufficient for submission for the partial fulfilment for the award of MA in Logistic and Supply chain management.

Shiferawu Mitiku (PHD)

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ADDIS ABABA UNIVERSITY

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LOGISTICS AND SUPPLY CHAIN MANAGEMENT UNIT

(MA PROGRAM)

This is to certify that the thesis prepared by Mr. Mengistu Girma entitled **''Inventory management practice, performance and challenges of program medicines in Hadiya Zone Primary Healthcare facilities, Southern Ethiopia''** which is submitted in partial fulfilment of the requirement for the degree of Masters in Logistics and Supply chain Management compiles with the regulation of the University and meet the accepted standard with respect to originality and quality.

Approved by Board of Examiners

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List of Acronyms and abbreviations

APTS	Auditable pharmaceuticals transactional and services
ART	Anti-retroviral therapy
DTC	Drug and Therapeutics Committee
EPSA	Ethiopian pharmaceutical supply Agency
EPSS	Ethiopian pharmaceutical supply service
FMOH	Federal Ministry of Health
FEFO	First expire first out
HCs	Health centers
KI	Key informants
IFRR	Internal facility report and resupply form
IPLS	Integrated Pharmaceuticals Logistic
LIAT	Logistic indicator assessment tool
LMIS	Logistics Management Information system
MCH	Maternal and Child Health
MSH	Management science for Health
OPD	Out Patient Department
PHs	Primary Hospitals
PHFs	Primary healthcare Facilities
RRF	Report and requisition form
SCM	Supply Chain Management
SPSS	Statistical Package for the Social Science
TB	Tuberculosis
TMs	Tracer medicines
WHO	World Health Organization

Abstract

Background: Effective inventory management which is heart of supply chain management is vital for ensuring availability of tracer healthcare products. However, inventory management practice and performance in public health facilities is often overwhelmed by various challenges that hinder the efficient healthcare services delivery. Hence, this study was aimed at assessing the current inventory management practices, operational performance, and identifying the challenges faced in public health facilities in Hadiya Zone Primary Healthcare Facilities, Southern Ethiopia. Facility-based cross-sectional descriptive research design was used involving both quantitative and qualitative research methods. Quantitative data were collected through semi-structured questionnaires and observational checklists and analyzed using the SPSS version 26. The qualitative data were gathered through key informant interviews. The interview was transcribed, summarized manually, and analyzed using thematic analysis.

The study revealed that 74.3% of facilities have tracer program medicines on the day of the survey. Stock out of tracer program medicines encountered in 47.1% of facilities with average stock out days of 33.38 days. Inventory accuracy was 17.14% and average order fill lead time of the past six months in those facilities was 35.57 days. Data quality of the RRF report assessed indicated that 74 (88.1%) of the RRF reports were timely, 47(60.)% of RRF reports was complete and 25 (54.7%) reports were accurate. About 64.3 percent of health facilities met suitable storage conditions. The respondents agreed with financial, Behavioural, Human resource, demand-supply, and logistic challenges with a grand mean of 3.67, 3.66, 3.92, 3.68, 4.19, and 4.25 respectively. KIs responses also indicated by default similar responses on challenges of inventory management. The study revealed that there is poor inventory management performance and control system of tracer program medicines in primary healthcare facilities of the Hadiya zone. It is recommended that sufficient amount budget allocation, technological support, resupply lead time be shortening, and appropriate staff members training should be considered.

Keywords: Inventory management performances, public primary healthcare facilities, tracer program Medicines, challenges

Chapter one
Introduction

1.1 Back ground of the study

Health facilities supply systems should ensure adequate stock of all the required items to maintain uninterrupted supply. Inventory management is a complex but crucial process within the healthcare delivery system and vital for organizational improved efficiency and competitiveness. Maintaining an appropriate amount of inventory is a need for efficient inventory management. Poor inventory management in health institutions, especially public health facilities results in, overstock, under stock, adds to the cost, and decreases productivity, damage, spoilage, and wastage of resources. On the other hand, insufficient inventory frequently causes a disruption in service delivery and increases the likelihood of poor customer service (Wijayawickrama, 2015). Moreover, limited availability, poor inventory management of pharmaceuticals, poor report quality, and inventory record accuracy are among the big challenges that public health facilities' logistics systems face (Tiye and Gudeta, 2018).

Inventory management is heart of supply chain management (SCM). Efficient pharmaceutical inventory management practices enable health institutions to have an up-to-date inventory count at all times, giving good customer service, give accurate information to the customers, and improving service quality as well as the patient care of the health institutions. In addition, a robust inventory management system allows managers to receive accurate and timely information on inventory which assists management in accurately making informed decisions that save time and cost used for labor working on inventory management (WHO, 2016). (Santhi and Karthikeyan, 2016) suggested that efficient inventory control techniques enable the optimized use of resources and eventually support improve patient care, by ensuring the availability of essential stocks and preventing stock-outs and overstocks. Effective pharmaceutical inventory management operates through close follow-up of important drugs and the priority setting in purchase and the distribution of drugs. Therefore, it is essential that health managers use scientific methods to achieve management of pharmaceutical inventory and patient satisfaction (MSH, 2014).

Assessment of healthcare facilities practice and inventory management performance has become extremely important as healthcare systems have begun to struggle to enhance operational efficiency and diminish costs. Inventory management performance must be effective in order to

guarantee access to health supply, and consequently for successful health outcomes. Inventory management practice of program essential medicines across public primary healthcare facilities (PHFs) is likely determined by, Logistics Management Information System (LMIS), and storage practice. Quality and response time indicators determine inventory management effectiveness and these indicators in turn determine inventory management performance (Desselle, 2012). Pharmaceutical wastage rate, inventory accuracy, and holding appropriate stock levels determine inventory management performance (Damtie et al., 2020). Poor pharmaceutical inventory management practices interrupt services (Mokheseng et al., 2017).

Effective inventory management decision depends on the quality of LMIS. The primary purpose of the LMIS is to manage the logistics to ensure smooth SCM. A well-implemented LMIS reduces the likelihood of stock outs and overstocks of essential medicines (Desale et al., 2013). Reporting rate, completeness, timeliness, and accuracy of Requisition and Reporting Format (RRF) and Health Post Medicine Requisition and Reporting (HPMRR) format constitute essential logistics data elements (FMOH, 2015). Logistics data management improves customer service by improving the quality of management decisions (USAID | DELIVER PROJECT, 2010). Quality of information and data inaccuracy are challenges of healthcare supply chains (Elmuti. et al., 2013). “Sick” inventory management systems generally feature subjective, ad hoc decisions about order frequency and quantity, inaccurate stock records, and a lack of systematic performance monitoring.

Since the establishment of Ethiopian pharmaceutical supply Agency (EPSA), with a strong partnership with FMOH, significant milestones have been taken to strengthen supply chain performance. However, the supply chain encounters various challenges including inadequate supply of essential pharmaceuticals, poor storage conditions, and weak stock management, resulting in high waste and stock outs (EPSA, 2018). On top of that, staff skill gaps and weak responsibility and governance among the Ministry of health, EPSA, and health facilities contribute to the under performance of the supply chain and ultimately stock out of essential medicines in Primary Healthcare Facilities (PHFs). In Ethiopia, in order to manage problems related to the pharmaceutical inventory management system namely, lack of availability, high cost, inadequate stock management and storage, and irrational use, the country launched Integrated Pharmaceutical Logistics System (IPLS) with the purpose of ensuring the availability of pharmaceuticals at health facilities. According to the IPLS principle, health facility order

program pharmaceuticals every other month, and the EPSA delivers the order. The system works to be effective, and efficient, avoiding stock out, losses, and expiry. All health program pharmaceuticals (HIV/AIDS, TB, Malaria, immunization, and others are managed by this system in Ethiopia. Maximum, minimum, and emergency stock level for hospitals and health centers is 4, 2, and 1 month respectively. But for the health post maximum, minimum, and emergency stock level is 2, 1, and 0.25 months respectively.

In Ethiopia, many studies on the practice, performance and challenges of inventory management have been conducted in health institutions at different levels focusing secondary and tertiary health care levels. In current proposed study area, Hadiya Zone health department consistently reported shortage of program pharmaceuticals in primary healthcare facilities. But, no sufficient study is done across public PHFs using different health program pharmaceuticals at a time. For that reason, this study was conducted to assess the health inventory management practices, performance and challenges related to inventory management in public primary healthcare facilities found in the Hadiya Zone. It is expected that this study will offer useful evidences on the status of inventory management practice, performance in public primary health facilities found in Hadiya Zone and it can help to prevent shortages of tracer medicines (TMs), thereby improving the performance of primary healthcare facilities. Besides, it would be base for further studies in these areas.

1.2 Statement of the problem

Majority of population in developing countries lack access to program medicines (WHO, 2018). Public sector healthcare supply chains are facing two significant challenges. One is resource constraints for improving public health in developing countries. The second is frequent stock out of essential medicines and other necessary products used to provide health care. Better health outcome depends on the combined effectiveness of health information, financing, personnel, and supply chains (Aronovich et al., 2010). Public health facilities rely heavily on the availability and prompt arrival of these products from their major suppliers to ensure the quality of patient care; however, assessments made at various points along the supply chain and by different institutions identified frequent interruptions of essential medicines, which were linked to dissatisfaction among healthcare professionals, patients, and the general public (WHO, 2018; EPSA, 2018).

Research reports indicated that limited availability, poor inventory management of TMs in the country (Kefale and Shebo, 2019), poor report quality and weak inventory accuracy were the main challenges of inventory management (Tiye,K and Gudeta, T., 2018). Inventory management determines SCM practice. A well-maintained inventory control system helps the patient receive medication without delay and prevents stock-out in healthcare facilities. It monitors the stock status of products at any given point in time and keeps track of any excess or deficit items. Poor pharmaceutical inventory management attributes to the interruption of essential pharmaceuticals. This leads to treatment interruption which can force changes in patient drug regimens, drive drug resistance, and increase mortality (Bam et al., 2017). A study conducted in Tanzania revealed that delays in the delivery of Human Immune Virus (HIV) diagnostic supplies in most public health facilities attributed to weak inventory management practices which resulted in compromised healthcare service (Kagaruki et al., 2018). An effective LMIS enables people involved in health product SCM to make informed decisions that will ultimately improve medicines availability to patients (FMOH, 2010). Timely, high-quality logistics data can strengthen the supply chain system. Untimely and inaccurate data, low reporting rates, and a lack of standardized data collection tools result in stock-outs of essential medicines (Shiferaw,G and Nfor, E., 2014).

Appropriate drug storage conditions at service delivery points are an important aspect of comprehensive drug control. However, lack of proper implementation of good storage condition principle is a major challenge in the public health facilities Ethiopian Pharmaceutical Supply

Agency (EPSA, 2015). On the other hand, inappropriate storage condition results in the loss of potency, which influence efficacy and safety of medicine (Shafaat et al., 2013).

According to a survey done in Ethiopia, an average of 63% of hospitals' stores and 43% of health centers' stores have acceptable storage conditions (Shewareget et al., 2015). Another research conducted in Addis Ababa indicated that pharmacy services need more materials and space for quality service due to a lack of access to basic medical supplies (E. Eshetu and T. Gedif, 2011). A survey report from Addis Ababa indicated that the utilization of bin cards in Hospitals was 33.5% (Tilahun A., 2015). Another study in Amhara region indicated that, only 47.4% of health facilities in the Amhara region received the same quantity of health commodities from PFSA in total amounts, which frequently resulted in stock outs of pharmaceutical medications at health facilities (Sinishaw M.A et al., 2015).

According to SNNPR health bureau annual performance reports (2018/19 and 2019/20), Hadiya Zone is one of the low performing Zone in the region to transform PHFs. This event impedes approximately 80% of the population benefiting from transforming PHFs. It was ruled out that there had been frequent interruption of TMs and this made a barrier to have high performing PHFs in the Zone. In addition, the logistic officer informed that the major problems currently the zone healthcare sector face are frequent stock out of medicines and lack of budget even for salary payment. This and other problems compromised effective inventory management practice. In Ethiopia, there is a dearth of study regarding inventory management practices, performance and its challenges especially in current study area. It is thus critical to assess the existing public health supply chain practice, performance and challenges in PHFs.

1.3 Research Questions

Based on the previous statement of research problem, the main research questions were :

- How inventory management of program pharmaceuticals is being is practiced in Hadiya Zone in terms of stock management, LMIS, management support and storage conditions?
- How is inventory management performance of program pharmaceuticals in Hadiya Zone in terms of availability, stock out rate, lead time, inventory accuracy and supplier order fill rate, storage?
- What are the major challenges of inventory management performance of public program medicines in Hadiya Zone primary healthcare facilities?

1.4 Objectives of study

1.4.1 General objectives

To assess inventory management practices, measure performance and challenges of program pharmaceuticals in Hadiya Zone primary healthcare facilities, Southern Ethiopia.

1.4.2 Specific objectives

- To assess the inventory management Practices of program pharmaceuticals in Hadiya Zone in terms of LMIS implementation, management support and storage conditions
- To measure the inventory performance of program pharmaceuticals in Hadiya Zone primary healthcare facilities in terms availability, stock out, lead time, inventory accuracy rate and supplier order fill rate, RRF report quality and storage?
- To identify major challenges of inventory management practice of program pharmaceuticals in Hadiya Zone Primary Healthcare Facilities

1.5 Scope of the Study

The study covered only inventory management practice, Performance and challenges of tracer program medicines in public PHFs of Hadiya Zone, Southern Ethiopia. The scope of study did not include the federal teaching referral hospital in the zone.

1.6 Significance of the Study

Inventory management of program medicines is complex and unique because the program medicines supplied are lifesaving. This study assessed the public inventory management practice and performance of public tracer program medicines in Hadiya Zone PHFs, Southern Ethiopia and helps to identify the strength and gaps of program medicines inventory management practice and performance. The findings of the study will provide valuable insights and recommendations for policymakers and healthcare managers to enhance inventory management practice and improve healthcare service delivery. The findings will also offer a useful reference document to PHFs for implementing corrective measures which improves inventory management practice and performance and can be used as a source of reference material for future researches on other related topics.

1.7 Limitation of the study

- Health posts which are lower level of PHFs manage only few program tracer medicines were not included.
- Wastage rate of program medicines were not done due to lack of recording and reported data at primary healthcare facilities.
- Self-reported inventory management practice and performance may possibly encounter reporting errors

1.8 Operational Definitions of terms and concepts

Acceptable storage condition: It is a condition in which facilities and store rooms have fulfilled at least 80% of the storage criteria set as standard criteria for evaluation (PFSA, 2017)

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

Completeness: it the extent of transferring the key data items to all products list on RRF and list of specific dispensing units mainly stock on hand received and adjustments (PFSA, 2015)

Data quality: it means the completeness, timeliness and accuracy of reports produced for decision making (Snow, J Inc., 2017)

Tracer medicines: are medicines that fulfil priority healthcare needs of specific population and the medications should be available all times in sufficient amounts

Internal Facility report and resupply form (IFRR): is internal facility report and resupply that is used by dispensing unit to report their stock status and be resupply by the store man

Inventory accuracy rate: is performance indicator that measures the level of accuracy of stock balance on bin card and stock on physical inventory (PFSA, 2017)

Inventory management: is process of maintaining inventory items properly at all levels of the supply chain at all times (PFSA, 2017)

Inventory management practice: It is technique of tracking and controlling stock level and making sure that appropriate refill is made to meet customer demand. It manages the whole flow of tracer medicines from requesting, availing to dispensing. It is about making sure health facilities consistently have proper quantities of right item in right place in right time (Argyropoulos, 2018).

Order lead time: Time interval between when new pharmaceutical is ordered and delivered to facility and ready for use (USAID/DELIVER project, 2011)

Performance: logistics performance defined by key indicators.

Pharmaceuticals: are all medicines, laboratory reagents, medical supplies and medical Equipments (PFSA, 2017)

Program medicines: are medicines used to diagnosis, treatment of HIV/AIDS, TB, Malaria, Expanded Program Immunization (EPI) and Maternal and child health (MCH) and provided for patients for by PFSA procurement and distribution (PFSA, 2017)

Public Health Facilities: Hospitals and health centers owned by government of Ethiopia

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

Timeliness: Indicates reporting at the agreed day and within days in the schedule set for RRF reporting; whereas within the specified period (1-10th days) for Hospitals and (1-5th days) for health centers RRF reporting to Woreda Health office (WoHo) (PFSA, 2017).

1.9 Organization of study

Chapter one presents general introduction to the thesis which begins with providing back ground information on the overall concept of inventory management practice, performance and challenges followed by statement of the problem, research question, objectives, significance, scope and limitation of the study.

Chapter two presents a review of relevant literatures related to the subject matter public health supply chain performance including different empirical studies.

Chapter three presents the methodology that was be used in conducting the research.

Chapter four presents results, discussion and interpretation part of the study covered.

Chapter five presents the summary of major findings, conclusion and recommendation

Chapter two

Literature review

This chapter offers detail review of existing theoretical and empirical literature the problem being investigated. The purpose of literature review is to provide a context for the whole research work. Reviewing available literature on question at hand, helps the researcher to identify the ‘’gap’’ that exists. Existing literatures have been reviewed in order to pursue understanding the inventory management practice, performance and challenges along with empirical study conducted on these areas. The impact of various challenges on effectiveness of inventory management has been investigated by scholars even though most of them were not specific to program medicines inventory management.

2.1 Theoretical Literature Review

2.1.1 Inventory management

Inventory management is the heart of SCM. Inventory management is all about ordering, receiving, storing, issuing, and reordering items. Inventory control effectiveness indicates health facilities' performance level in providing customer-required services. Inventory management performance is determined by order fill rate, inventory accuracy, average lead time, and months of stock. It is not a smooth task; certainly critical and complex. It hosts storage, distribution, and correct record-keeping. It is a system of transaction and healthful inventory-keeping practices of commodities (USAID/Deliver, 2011). It ultimately calls for morally and legally sound recording practice. Inventory control and recording are as a consequence inseparable. Thus, stock records are the core records in the inventory management system. They can be either manual or computerized (USAID/Deliver, 2011b). It is function responsible for all decisions made about a stock and makes sure the right amount of each item is kept in stock at any time (MSH, 2012).

Economic order quantity (EOQ)

EOQ helps inventory managers to determine ideal product demanded from supplier for un interrupted service delivery. The limitations of EOQ model is that it consider the conditions such as uniform demand, fixed lead time, fixed cost, immediate refill and no stock out which is not applicable most of the time especially in developing countries. Therefore, EOQ model should be improved to the actual inventory control system analysis (Rachmania and Basri, 2013).

Maximum –minimum inventory control system

This is one of inventory control system which commonly used to ensure that the quantities in Stock fall within an established range. This system is applicable to health products logistic system and the products are categorized into three. This includes forced ordering, continuous review and standard system. Inventory control system is used to determine the quantity to order or issue and when to request or issue. In forced ordering system, the trigger for order us end of review period which is commonly used in our country healthcare system. In continuous order review system, the trigger for order is reaching minimum level. In a standard system, the trigger for order is end of review period for products that are at the minimum level (MSH, 2012; USAID/Deliver project, 2011b)

Logistics management information practice

Information is the engine that drives the entire logistics cycle. A logistics management information system consists of a system of records. It 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. An effective LMIS enables people involved in health product management to make informed decisions that will ultimately improve patient medicine availability. LMIS plays a pivotal role in enhancing the performance of SCM. However, sometimes relevant data is lost or even not registered leading to guessing which leads to mistaken decision-making (Shiferaw and Nfor, 2014)

Pharmaceutical store management practice

Storing is properly keeping pharmaceuticals to avoid damage, expiration, and theft. Proper storage helps to ensure that product shelf life is maintained with its required quality, with limited or no wastage due to damage or expiry (Shafaat et al., 2013). If pharmaceutical storage follows proper storage principles, customers can get quality products. Well organized storeroom will simplify the work burden by arranging products in a way that quickly figured out (Public Health England, 2013).

2.1.2 Inventory management performance

Performance measurement is a management tool that is used to assess how well a company or organization is performing (Kumar et al., 2005). The process of calculating the efficacy and efficiency of previous acts is called performance measurement. Effectiveness is the degree to which customers' needs are met, while efficiency is the cost-effectiveness with which a

corporation uses its resources to provide a given level of customer satisfaction. They also emphasize the need for a performance measuring system to allow for the taking of informed decisions and actions. General benefits of evaluating performance include assessing and controlling progress, highlighting accomplishments, improving understanding of key processes, identifying potential problems and providing insight about possible future improvement actions, among others (Ahi & Searcy, 2015).

According to Edward Frazelle (2001) model as adapted by Aronovich et al., (2010), there are four indicators: quality, time, financial, and productivity. To complete the analysis, all indicator types need to be considered, and they need to work together. Quality Indicators: These indicators are often the simplest and most widely used to implement and measure. Typically, they tell you how well you are performing a specific activity. A standard indicator in this classification includes the average percentage shelf life of key essential medicines, the percentage of facilities stocked according to plan (stock levels between the min and max levels, inventory accuracy rate, percentage of stock wastage due to expiration or damage over a period of one year (Aronovich et al., 2010; PFSA, 2017) Time Indicators: These indicators measure the time it takes to complete specific activities. They show where saving time during specific activities can improve an overall supply chain performance. An order lead time is a common indicator in his category (Frazelle 2001; Aronovich et al., 2010).

Different measurements should be employed to evaluate organizational performance depending on the kind of organization because these metrics are frequently industry-specific (Elrod C, Murray S & Bande S., 2013). The logistic indicator assessment tool (LIAT), a quantitative data-gathering instrument, can be used by USAID/DELIVER (2008) to analyze the effectiveness of processes engaged in the SCM of health commodities. The primary logistical performance indicators are ordered fill rate, inventory accuracy rate, percentage of facilities receiving the number of goods ordered, percentage of facilities maintaining acceptable storage conditions, percentage of facilities experiencing a stock out at any point during the visit, and many more. A powerful stock control system absolutely satisfies client orders in the right quantities and types. In Ethiopia, the fulfilment of orders of as a minimum of 80 percent is acceptable (EPSA, 2017).

2.2 Empirical Literature Review

2.2.1 Inventory management practices

Inventory control is the core of the pharmaceutical supply system. A study report from India showed that only 8.5% of facilities provide safe delivery supplies which are related to poor inventory management practices (Neville et al., 2019). But most developing countries still rely on paper-based data management, which results in poor data quality, including incompleteness, inaccuracy, and untimely reporting. These gaps ultimately result in frequent stock out (Culas, 2011). A survey carried out in Nigeria indicated that lack of standard operating procedures, lack of power supply, lack of computer and internet, lack of training, inadequate store, and poor record-keeping were among significant constraints of LMIS (Kingston, 2017). Research done in Public Health Facilities of East Gojjam Zone, Northwest Ethiopia revealed that LMIS recording and reporting tools such as stock keeping records and RRF reports were available and utilized at 20% health facilities. IFFR was fully available and utilized at 20 (100 percent) and 14 (70 percent) health facilities respectively (Azmeraw B., 2021).

2.2.2 Inventory management performance

Another study conducted in South Africa revealed that the stock-out duration of anti-retroviral drugs ranges from 1 to 3 months and more than half of hospitals receive incorrect quantities of anti-retroviral medications (Mokheseng et al., 2017). A qualitative study report indicated the supply of malaria rapid diagnostic tests (RDT) and Artemether-Lumefantrine (AL) was very low (Davlantcs et al., 2019). A study report in Ethiopia showed order fill rate for anti-retroviral medicines is 53.3%. Stock out of anti-retroviral drugs in 30% of hospitals occurred two times and in 16.67 % of health centers (HCs) three times (Damtie et al., 2020). But these studies should have addressed the inventory management performance of different public health programs' medicines at a time for better intervention. Another inventory management performance indicator is maintaining appropriate months of stock. Months of stock for the supply of health products at any level should be measured differently. Averaging oversupply in one health commodity can cancel out undersupply in another and falsify the actual stock level (Aronovich et al., 2010). Recent research has revealed that issues with waste and high stock-out rates are caused by a lack of high-quality, reasonably priced vital medications, inadequate storage conditions, and weak inventory management (Shewarega et al., 2015).

According to recent studies, there is a 9% to 77% shortage of maternal and child health basic TMs at the service delivery point. Health stations, which are typically only a few kilometres from health facilities and have limited transportation, are in an even worse situation. Majority of health extension workers are required to collect and bring medications back to the health posts (Woinshet et al., 2018). Many studies that may improve the efficiency of the pharmaceutical inventory management were conducted simultaneously in at most two different levels of primary healthcare facilities (primary hospitals and health centers). But, dynamics of the complicated downstream system of health care delivery could offset the anticipated benefit (Settanni et al., 2017).

Research findings from Malawi and Rwanda indicated that stock out at resupply point in the three countries was one of the causes for stock out at health facilities. One of the survey conducted in Malawi an African community reported that the main reason for the shortage of drugs at the HCs was insufficient deliveries from the regional medical store (Kagashe GAB, 2012) (Chandani Y., 2012). A survey study report from Ethiopia revealed that the fundamental reasons recognized for stock out rate had been insufficient supply of drugs (27.7 percent), stock out at refill time (30.9 percent), due to drugs expiration (26.8 percent) and order changed at the refill time (18.9 percent) (Gurmu, T.G. and Ibrahim, A.J., (2017)).

Supportive Supervision in inventory management practices

Supervision at the health facility level can alert program managers of potential problems within the inventory management system, which, once addressed, help strengthen the system and better ensure commodity. It is carried out in a respectful and non-authoritarian way with a focus on using supervisory visits as an opportunity to improve knowledge and skills of health staff. Supportive supervision encourages open, two-way communication, and building capacity of health workers. Lack of supportive supervision for health facilities from WoHo, Zone Health Department, and PFSA concerning on availability of essential medicines and their implementation of LMIS worsen challenges of inventory management practices in the health facilities (Belete, 2020).

2.2.3. Challenges of inventory management practices

According to the study by Nahamya D. (2007), the main cause of the poor record-keeping found in public health facilities was due to the staff's insufficient training in drug logistic management. In Ghana, an evaluation of the practices used to manage health commodities in a few hospitals in

the Ashanti region revealed that these practices undermined distribution, transportation, lack of adequate storage facilities, irrational/incorrect use, delays in approving medicines and non-medicines, counterfeit and/or substandard commodities, and irrational/incorrect use, unavailability of skilled labour, internal bureaucracy, lack of funding, and logistical problems are the main challenges that face managing inventories (Adzimah et al., 2014). According to a study by (Tadesse, 2017) providing medications without a need or requisition, not having an automated stock management tool, having a functional Drug and Therapeutics Committee (DTC), having poor communication with the PFSA and the facilities, not having enough pharmacy staff, and having a weak monitoring and evaluation system were some of the main causes of medication waste in the facilities. Frequent stock-outs and inventory overstock is common stock management challenges in Ethiopia wherein demand uncertainty is the most factor (Menebo, 2017)

2.3 Conceptual framework

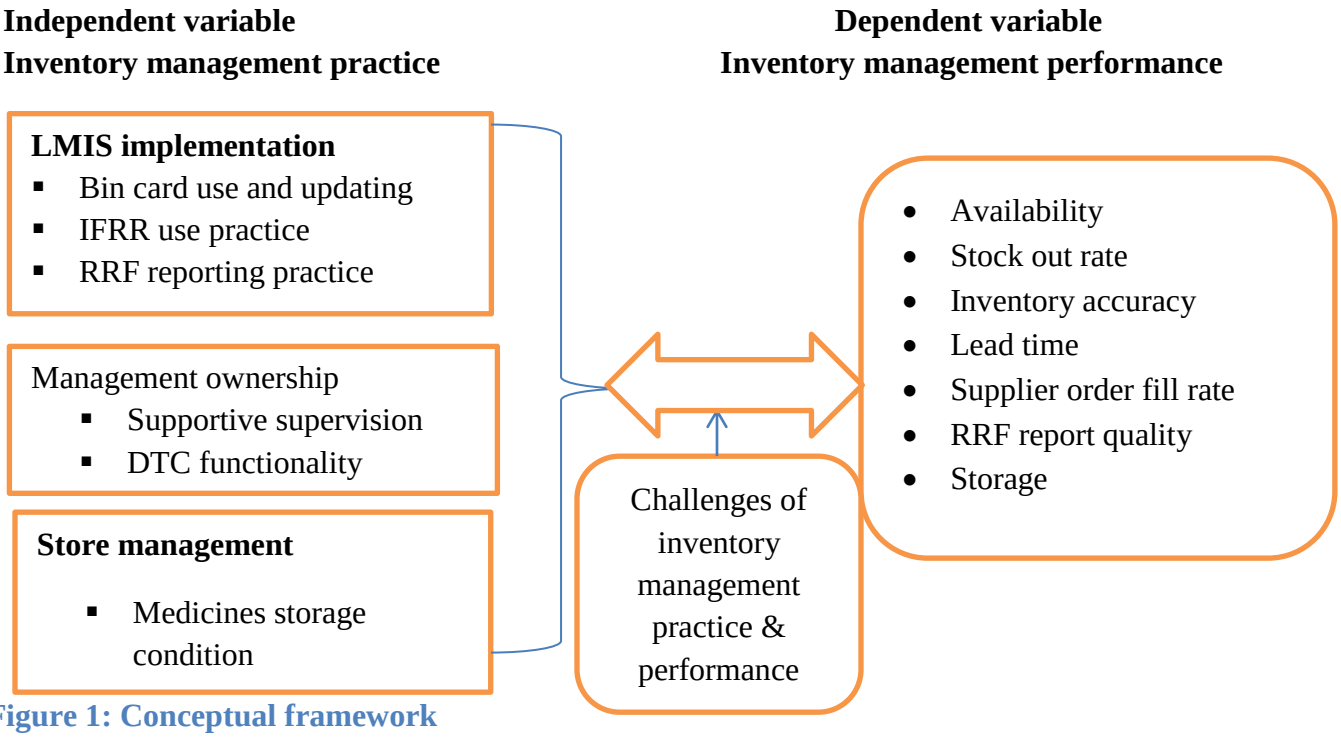

Figure 1: Conceptual framework

2.4 Identified Literature gap

There is several research gaps that have been identified from the studies reviewed so far. There is limited research on health inventory management performance in PHFs especially in developing countries. Most researches research has focused on the secondary and tertiary facilities supply chain even with the context of developed countries. The factors that affect health inventory management performances in PHFs have not been researched in full scale. The study addresses all challenges in different dimension within Inventory management performances in detail, which provides valuable and integrated information for effective and critical decision. This study will try to fill the empirical gap found from literatures on the status and performances of tracer medicines in public health facilities and suggest the future improvement directions.

Chapter three
Methodology

3.1 Description of the study area

The study was conducted in Hadiya Zone primary healthcare facilities. Hadiya Zone has a total population of 1,573,841. Of the total population, 778,597(49.47%) and 795,262(50.53%) are males and females respectively. From the total population majority (89.3%) are dwellers. The capital of Hadiya zone administration is Hosanna which is 232 km far from Addis Ababa in the south west direction and 194km from Hawassa town in the North West direction. The Zone is bordered by Gurage zone in the north, Silte zone in the east, Kembata Zone and Halaba special woreda in the south. Administratively, it has 11 woredas (districts), two reformed towns, and 311 srural and 24 urban kebeles. Hadiya Zone has one teaching referral hospital that Wachemo University Nigist Eleni Mohammed Memorial hospital, four PHs, 61 HCs and 311 rural health posts. The Ethiopian pharmaceutical supply agency Hawassa hub one is the main supplier of medicines for these public health facilities. Besides, there are 81 private clinics and 39 private pharmacies in Hadiya Zone. All public PHFs in this Zone, provide health care services of major diseases (tuberculosis and malaria), maternal and child health care. But Selected ART site (all PHs and selected ART site HCs) provide full service with stocking program medicines through Ethiopian pharmaceutical supply service (EPSS) direct delivery every other month.

3.2 Research approach

In order to attain research objective, both qualitative and quantitative approaches were employed. There are two types of research methods available: quantitative and qualitative. None of these is necessarily superior to the other; it all relies on the researcher's intended method of study (Ghauri and Kjell, 2005). Quantitative approach was used to assess the current inventory management practice and performance of primary healthcare facilities using modified standard logistic indicator assessment tool of performance (LIAT) |DELIVER PROJECT) while qualitative approach was used to complement quantitative findings and to address the third specific objective of the study as it stands to explore challenges of inventory management practices and performance.

3.3 Research Design

Research design is a blueprint that is followed for collection, measurement and analysis while conducting study. It is a map that guides study (Prabhat, 2015). Descriptive research design with both quantitative and qualitative data collection was used in this study. A survey method was used in this study because data was collected once only from health facilities from May 20, 2020 to June 20, 2023.

3.4 Population and Sample Design (Sample size determination technique and sampling technique)

The study populations was all public primary healthcare facilities found in the Hadiya Zone, tracer program medicines, health professionals, zone health bureau, woreda health bureau, EPSA and logistics documents. The public PHFs stock key tracer program medicines are four PHs and 61 HCs from which ART sites are four PHs and twelve HCs. The study unit was all ART site PHFs, stakeholders, selected key tracer program medicines, selected bin reports cards and RRF. Health posts stock few program pharmaceuticals. According to the Ethiopian health structure, health posts are under the umbrella of HCs. Due to this health posts are excluded from sampling frame. Sample size was calculated according to the guide for conducting logistic performance assessments tool (LIAT) (USAID| DELIVER PROJECT, 2008). It recommends taking at least 15% of the total facilities. Total numbers of primary healthcare facilities (PHs and HCs) in Hadiya Zone are 65. Thus, based on the LIAT guideline, the sample size became 10 (i.e. 15% of 65=9.75). As the facilities differ in terms of setting and scope of services, further stratification was done to HCs. The HCs were clustered based on districts. According to Ethiopian health care system, only one health center per district provides HIV treatment service. Therefore, all 12 ART sites HCs were purposively included for consistency of information from woreda from which hospitals ware not selected. Bonosha Primary Hospital was new and it has only limited documents. Due to this, it was excluded from the study. One health center and new primary hospital were used as pre-test sites and excluded from final sample. Accordingly, total of 14 public primary health facilities were taken from total of 65 public primary healthcare facilities beyond the minimum requirement.

With regard to type and amount of key TMs included, the medicines were selected and obtained by referring to MOH and EPSA reference lists (MOH, 2019). The selected items were filled in the pre-prepared templates of tailored public PHFs to further collect data. Twenty five bin-cards

from each health facilities for the 25 tracer program medicines were reviewed. Moreover, facility RRF reports of program medicines were used and census was conducted for store manager interview per facility for semi structured questionnaires.

Key informant were recruited from facility managers, pharmacy heads, store managers; zone logistic officer, and EPSS, Hawassa hub supplier coordinator to maximize the range of various response on the subject of study and data was collected by principal Investigator to maintain consistency throughout the interviews. The participants of the key interview were selected based on their position of information. Accordingly, three store managers, three pharmacy heads and three facility managers, one zone logistic officer, and one EPSS hub coordinators were included.

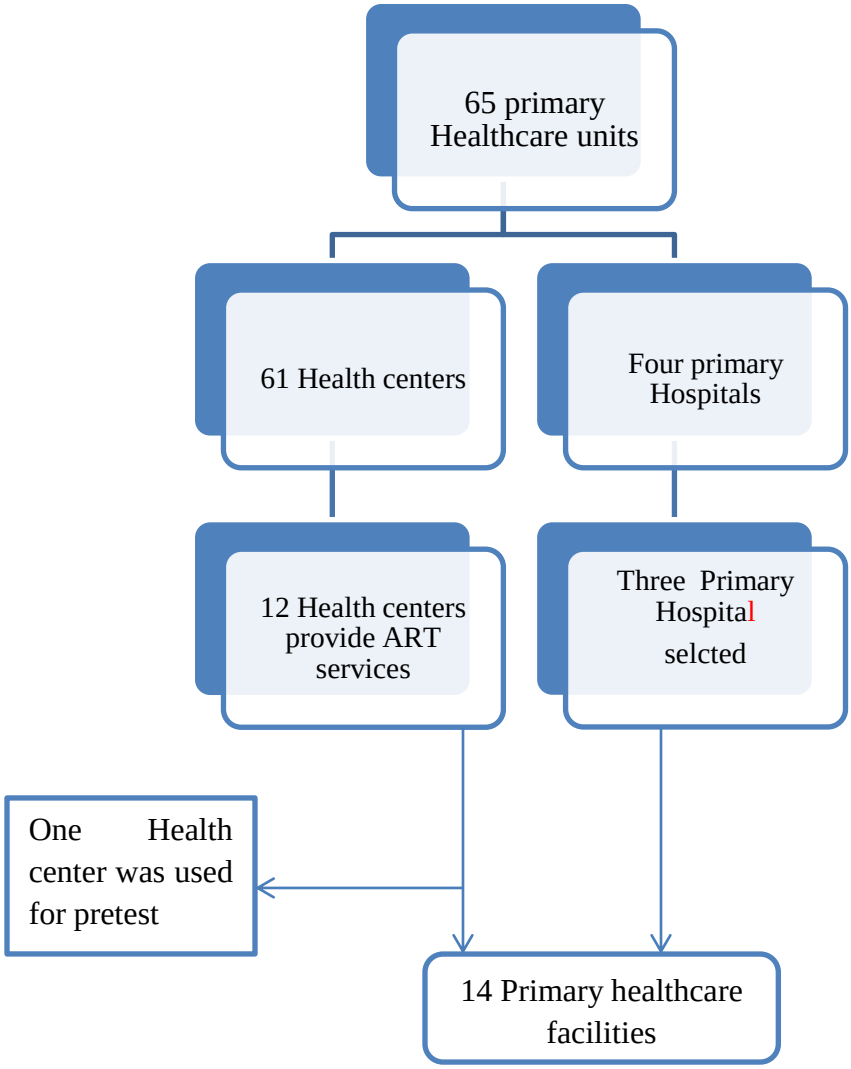

Figure 2: Flow diagram showing the health facilities selection procedure.

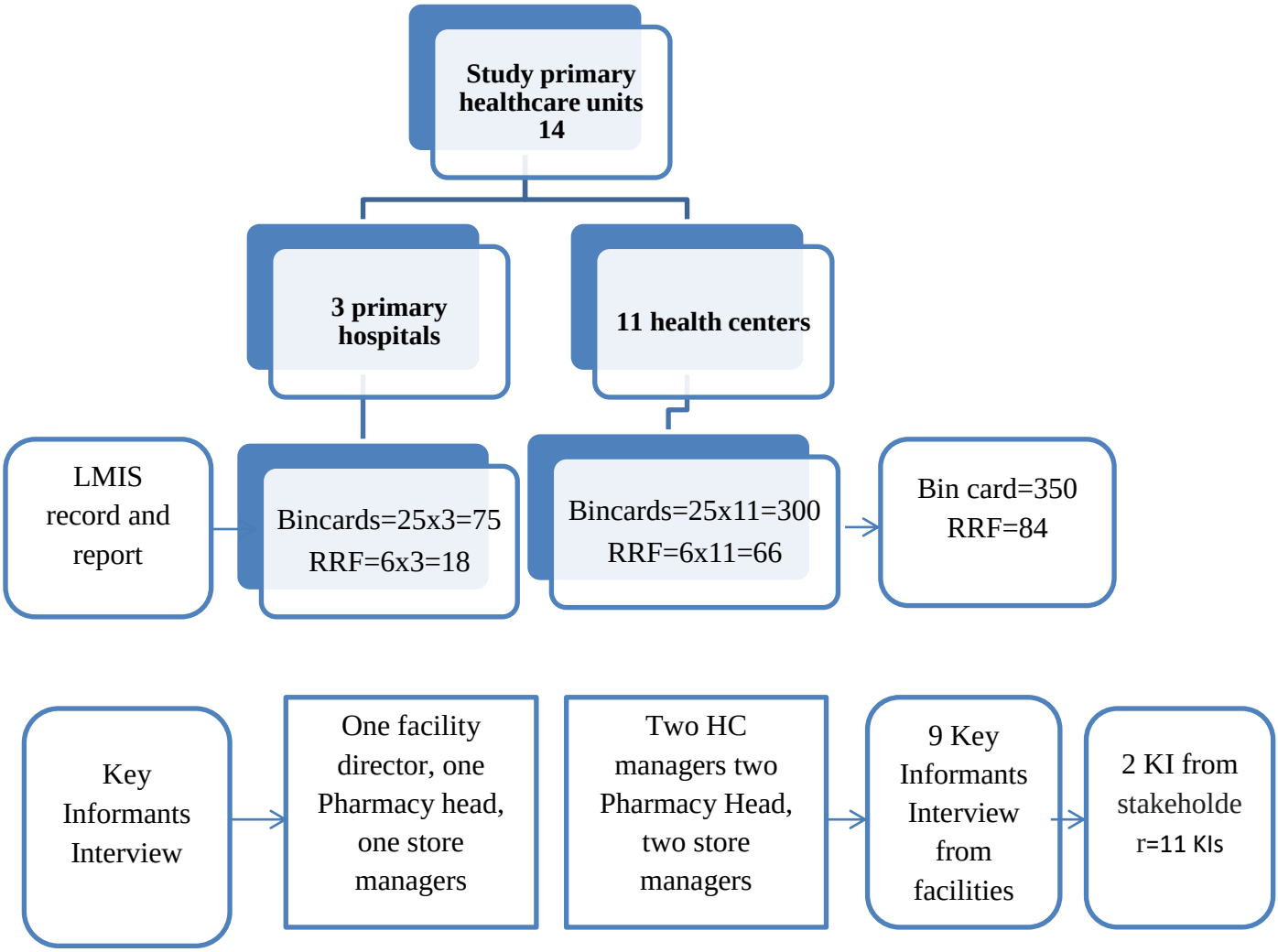

Figure 3: Flow diagram showing documents and personnel selection for study

Dependent Variables

Inventory management performance

In current study, inventory management performance was considered as a cumulative product of program medicines stock status and Logistics management information System (LMIS) performance. Each of them is also measured by different performance indicators below.

Program medicines stock status

Availability: Availability of the program medicines was assessed during data collection by physically counting medicines in store. Then medicines with physical stock counts of not zero were considered as available. Then the percentage was calculated for each program medicines using the following formula.

$$\text{Availability percentage} = \frac{\text{Number of facilities with elected tracer program medicines in stock}}{\text{total number of facilities evaluated}} * 100$$

Stock out Rates: It is status of selected tracer program medicines within 6 months periods reviewed from documents.

The stock out rate = it is stock status of selected tracer program medicines in the past six months period, from January 1 2023 to June 30, 2023

$$\text{The stock out rate} = \frac{\text{number of facilities that experienced a stockout of selected medicines}}{\text{Total number of facilities that are expected to hold the medicines}} * 100$$

LMIS Performance: The performance was measured using timeliness and completeness and accuracy of reported RRF data.

Accuracy of RRF data: assures the beginning balance of RRF report is similar with previous report ending balance and in each report column free of errors in calculation for each products

$$\text{Accuracy of RRF data} = \frac{\text{number of reports free from calculation errors from facilities}}{\text{total number of reports submitted}} \times 100$$

Inventory accuracy rate = Percentage of Facilities that had no discrepancy between stock records and physical inventory

$$\text{Inventory accuracy rate } == \frac{\text{Number of facilities with out discrepancies } * 100}{\text{Total number of facilities assessed}}$$

$$\text{RRF Report rate: } = \frac{\text{Total Number of RRF reported} * 100}{\text{No.of health facilities expected to report X Number of RRF reports expected}}$$

$$\text{Timeliness of RRF report} = \frac{\text{Total number of RRF reports received on time} * 100}{\text{Total Number of reports expected}}$$

$$\text{\% fulfilment of Storage condition} = \frac{\text{Tnumber of yes} * 100}{\text{Total Number of storage conditions considered}}$$

Order lead time=Day order was received –day order was placed by the facility to the supplier

Independent variables

Service and practice related factors

Presence and use of logistic forms

Type of recording system

Training offered

Time of higher level supervision

SOP manuals (IPLS)

Staff related factors

Professionals' educational background

Experience in the field of work

Table 1: Indicators and their data sources

s.no	Indicators	Data sources	Formula	Interpretation
1	Stock out	Physical count, bin card records and participants response	Number of tracer program medicines available divided by number of tracer program medicines under review	Product stock out for one day in a month, then it is taken stock out for the whole month
2	Inventory accuracy	Inventory check for bin card balance and physical count	Number of stock equals to physical inventory count over total number of tracer program medicines	Indicates level of accuracy of logistic data and level of discrepancy between inventory and bin card records
3	Lead time	RRF, Model 19 and Participants	Perception of participants	Average supplier lead time greater than 20 days is considered as delay
4	Percentage of facilities meet storage conditions	Visual observation	Number of healthcare facilities that meet acceptable storage conditions over total healthcare facilities	The conditions of storage against the standard
5	Bin card use and updating	Availability of bin card and evidence of use in store and dispensary	Visual observation	Evidence of utilization in store
6	RRF report completeness	Availability of RRF and documented data	Completeness of all column and row	Report quality

7	RRF report accuracy	RRF reports	Comparison of inventory balance on bin cards and RRF report	Report quality
8	RRF timeliness	RRF report	Total number of RRF submitted on time over expected	Indicates the level of timely reporting and requesting products from supplier
9	Supplier fill rate	RRF report, Model 19 and participants	Percentage of healthcare facilities that obtained same quantity of products ordered	Indicated level of supplier order fill in quantity ordered

Source: (MOH, 2019)

3.5 Data source and type

The sources of data for this study were primary and secondary. The primary sources were interview by using structured questionnaires, physical observation and interviewing respondents. The secondary sources were past six months logistic data (reviewing record and report) of selected essential medicines (bin card, IFRR and RRF).

3.6 Data collection methods, instruments and Procedures

Data was collected by principal investigator using semi structured questionnaires and key informant interviews with support from primary health care facilities based on their technical and managerial experiences of serving in health care facilities. Semi structured questionnaires have two parts; socio demographic parts of the respondents and second part deals with main parts, which were customized from inventory management tool and Logistics indicator assessment tool (LIAT) of USAID/deliver project for use in public healthcare facilities (Aronovich et al.,2010). To assess storage condition, EPSA storage guideline checklist was used. The questionnaires were collected by checking the completeness of the data and by appreciating their participation and devoting their precious time for the research. The tool was pre tested at selected primary hospital and health center in order to check the clarity, validity, ambiguity and readability of the statements and questions. For qualitative part, All Key informants interviews conducted were

audio recorded. The records were listened for several times and transcribed to ensure quality transcription.

3.7 Methods of data analysis and presentation

The collected data was edited, cleaned and input into Excel software, and then exported to the Social Science Statistical Package (SPSS) version 20 (IBM Corporation, Armonk, New York, USA) for analysis. The descriptive summary statics used to describe a set of data in terms of its frequency of occurrence, its central tendency. Inferential statistics such as multivariable linear regression analysis was done to determine the degree of influence of predictor variables on operational performance of selected tracer program medicines in public PHFs. Qualitative data was thematic analysis after transcription.

3.8 Validity and Reliability test

Validity test

Validity is extent to which a test measures what it is expected to measure (Creswell, 2009). It is degree to which results obtained from analysis of the data represents the objective. Prior to data collection, data collection tool was pretested at two primary healthcare facilities namely, one primary hospital and one health center in order to check validity of the data collection tool and the health care facilities were included in pre-test were excluded from main study. Based on finding, contents were modified on data collection tools towards objectives. Finally, the improved versions of the data collection tools were used. For qualitative part, the semi structured interview guide was tested for its validity by taking two informants interviews.

Reliability test

Cronbach's alpha was calculated by using of SPSS version 26 for reliability test. Cronbach's alpha value for all inventory management practice and inventory management performance and challenges was greater than α 0.7 that was considered be acceptable. Summary of the reliability test of inventory management practice, performance and challenges is the (table1) below.

Table 2: Reliability test result

Variables	Reliability Cronbach's alpha
Inventory management practice	0.75
Inventory management performance	0.71
Challenges of inventory management practice	0.89

3.9 Ethical consideration

Ethical approval was obtained from the Ethics Review Committee of the School of Commerce, Department of Logistics and supply chain management Addis Ababa University. Then, the Hadiya zone health department was notified by an official letter from the Logistics and supply chain management, Addis Ababa University and the same concept was written down from the Zone health department to woreda Health office, primary hospital and HCs. The study was conducted in the selected hospital and HCs after getting permission from respective directorates of health care facility. Data acquired from the study was kept securely so that there could be no access for non-authorized personal to identify or record on any tools used for data collection.

Chapter four
4. Result, discussion and interpretation

This chapter presents the analysis of data followed by discussion of study findings so that the reader of the paper understand the result of the study, that is inventory management practice, performance and challenges of tracer program medicines in Hadiya Zone PHFs, Southern Ethiopia. The chapter focuses on presenting the demographic data of respondents in first section while the second section provides the detail findings of the specific objectives of the research study. Based on SPSS version 26, the data was analysed and findings were reported by descriptive statics, including graphic presentations, tables, frequencies, mean, and standard deviations. Multiple regression analysis was done to estimate the effect of predictor variables on outcome variables. In addition, the main challenges related to inventory management of tracer program medicines at Hadiya Zone PHFs are identified and described.

The primary data were obtained from Hadiya Zone PHFs healthcare workers who are involved in inventory management practice of program medicines which included store managers, pharmacy heads, facility managers, Zone logistic officers and EPSS, Hawassa hub officer. Secondary data were obtained from Bin cards, IFRR, RRF, Model 19 and model 22. In qualitative data collection, three store managers, three pharmacy heads and three facility managers, one Zone logistic officer and one EPSS, hub officers were interviewed.

4.1 Response rate of the study

A total of 38 respondents were targeted in the study which includes store managers, pharmacy heads and senior pharmacists coordinate inventory management from store to dispensing units. From which, 34 respondents returned completely filled response questionnaires with response rate of 89.5% which is sufficient to carry out analysis (table 2).

Table 3 : Response rate of respondents

Profession/position of work of respondents	**Questionnaires given**	**questionnaires returned**	**Frequency (%)**
Store managers	14	14	100
Pharmacy head	8	8	100
Pharmacists	16	12	75
Total	38	34	89.5

4.2 Characteristics of primary healthcare facilities and respondents

As indicated in table 3 below, majority of healthcare professionals are males 61.8% followed by females 38.2%. This finding indicated that both genders who work in inventory management practice were involved in the study and the study has no gender bias. Professionally, pharmacists cover 82.4% of inventory managing staffs and the remaining professionals were from other health departments. It would be better if inventory management practice is handled by pharmacy professionals. But due to staff shortage in primary healthcare facilities, senior nurses and even public health professionals manage inventory management tasks under supervision of facilities management and training supports. On level of education, majority (60%) of professionals have diploma level followed by first degree (41.2%) which indicated that the respondents had the minimum educational level to respond to the questionnaire which is much related with day to day practice. work experiences of greater than 5 years account 32.4% but all of them have more than 2 years' work experience which shows that they have enough level of experience enable them to respond to the questionnaires in more sufficient way. 33 (97.1%) had never received IPLS training

Table 4 : Profile information of respondents

Variable		Frequency	Percent
Gender of respondent	Male	21	61.8
	Female	13	38.2
	Total	34	100.0
Profession of respondent	pharmacist	28	82.4
	Nurse	4	11.8
	Other	2	5.9
	Total	34	100.0
Educational level	Diploma	20	58.8
	Degree	14	41.2
Job title of respondent	pharmacy head	8	23.5
	Store keeper	14	41.2
	Pharmacist	12	35.3
	Total	34	100.0
Work experience	≤ 5year	23	67.6
	>5 years	11	32.4
	Total	34	100.0
A pre service training of IPLS	Trained	1	2.9
	Not trained	33	97.1
Total		34	100.0

4.3 Inventory Management Practices of program medicines

The availability of logistic forms was 100% in almost all facilities. But utilization of bin card was minimal and stock card was none. Regarding availability of SOP of IPLS, about one third facilities have SOP of IPLS and all facilities respondents stated that their product storage in their store follows (first-to expire, first-out) (FEFO),/Last in first out (LIFO) drug distribution system. Although, most of the facilities respondents (61.76%) stated that they have functional DTC, but only (23.52%) have functional DTC whose evaluation result was greater than 75%. Only (32.35%) respondents had taken IPLS training, close to one fourth of respondents had taken supportive on job training and (70.58%) had not got training opportunity at all. About 65% of

respondents stated that there is at least one timely feedback and supervision in six months followed by annual 7(20.58%) from higher level health departments. All the assessed primary healthcare facilities have no automated data management system and the reason behind was, even if there is software loaded computers are available, they are not functional (As per KIs, response. All facilities compile and send RRF report every other month for resupply. From total respondents, 20(58.8%) mentioned they encounter stock out of programs medicines. All facilities receive products in one month to two months period (table 4).

Table 5: Inventory Management Practices of Facilities in Hadiya Zone PHFs, Southern Ethiopia, 2023

Inventory management practice assessed		**Number of facilities response**	
		Yes	**No**
Availability of logistic Forms		**Number (%)**	**Number (%)**
Bin card availability		34(100)	0
IFRR availability		34(100)	0
RRF availability		34(100)	0
stock card availability		7(20.58)	27(79.42)
Utilization of logistic Forms			
Utilization of bin card		20(58.82)	14(41.17)
Utilization of IFRR		34(100)	0
Utilization of RRF		34(100)	0
Utilization of stock card		0	34(100)
Availability of SOP of IPLS		12(35.29)	22(64.71)
FEFO/LIFO drug distribution system		34(100)	0
Functional DTC		21(61.76)	13(38.24)
Did you receive IPLS training		11(32.35)	23(67.65)
Pre service training		1(2.94)	33(97.06)
On job training		9(26.47)	25(73.53)
Never been trained		24(70.58)	10(29.42)
Is there any feedback from higher level?		34(100)	0
If YES how often?	quarterly	5(14.7)	(85.3)
	six monthly	22(64.7)	12(35.3)
	annually	7(20.58)	27(79.42)
Is there automation in your store?		0	34(100)
If no, why? Not functional		34(100)	0

The health facility compiles and sends RRF to higher level		34(100)	0
If yes, does all the columns in RRF completed		34(100)	0
Use IFRR for regular reporting in ART		34(100)	0
Use IFRR for regular reporting in OPD		34(100)	0
Use IFRR for regular reporting in TB		34(100)	0
Use IFRR for regular reporting in MCH		34(100)	0
Does the facility usually stock out key essential medicines		20(58.8)	14(41.2)
If yes for above question, what was the reason?	Resupply point does not have adequate supply	20(64.7)	
	Resupply point was stock out	20(64.7)	
	Order amount change at supply point	20(64.7)	
Do you always receive the exact quantity of products ordered from the suppler, (see RRF, model 19)		0	34(100)
How long doe s it take from the time the facility places an order until the drugs are received?	1 to 2 months	34(100)	0
DTC functionality above 75%		8(23.52)	26(76.48)
Supportive supervision		23(67.65)	11(32.35)

4.4 Challenges of program medicines inventory management practice and performance

Inventory management is heart of pharmaceutical SCM. It is approach for keeping track flow of the inventory. Without healthy inventory management, the pharmaceutical supply system could not be viable. Poor inventory management in public health supply system leads to waste of scarce resource, stock out of essential medicines and decline in quality care. In this part, the researcher tried to explore the major findings on the inventory management challenges in studied primary healthcare facilities. A total of 34 respondents (9 from PHs, 25 from HCs) participated to questionnaires which contained 43 questions in seven main areas for assessment of inventory management. The questionnaire was designed in a way the respondents could fill their response using five likert scales by selecting the extent they agree. They choose 5 for strongly agree, 4 for agree, 3 for neutral, 2 for disagree and 1 for strongly disagree. The calculated with result of score 1-1.80 indicates the respondents strongly disagree, 1.81-2.60 the respondents were disagreed, 2.61 to 3.40 the respondents were neutral, 3.41 to 4.20 were agreed and 4.21 and above were strongly agreed (Nyutu, E. N et al., 2021).

Table 5 shows the respondents response on challenges of inventory management in primary healthcare facilities in Hadiya Zone, Southern Ethiopia. As stated in the table below, the respondents were neutral on the issue of operational challenges with grand mean of 3.37 even if they strongly agreed on inventory discrepancy (mean of 4.29) and inability of supplier to fill the order (mean of 4.27). They disagreed on misplaced items in store that cannot be traced (mean of 2.59) and insufficient order management (mean of 2.32). The respondents agreed with financial, Behavioural, Human resource, demand supply, and logistic challenges with grand mean of 3.67, 3.66, 3.92, 3.68 and 4.19 respectively (table 5). Hence, finding solutions for aforementioned challenges can improve inventory management practice mainly for logistic, the human resource and financial challenges. This result was in line with key informant interview results. Here on behavioural challenge part, the respondents were neutral existence of knowingly giving inaccurate information to clients and Manipulating inventory figures and levels with mean response of 2.90 and 2.91 respectively which means the issues could affect inventory management practice neither positively nor negatively. They also strongly agreed on existence of technological challenges with grand mean 4.25 which means number one factor affecting inventory management practice was technological challenges and availing access for friendly electronic data management system can solve this number one challenge.

Table 6 : Challenges of program medicines inventory management practice and performance in Hadiya zone PHFs, 2023

Operational challenge(N=34)	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
Physical inventory (stock) that does not match the records	0	4(11.7)	2(5.9)	18(53)	12(35.3)
Pilling up of inventory (stock) that is not moving	0	10(29.4)	7(20.5)	13(38.2)	4(11.7)
Inability of suppliers to meet the orders made	0	3(8.8)	2(5.9)	17(50)	12(35.3)
Increasing number of damaged inventory (stock)	0	10	18	3(8.8)	3(8.8)
Increasing number of inventory (stock) with a passed expiry date	0	0	11(32.4)	20(58.8)	3(8.8)
Misplaced items in store that cannot be traced	0	20(58.8)	8(23.5)	6(17.6)	0
Insufficient Order Management	0	6(17.6)	11(32.4)	17(50)	0
Inability to manage inventory waste and defects	0	6(17.6)	12(35.3)	16(17.6)	1(2.9)
Inefficient internal process	0	0	17(50)	16(47.1)	1(2.9)
Grand mean and average standard deviation (mean ± SD)					3.37±0.579
Financial challenges (N=34)					
Rising storage costs	0	3	17(58.8)	14(41.2)	0
Warehouse Efficiency	0	6(17.6)	11(32.4)	12(35.3)	5(14.7)
High cost of managing defects and waste	1(2.9)	1(2.9)	14(41.2)	15(44.1)	3(8.8)
Lack of budget for inventory management systems	0	6(17.6)	2(5.9)	16(47.1)	10(29.4)
Grand mean average standard deviation (mean ± SD)					3.67±0.500

Behavioural challenges (N=34)					
Theft of inventory (stock)	0	0	11(32.4)	13(38.2)	10(29.4)
Inventory Loss due to employee's unethical practices	0	3(8.8)	11(32.4)	17(50)	3(8.8)
Knowingly giving inaccurate information to clients	10(29.4)	1(2.9)	8(23.5)	9(26.5)	2(2.9)
Manipulating inventory figures and levels	5(14.7)	9(26.5)	10(29.4)	4(11.7)	6(17.6)
Grand mean average standard deviation (mean ± SD)					3.6±0.797
Human resource related challenges(N=34)					
Errors due to incompetent staff	0	0	2(5.8)	21(61.7)	11(32.4)
Lack of Expertise	3(8.8)	2(5.8)	5(14.7)	18(53)	6(17.6)
Poor Communication	0	0	1(2.9)	21(61.7)	12(35.3)
Inefficient Processes	0	0	8(23.5)	23(67.6)	3(8.8)
Overstocking due to failed to use optimize the warehouse	0	0	14(41.2)	13(38.2)	7(20.6)
Inability to locate the inventory stocks	0	7(20.6)	15(44.1)	15(44.1)	1(2.9)
Lack of awareness on the benefits of inventory management	0	0	3(8.8)	`18(53)	13(38.2)
Lack of management support on inventory management	0	6(17.6)	2(5.8)	20(58.8)	6(17.6)
Grand mean average standard deviation (mean ± SD)					3.92±0.567
Demand and supply related challenge (N=34)					
Demand uncertainty	0	4(11.7)	5(14.7)	19(55.8)	6(17.6)
Supply Chain Complexity	1(2.9)	3(8.8)	9(26.5)	18(53)	3(8.8)
Increasing Competition	1(2.9)	0	8(23.5)	16(47.1)	9(26.5)

Changing Customer demand constantly result in obsolete inventory	1(2.9)	2(5.8)	6(17.6)	19(55.8)	6(17.6)
Unable to keep up with the demand from customers	3(8.8)	2(5.8)	18(530	5(14.7)	6(17.6)
Grand mean average standard deviation (mean ± SD)				3.68±0.880	
Technological challenges(N=34)					
Inadequate Software	0	4(11.7)	1(2.9)	18(53)	11(32.4)
Inaccurate Data	0	2(5.8)	2(5.8)	20(58.8)	10(29.4)
Inconsistent Tracking	1	2(5.8)	2(5.8)	18(52.9)	11(32.4)
Limited Visibility	0	3(8.8)	4(11.7)	17(50)	10(29.4)
Lack of interoperability between software	0	0	1(5.8)	21(61.7)	12(35.3)
Lack of good infrastructure like IT equipment	0	3(8.8)	3(8.8)	15(44.1)	13(38.2)
Lack of tracking Obsolete Stocks	0	2(5.8)	2(5.8)	20(58.8)	10(29.4)
Grand mean average standard deviation (mean ± SD)				4.25±0.574	
Logistical facility challenges (N=34)					
Weak Warehouse Space Management	0	2(5.8)	1(2.9)	20(58.8)	11(32.4)
Choosing a manual inventory process	0	2(5.8)	2(5.8)	20(58.8)	10(29.4)
Problem Stock (lack of specialized plans for care and storage)	0	3(8.8)	2(5.8)	17(50)	12(35.3)
Lack of a centralized inventory hub	0	2(8.8)	7(20.6)	23(67.4)	2(5.8)
Absence of different types of record keeping cards	0	11.7(11.6)	2(5.8)	18(53)	10(29.4)
Grand mean average standard deviation (mean ± SD)				4.19±0.564	

4.5 Inventory management performance

4.5.1 Availability of tracer Program Medicines

Strong inventory management practice plays vital role in improving availability and reducing stock out of tracer program medicines. Undertaking performance evaluation helps to identify gap areas of inventory management. Ensuring availability of medicines is ultimate goal of inventory management in public healthcare facilities. No product means there is no service provision. The availability of tracer program medicines was assessed by checking availability on the day of visits which measures the health system effectiveness in maintaining a range of products in stock (at the time of assessment). The assessment of availability of tracer program medicines was done by interviewing store managers and observation with checklist of tracer program medicines. The mean availability of tracer program medicines on the day of visit was 74.3% out of 25 key tracer program medicines (table 6). The result was lower than study finding from Adama which was 87.9% and study report from Gondor which ranges from 26 to 91% (Mulugeta-Fentie, 2015), South Wollo (76 %) (Belete, 2020) and Uganda (79.5%) (Bruno et, 2015). It was lower than study report from Uganda (45.7%) (MOH, 2016) Tanzania, 20% (Massawe, 2012) and Kenya 20% (Harrington, 2014). The average availability of tracer program medicines in PHs and HCs were 64% and 59.3% respectively. This was higher than availability report in national IPLS survey where 81.9% at hospitals and 77.3% at HCs (Shewarega et al., 2015). This might be due to difference in EPSS hub and variation from region to region in supply practice. Product availability on the day of a health facility visit serves as proxy for overall availability. As per the WHO recommendation, overall availability result indicates poor inventory control practice.

Table 7 : Availability of program medicines on the day of visit at public PHFs of Hadiya Zone, 2023

S. No	Name of product	Availability		
		Hospitals (N=3) no (%)	HCs (N=11) no (%)	Total (N=14) no (%)
1	Medroxyprogesterone (Depo-provera) inj	1((33.3)	10(90.9)	11(75.6)
2	Etongestrel (Implanon) - 68mg	2(66.7)	8(72.7)	10(71.4).
3	Combined oral contraceptive (COC)	3(100)	11(100)	14(100)
4	Oxytocin injection	2(66.7)	10(90.9)	12(85.7)
5	Magnesium Sulfate injection	3(100)	10(90.9)	13(92.9)
6	Iron + Folic (60mg + 400mcg) tab	1((33.3)	11(94.7)	12(85.7)
7	Tetracycline - 1% - Eye Ointment	2(66.7)	9(81.8)	11(75.6)
8	Vitamin K (phytomenadione)	0(0)	1(9.1)	1(7.1)
9	Pentavalent vaccine	3(100)	11(100)	14(100)
10	Chlorhexidine Digluconate	1((33.3)	11(100)	12(85.7)
11	Coartem 6x4 Tablet	1((33.3)	9(81.8)	10(71.4)
12	Coartem 6x3 Tablet	1((33.3)	9(81.8)	10(71.4)
13	Coartem 6x2 Tablet	0(0)	8(72.7)	8(57.1)
14	Primaquine 7.5 mg tablet	3(100)	8(72.7)	11(75.6)
15	Artesunate - 60mg/ml in 1ml Inj	0(0)	1(9.1)	1(7.1)
16	Adult TB Kit(RHZE)	3(100)	11(100)	14(100)
17	Vitamin B6 (Pyridoxine HCl) 25 mg Tablet	3(100)	6(54.5)	9(64.3)
18	Amoxicillin - 250mg - Tablet (Dispersible)	2(66.7)	9(81.8)	11(75.6)
19	Oral Rehydration Salts (ORS)	3(100)	10(90.9)	13(92.9)
20	Zinc Acetate 20mg – Tablet	3(100)	11(100)	14(100)
21	TDF+3TC+DTG (300mg + 300mg + 50mg)	3(100)	11(100)	14(100)
22	Abacavir + Lamivudine(120mg + 60mg) tab	3(100)	10(90.9)	13(92.9)
23	Nevirapine - 10mg/ml - Oral Suspension	3(100)	11(100)	14(100)
24	Dolutegravir 50mg tablet	3(100)	10(90.9)	13(92.9)
25	Dolutegravir 10mg tablet	2(66.7)	7(63.6)	9(64.3)
	Overall Average	**1.92 (64)**	**8.92 (59.3)**	**10.8 (74.3)**

4.5.2 Stock out rate

Stock out within last 180 days was expressed as the average percentage of time that the products were out of stock in healthcare facilities. The finding revealed that the PHFs experienced stock out of number of tracer program medicines in last six months. On average, stock out of tracer program medicines encountered in (47.1%) of primary healthcare facilities with average stock out days of 33.38 days (table 7). This was lower than stock out rate reported from public health facilities from Southern Ethiopia (53%) (Damtie et al., 2020).The result was higher than research report from Malawi (33.3%) (Anon, 2007). Average stock out of PHs and HCs were (46.7%) and

(46.4%) respectively. This result is higher than study report from Gamo Zone (18.5% and 22.7%) (Alemu et al., 2023). Most of the key informants both from study facilities and Zone logistic officer raised low fill rate of EPSS was reason behind stock out. This was in line with study report from Indonesia (JSI, 2016). The average stock out duration of current study (33.38 days) is higher than research report of Uganda in which average out duration ranged from 7 to 20 days (Okiria et al.,2016) and comparable with study report from Gurmu and Ibrahim in which the average stock out duration was 35.31 days (Gurmu and Ibriham,2017). This could be due to poor inventory control practice, less accurate average monthly consumption data, low supplier order fill rate and poor quality logistic records (USAID, 2016; Okiria et al.,2016)**.** Besides, Primary healthcare facilities are the last but not the least destiny of products supply chain which makes a bit far from suppler but on average 80% population utilizes the service. Therefore, this frequent stock out needs intervention from EPSS.

Table 8 : Stock out rate of tracer program medicines in preceding six months from the study period in public PHFs of Hadiya Zone, June 2023

S. No	Name of products	6-month stock out rate			
		Hospital(N=3) (no)%	HC (N=11) (no)%	Total(N=14) (no)%	Duration of SO in months
1	Medroxyprogesterone (Depo-provera) inj	2(66.7)	4(36.7)	6(42.9)	26.79
2	Etongestrel (Implanon) - 68mg	2(66.7)	3(27.3)	5(35.7)	23.57
3	Combined oral contraceptive (COC)	1(33.3)	1(9.1)	2(14.3)	7.14
4	Oxytocin injection	0(0)	0(0)	0(0)	0.00
5	Magnesium Sulfate injection	0(0)	10(90.1)	10(28.6)	17.14
6	Iron + Folic (60mg + 400mcg) tab	3(100)	3(27.3)	6(42.9)	19.79
7	Tetracycline - 1% - Eye Ointment	1(33.3)	7(63.6)	8(57.1)	34.29
8	Vitamin K (phytomenadione)	3(100)	11(100)	14(100)	128.57
9	Pentavalent vaccine	1(33.3)	4(36.7)	5(35.7)	7.29
10	Chlorhexidine Digluconate	1(33.3)	4(36.7)	5(35.7)	13.93
11	Coartem 6x4 Tablet	3(100)	5(45.5)	8(57.1)	22.29
12	Coartem 6x3 Tablet	3(100)	5(45.5)	8(57.1)	35.45
13	Coartem 6x2 Tablet	3(100)	6(54.5)	9(64.3)	52.29
14	Primaquine 7.5 mg tablet	1(33.3)	7(63.6)	8(57.1)	40.71
15	Artesunate - 60mg/ml in 1ml Inj	3(100)	10(90.1)	13(92.9)	126.43
16	Adult TB Kit(RHZE)	1(33.3)	3(27.3)	4(28.6)	10.71
17	Vitamin B6 (Pyridoxine) 25 mg tab	1(33.3)	9(81.8)	10(71.4)	55.71
18	Amoxicillin - 250mg (Dispersible)	3(100)	7(63.6)	10(71.4)	64.57
19	Oral Rehydration Salts (ORS)	0(0)	6(54.5)	6(42.9)	18.64

20	Zinc Acetate 20mg – Tablet	0(0)	5(45.5)	5(35.7)	18.14
21	TDF+3TC+DTG (300mg + 300mg + 50mg)	0(0)	0(0)	0(0)	0.00
22	Abacavir + Lamivudine(120mg + 60mg) tab	1(33.3)	3(27.3)	4(28.6)	19.64
23	Nevirapine - 10mg/ml - Oral Suspension	0(0)	4(36.7)	4(28.6)	25.71
24	Dolutegravir 50mg tablet	1(33.3)	4(36.7)	5(35.7)	22.43
25	Dolutegravir 10mg tablet	2(66.7)	8(72.3)	10(71.4)	51.43
	Overall Average	**1.4 (46.7)**	**5.1(46.4)**	**6.6 (47.1)**	**33.68**

4.5.3 Bin card utilization and Updating practice

Sixty bin cards were used for tracer program medicines in selected primary healthcare facilities from expected three hundred fifty bin cards. In another word, on average (28.3%) primary healthcare facilities were using bin cards. When it comes to bin cards updating, from the total primary healthcare facilities, (20.6%) facilities have updated their bin cards in the last one month period. Both bin cards utilization and updating practice is slightly better in PHs than HCs (33.3%), (21.3%) and (27.3%), (20%) respectively (table 8).

This is lower than research conducted by (EPSA, 2018) in which average bin card utilization was 90% in hospitals and 55% in HCs. It was also lower than study reported by (Alemu et al.,2020) in which utilization of bin cards for tracer products was 84% for hospitals and 75.4% for HCs. Average bin card updating for hospitals was about 44% and 33% for HCs (table 8). This might be due to the difference in level of commitment in health facilities professionals.

Table 9 : Bin card utilization and updating practice for tracer program medicines in PHFs of Hadiya Zone, June 2023

S. No	Name of Medicine	Bin card utilized			Bin card updated		
		Hospital N=3 (no)%	HCs N=11 (no)%	Total (N=14) (no)%	Hospital (N=3) (no)%	HCs (N=11) (no)%	Total (N=14) (no)%
1	Medroxyprogesterone (Depo-provera) inj	0(0)	6(54.5)	6(42.9)	0(0)	3(27.3)	3(21.04)
2	Etongestrel (Implanon) - 68mg	1(33.3)	4(36.4)	5(35.7)	1(33.3)	4(36.4))	5(35.7)
3	Combined oral contraceptive (COC)	1(33.3)	4(36.4)	5(35.7)	1(33.3)	3(27.3)	4(28.6)
4	Oxytocin injection	1(33.3)	3(27.3)	4(28.6)	0(0)	2(18.2)	2(14.3)
5	Magnesium Sulfate injection	2(66.7)	3(27.3)	6(42.9)	1(33.3)	3(27.3)	4(28.6)
6	Iron +Folic (60mg + 400mcg) tab	2(66.7)	4(36.4)	6(42.9)	1(33.3)	4(36.4)	5(35.7)
7	Tetracycline - 1% - Eye Ointment	1(33.3)	3(27.3)	4(28.6)	1(33.3)	2(18.2)	3(21.4)
8	Vitamin K (phytomenadione)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
9	Pentavalent	0(0)	2(18.2)	2(14.3)	0(0)	0(0)	0(0)
10	Chlorhexidine Digluconate	1(33.3)	6(54.5)	7(50.0)	0(0)	2(18.2)	2(14.3)
11	Coartem 6x4 Tablet	1(33.3)	3(27.3)	4(28.6)	1(33.3)	1(9.1)	2(14.3)
12	Coartem 6x3 Tablet	1(33.3)	3(27.3)	4(28.6)	0(0)	1(9.1)	1(7.1)
13	Coartem 6x2 Tablet	1(33.3)	2(18.2)	3(21.4)	0(0)	2(18.2)	2(14.2)
14	Primaquine 7.5 mg tablet	1(33.3)	4(36.4)	5(35.7)	0(0)	1(9.1)	1(7.1)
15	Artesunate - 60mg/ml in 1ml Inj	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
16	Adult TB Kit (RHZE)	1(33.3)	2(18.2)	3(21.4)	1(33.3)	3(27.3)	4(28.6)
17	Vitamin B6 (Pyridoxine HCl) 25 mg Tablet	1(33.3)	3(27.3)	4(28.6)	1(33.3)	3(27.3)	4(28.6)
18	Amoxicillin - 250mg - Tablet (Dispersible)	1(33.3)	5(45.5)	6(42.9)	1(33.3)	6 (54.5)	7(50.0)
19	Oral Rehydration Salts (ORS)	1(33.3)	3(27.3)	4(28.6)	1(33.3)	2(18.2)	3(21.3)
20	Zinc Acetate 20mg - Tablet	1(33.3)	2(18.2)	3(21.4)	1(33.3)	2(18.2)	3(21.4)
21	TDF+3TC+DTG (300mg + 300mg + 50mg)	2(66.7)	2(18.2)	4(28.6)	2(66.7)	2(18.2)	4(28.6)
22	Abacavir + Lamivudine (120mg + 60mg) tab	1(33.3)	2(18.2)	3(21.4)	1(33.3)	1(9.1)	2(14.3)
23	Nevirapine Suspension	2(66.7)	3(27.3)	5(35.7	1(33.3)	3(27.3)	4(28.6)
24	Dolutegravir 50mg tablet	1(33.3)	3(27.3)	4(28.6)	1(33.3)	3(27.3)	4(28.6)
25	Dolutegravir 10mg tablet	1(33.3)	3(27.3)	4(28.6)	0(0)	2(18.2)	2(14.3)
	Average	**1(33.3)**	**3 (27.3)**	**4.0 (28.3)**	**.64 (21.3)**	**2.2 (20)**	**2.9(20.6)**

4.5.4 Inventory accuracy rate

Bin cards are one of stock control logistic tool and performance indicator. Having accurate stock on hand is vital for proper inventory management. From the result, it can be noted that the number of primary healthcare facilities which has no discrepancy between physical count and bin card balance on day of visit was (17.14%). Primary hospitals have greater inventory accuracy (34.7%) than HCs (12.7%) (table 9). The current finding is lower than inventory accuracy rate of 52.4%, 30.4% , 57 and 51.7 reported from West Wollega and Jima Zones of Oromia, Southern Ethiopia and South Africa respectively (Befikadu et al.,2020; EPSA,2019, and Alice Mahoro,2013).

Table 10 : Bin card data accuracy for tracer program medicines at in public health facilities of Hadiya zone, June 2023

S. No	Name of product	Inventory accuracy		
		Hospitals (N=3) (no)%	**HCs (N=11) (no)%**	**Total (N=14) (no)%**
1	Medroxyprogesterone (Depo-provera) inj	0(0)	4(36.4)	4(28.6)
2	Etongestrel (Implanon) - 68mg	0(0)	0(0)	0(0)
3	Combined oral contraceptive (COC)	2(66.7)	3(27.3)	5(35.6)
4	Oxytocin injection	1(33.3)	1(9.1)	2(14.3)
5	Magnesium Sulfate injection	1(33.3)	1(9.1)	2(14.3)
6	Iron + Folic (60mg + 400mcg) tab	1(33.3)	2(18.2)	3(21.4)
7	Tetracycline - 1% - Eye Ointment	1(33.3)	3(27.3)	4(28.6)
8	Vitamin K (phytomenadione)	0(0)	0(0)	0(0)
9	Pentavalent	0(0)	0(0)	0(0)
10	Chlorhexidine Digluconate	2(66.7)	2(18.2)	4(28.6)
11	Coartem 6x4 Tablet	1(33.3)	2(18.2)	3(21.4)
12	Coartem 6x3 Tablet	1((33.3)	0(0)	1(7.1).
13	Coartem 6x2 Tablet	1(33.3)	1(9.1)	2(14.3)
14	Primaquine 7.5 mg tablet	2(66.7)	1(9.1)	3(21.4)
15	Artesunate - 60mg/ml in 1ml Inj	1((33.3)	0(0)	1(7.1)
16	Adult TB Kit (RHZE)	1((33.3)	4(36.4)	5(35.6)
17	Vitamin B6 (Pyridoxine) 25 mg Tablet	1((33.3)	0(0)	1(7.1)
18	Amoxicillin - 250mg (Dispersible)	1((33.3)	0(0)	1(7.1)
19	Oral Rehydration Salts (ORS)	1(33.3)	2(18.2)	3(21.4)
20	Zinc Acetate 20mg – Tablet	1(33.3)	1(9.1)	2(14.3)
21	TDF+3TC+DTG (300mg+300mg+50mg)	2(66.7)	3(27.3)	5(35.6)
22	ABC + 3TC (120mg + 60mg) tablet	1((33.3)	0(0)	1(7.1)
23	Nevirapine - 10mg/ml - Oral Suspension	1(33.3)	1(9.1)	2(14.3)
24	Dolutegravir 50mg tablet	2(66.7)	3(27.3)	5(35.6)
25	Dolutegravir 10mg tablet	1(33.3)	1(9.1)	2(14.3)
	Overall Average	**1.04 (34.7)**	**1.36 (12.7)**	**2.4 (17.14)**

The difference might be due to difference in the number of facilities involved. In current study, high discrepancy in HCs which could be due to limited supportive supervision from higher level responsible bodies, lack of IPLS training, electronic data management and lack of commitment from working staffs in healthcare facilities.

4.5.5 Lead time

It is the time interval required by supplier to take order and supply facilities with products requested. It begins with the demand for new products is known and ends when that stock is delivered and available for an issue (MSH, 2012). Overall average order lead time of the past six months in those facilities was 35.57 days. It ranges from 30 days in Hossana and Gimbichu primary Hospital to 45 days in Geja Health center (figure 4). This was relatively shorter than study report from Uganda in which average lead time was 41 days (Uganda MOH, 2016). Although, there is no maximum lead time set, weak inventory management and supplier fill capacity contribute to longer lead time which may leads to stock out TMs.

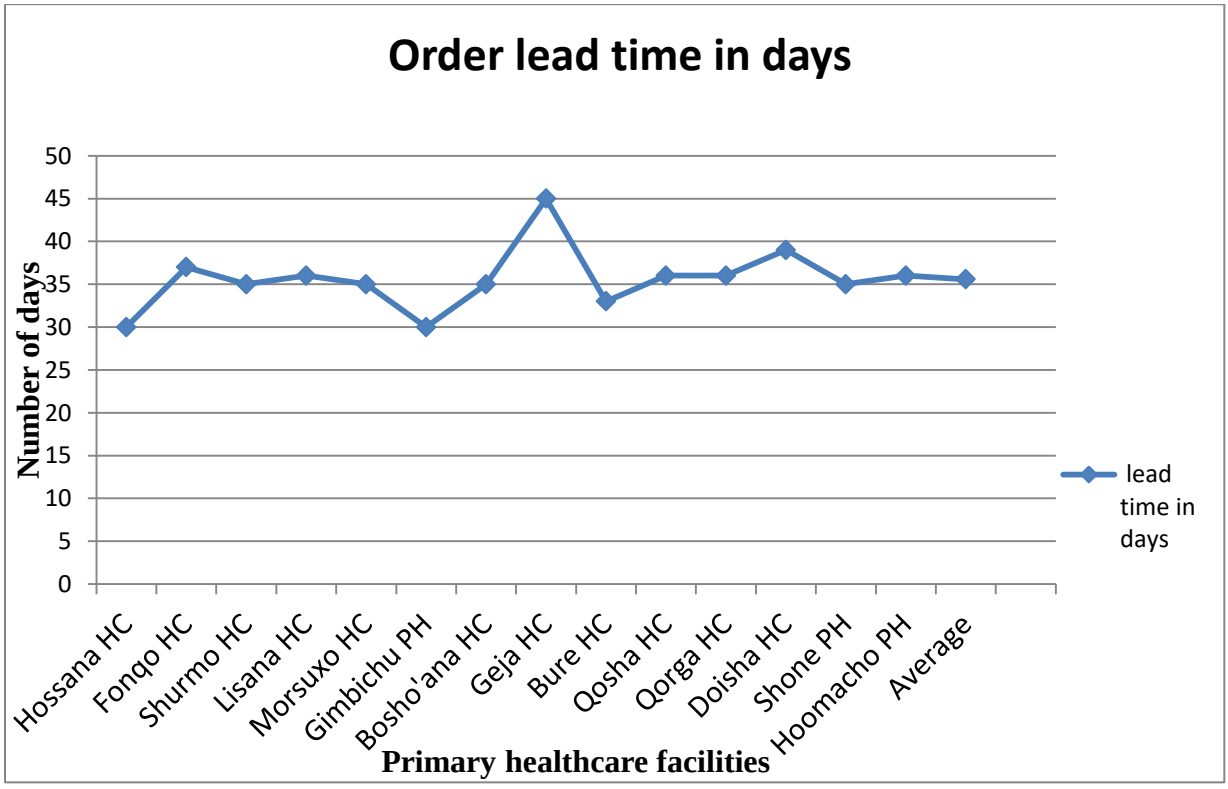

Figure 4 : Order lead time of primary healthcare facilities in Hadiya Zone, Southern Ethiopia, 2023

4.5.6 Supplier order refill rate

Data collected through the RRF reports are used to make logistic decisions. EPSS resupplies facilities with the requested quantity within one month of receiving the request. This was done by comparing the most recent quantity ordered of the tracer program medicines from RRF with the same period quantity received from the receiving record of health facilities. The average order fill rate at the hospital level is 51.3% which is less than the order fill rate of HCs which comprise 54.4%. Artesunate injection and vitamin K supply was zero for all primary healthcare facilities (Figure 5).

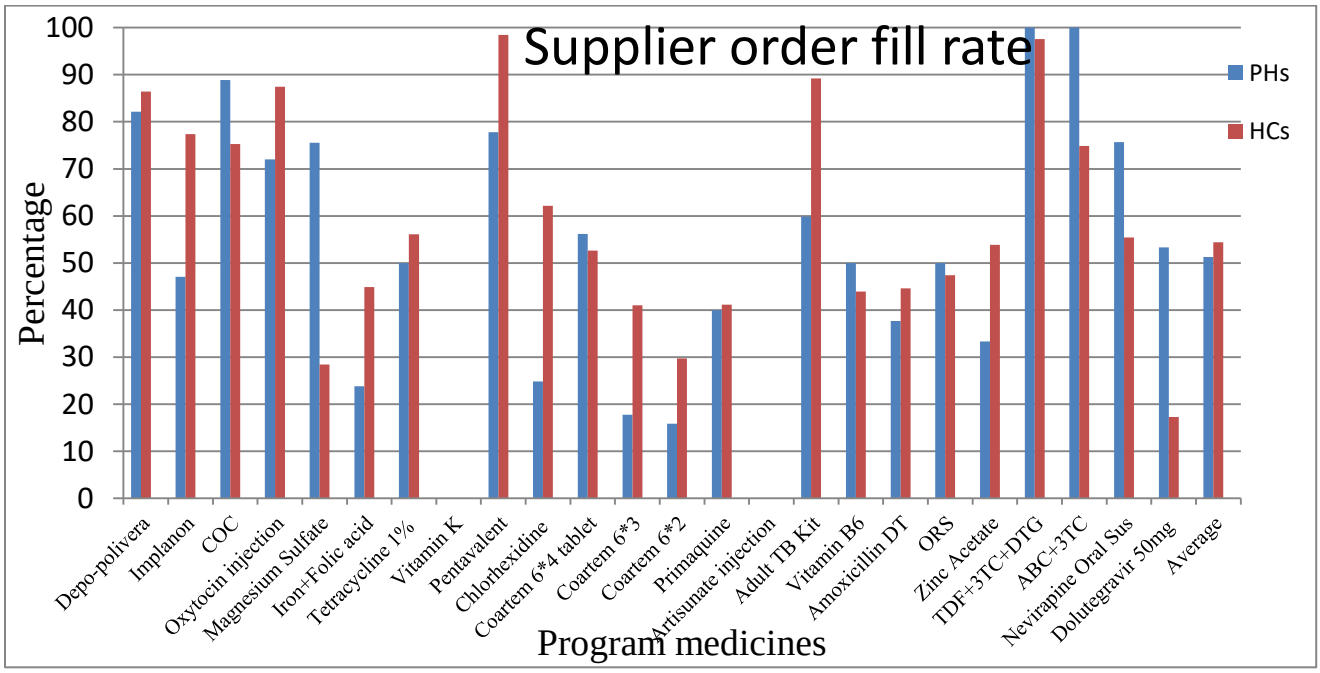

Figure 5 : Percentage of Order Fill Rate of tracer program medicines HZ, PHFs, 2023

4.5.7 Primary health facilities RRF reporting quality

Data quality of RRF report assessed indicated that around 74 (88.1) % of the RRF reports were timely, 47(60.)% of RRF was complete and (54.7%) was accurate for study facilities (figure 6).

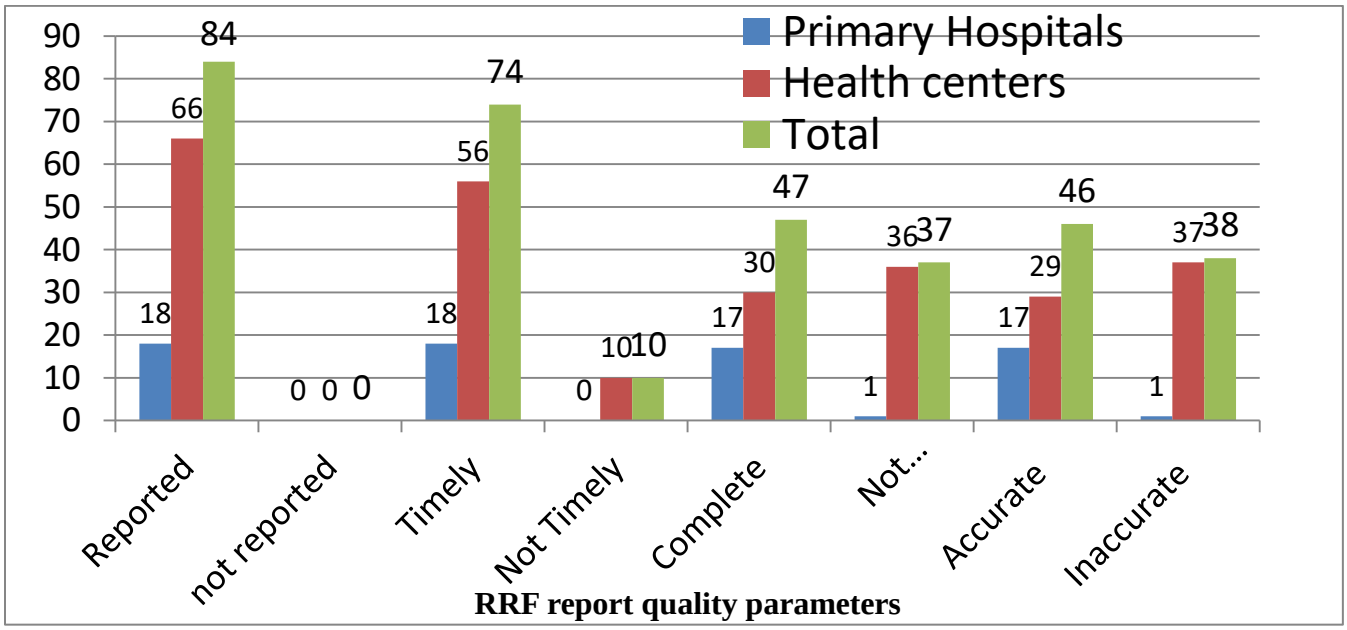

Figure 6 : RRF report quality of primary healthcare facilities

The gaps in data quality might be related the professionals' commitment and/or weak supportive super vision from higher levels (WoHo and zone logistic office and regional health bureau). This result was lower than study report from public health facilities from East Wollega where (64.6%) RRF were of them were accurate and 97.8% of the reports were complete. Weak supportive supervision was one factor for poor data quality (Tiye, K and Gudeta, T., 2018). Another RRF data quality study from EPSA Bahir Dar indicated that indicated that from 36.2% RRF were accurate, 68.5% were complete and 76% were submitted on time (Zewdu Tessema and Zelalem Tilahu., 2022). The result is better than study report from Nigeria in which completeness and accuracy was only 25% (Kolapo, U. et al, 2007) and study report from Sudan (27%) (Mochache D., 2011). Poor supervision, shortage man power and skill gaps might have contributed for the current poor RRF data quality which was also raised by most KIs.

4.5.8 Storage conditions

In this study, seventeen standard criteria were used to assess the storage conditions of health facilities and tracer program medicines. Products are protected from direct sunlight at all times of the day and during all seasons the criteria met by 100% of hospitals and HCs. The facility makes it a practice to separate damaged and expired products from usable products and removes them from inventory, the current space and organization are sufficient for existing products, and the Storage area is visually free from harmful insects and rodents the least fulfilled storage condition by both facilities 66.7% and 45.5% of hospitals and HCs respectively. From the total facilities assessed, only 5(35.7%) of them met at least 80% storage requirements. This was lower than study report from Eastern Ethiopia (55% (Tesfaye and Tadesse, 2017), the IPLS survey report of 55% of facilities met at least 80% criteria (PFSA, 2015), and, higher than the study reported by (Gurmu and Ibriham 2017), Addis Ababa where 71.8% facilities met at least 80% criteria (Mezid et al., 2014) and study report from South Africa in which 80% of them met requirement of storage guideline (Alice, 2013). The difference may be due to the number and type of healthcare facilities. Only 28.5% of facilities have fire safety equipment. Storage conditions affect the quality of pharmaceuticals in stores. Store must be dry, well-ventilated, out of direct sunlight, complete with safety equipment, and clean with adequate space and standard pallets and shelves (PFSA). In the current study, some of the facilities were performing well while some were managing their products in unacceptable conditions. Majority of primary healthcare facilities were handling program medicines in unacceptable storage conditions (64.3%) (table 10).

Table 11: Percentage of primary healthcare facilities meeting specific acceptable storage conditions by facility type, Hadiya Zone, Southern Ethiopia, 2023

s.n	Storage conditions	PHs (no)%	HCs (no)%	Total N (%)
1	Products that are ready for distribution arranged so that identification labels and expiry and manufacturing dates are visible	3(100)	10(90.9)	13(92.9)
2	Stored and organized in a manner accessible for FEFO counting and general management.	3(100)	6(54.5)	9(64.3)
3	Cartons and products are in good condition, not crushed due to mishandling.	3(100)	10(90.9)	13(92.9)
4	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory.	2(66.7)	5(45.5)	7(50)
5	Products are protected from direct sunlight at all times of the day and during all seasons	3(100)	11(100)	14(100)
6	Cartons and products are protected from water and humidity during all seasons.	2(66.7)	8(72.7)	10(71.4)
7	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of rodents	2(66.7)	5(45.5)	7(50)
8	Storage area is secured with a lock and key, but is accessible during normal working hours	3(100)	10(90.9)	13(92.9)
9	Products are stored at the appropriate temperature during all seasons according to product temperature specifications.	3(100)	7(63.6)	10(71.4)
10	Roof is always maintained in good condition to avoid sunlight and water penetration	3(100)	6(54.5)	9(64.3)
11	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).	3(100)	10(90.9)	9(64.3)
12	The current space and organization is sufficient for existing products and reasonable expansion	2(66.67)	6(54.54)	8(57.1)
13	Products are stacked at least 10 cm off the floor.	3(100)	8(72.73)	11(78.5)
14	Products are stacked at least 30 cm away from walls	3(100)	5(45.45)	8(57.1)
15	Products are stacked no more than 2.5 meters high	3(100)	10(90.9)	13(92.9)
16	Fire safety equipment is available and accessible	2(66.67	2(18.18)	4(28.5)
17	Products are stored separately from insecticides and chemicals	2(66.67	5(45.45)	7(50)
Average		**2.65(88.3)**	**6.2(56.4)**	**8.9(63.9)**

4.6 Challenges of Key tracer program Medicines Inventory Management performances

For qualitative part of the study, Key informant interviews were held with three head of facility managers, three heads of pharmacy, and three store managers working in primary healthcare facilities, one Hadiya zone logistics officer and one EPSS Hawassa hub staff. Eight males and three females participated in KIs with age ranging aged between 30 and 43 years. In addition their work experience ranged between two and twelve years. The data obtained by interviewing the key informant were transcribed immediately after interviews, then thoroughly analysed and categorized into four thematic areas based on the nature of the data as summary.

Budget constraints

Almost all KI informants of study facilities and zone logistic officer mentioned that number one challenge was budget constrain which even affected their work motivation because the basic salary is not being paid on time. One KI (Store manager, female, 4 years experiences) mentioned

‘‘*The supervision team ordered us to improve our inventory management gap areas like electronic data use, cold storage and report accuracy issues. But due to budget constraints, it was difficult to take actions’’* the key informants also added *that ‘’there is limited supervision and support from woreda, zone and regional EPSS offices in a regular way’’.*

KI from Hadiya zone logistic office, was asked about their commitment and challenges mentioned that (Zone, male, 12 years’ experience)

‘’Even if we know the gaps in LMIS report and training, due to shortage of budget and not linking existing limited budget with programs focus area, there is no regular supervision, support and training for primary healthcare units pharmacy professionals’’.

Products availability

Most of KI agreed that stock outs of the products at facilities and EPSS hub were major challenge hindering the availability of tracer program medicines at time they are demanded.

(Pharmacy head, Male, 8 years’ experience) KI added that

"For program medicines quantity demanded and quantity supplied did not balance most of the time which may be related with stock availability at EPSS and/or other factors which ultimately affect service utilizer. EPSS supplies products which are near to expire and products that are not requested''.

The other KI mentioned that (Sore manager, Nurse, Male, 4 Years' experience)

"Program medicines supply is very low as per quantity requested and sometimes it is difficult to get at time they are needed"

Human resource and staff capacity building related issues

The issue of human resource is serious challenge in primary healthcare facilities particularly in rural and remote HCs mentioned my key informants. Two KI added (Facility manager, male, 2 years of experience)

'' Our facility has no pharmacist or pharmacy technician and to cover the work burden, experienced nurses are working in pharmacy store and dispensary. The trained work force gap is clearly feasible in pharmacy area which need solution from both woreda and zone health department''.

Hadiya zone logistic officer was asked about the issue and said that (ZHB, Male,12 years' experience)

"We have lack of human resources, especially in HCs which are which is related with budget constraint. Let alone hiring new staffs, paying salary is becoming hard for existing staffs''.

Most of the KI reported that no in service training has been offered for store managers. Two KIs, Pharmacist, Female, 4 years' experience and pharmacy technician, male, 4 years experiences)

"Most of the time, supervision and support team from zone and region have been come to the facilities and have taken notes on gap areas. But no intervention had been done. There is no training opportunity'' challenges; however, no training and regular feedback"

Infrastructure and LMIS related challenges

In some primary healthcare facilities, main store and supply store are in the same room. Some of the KI stated that absence of standard store room is main challenge in primary healthcare facilities.

‘’ *HCs store has not only the problem of limited size but also the design itself has problem which affects proper management of medicines’’* (facility head, male 6 years’ experience),

Medicines stored in inappropriate space due to inadequate space and lack of store equipments and shelves which make products management challenging. Store freeze is not working and I used to store cold chain products in Immunization store freeze’’.

Most of the KI agreed that automated LMIS have positive effect on improving the data quality and product availability of tracer program medicines. One KI stated that (Pharmacist, male, 5 years’ experience) *‘’electronic data management will be a good solution for LMIS data quality improvement as well as minimizing stock out. But due to the infrastructure and access for functional computer and software, it was difficult to use electronic data management system. Besides, lack of training and trained professionals is also another challenge’’.*

Another KI (druggist, female, 4 years’ experience)

‘’The gap in updating bin cards is related with tiresome paper based work which extra burden on daily activity. I have to do RRF manually for all medicines. it would be better at least, there is electronic system for RRF so that bin card updating will not be tiresome work’’.

At last, for challenges encountered in inventory management of program medicines, the recommended solutions mentioned my KIs, are supportive supervision with feedback, training especially, IPLS, solving financial constrains by responsible government and non-government responsible bodies and shifting from manual to electronic data management system were identified as main way forwards to improve inventory management practice. Similar result from India indicated that main challenges of inventory management were financial, capability, commitment from top management and skill gap (Gupta et al, 2007).

Chapter five
5. Conclusion and recommendation

This chapter deals with a summary of key finding of the study, the conclusion drown from research findings and recommendations for stake holders to improve inventory management in primary healthcare facilities. The order of chapter is: summary, conclusion, recommendations and suggestions for further study.

5.1 Summary

This study was conducted to assess inventory management practice, performance and challenges of tracer program medicines in public primary healthcare facilities of Hadiya Zone, Southern Ethiopia. The summaries of major findings are presented as follows:

Fourteen primary healthcare facilities were assessed for the study. A total of 34 respondents have filled and returned the survey questionnaire with response rate of 89%. 61.8% respondents were females, 60% have Diploma education level. Almost all working staffs in pharmacy units are pharmacy professionals but not trained in IPLS.

Inventory management practice

The availability of logistic forms is determinant for inventory management practice and performance. The study indicated that all healthcare facilities had the recording and reporting formats in their facilities. The availability of logistic forms was 100% in almost all facilities. But utilization of bin card was (58.8%) in study facilities and stock card utilization was none (0%). Although, most of the facilities respondents (61.76%) stated that they have functional DTC, but only (23.52) have functional DTC whose evaluation result was greater than 75%. Only (32.35%) respondents had taken IPLS training, close to one fourth of respondents had taken supportive on job training and (70.58) have not got training opportunity at all. About 65% of respondents stated that there is at least one time feedback and supervision from in six months period followed by annual visit 7(20.58) from EPSS, Woreda and Zone health departments. All the assessed PHFs have no automated data management system and the reason behind was, even if there are computers with necessary applications are available, they are not functional was all respondents response. From total respondents, 20(58.8) of them mentioned that they encounter stock out of programs medicines. All facilities receive products in one month to two months period

Operational performance of tracer program medicines

Pharmacy stores of most primary healthcare facilities did not use and update bin cards for tracer program medicines. On average, Bin card used and updated only in 28.3% and 20.6% of primary healthcare facilities. Both bin cards utilization and updating practice is slightly better in PHs than HCs (33.3%), (21.3%) and (27.3%), (20%) respectively. Average product availability on day of visit indicated that 74.3% facilities have tracer program medicines on the day of survey. This indicates that there is still gap on average 25.7% of program medicines were not available on day of visit which may be contributed to poor inventory management practice at primary healthcare facilities. Stock out of tracer program medicines encountered in (47.1%) facilities with average stock out days of 33.38 days.

A number of primary healthcare facilities which has no discrepancy between physical counts and bin card balance on day of visit were 17.14%. Primary hospitals have greater inventory accuracy (34.7%) than HCs (12.7%). Overall average order lead time of the past six months in those facilities was 35.57 days. The average order fill rate at the hospital level is 51.3% which is less than the order fill rate of HCs which comprise 54.4%. Data quality of LMIS report assessed indicated that 74 (88.1) % of the RRF reports were timely, 47(60.)% of RRF was complete and 25 (54.7) % was accurate. Storage condition findings indicated that majority of facilities physical storage conditions did not meet the minimum requirements.

Challenges of inventory management practice and performance

The respondents were neutral on the issue of operational challenges with grand mean of 3.37 even if they strongly agreed on inventory discrepancy (mean of 4.29) and inability of supplier to fill the order (mean of 4.27). They disagreed on misplaced items in store that cannot be traced (mean of 2.59) and insufficient order management (mean of 2.32).

The respondents agreed with financial, Behavioural, Human resource, demand supply, and logistic challenges with grand mean of 3.67, 3.66, 3.92, 3.68 and 4.19 respectively. Hence, finding solutions for aforementioned challenges can improve inventory management practice mainly for logistic, the human resource and financial challenges. They also strongly agreed on existence of technological challenges with grand mean 4.25 which means number one factor affecting inventory management practice was technological challenges and availing access for friendly electronic data management system can solve this number one challenge

Key informant interview result summary indicated that Stock management budget and ownership related human resources and capacity building related, product availability related, and infrastructure and LMIS data management related were the critical challenges. The most of them KIs agreed that the availability of tracer program medicines at their facility and budget constraint related problems should be improved for the inventory management practice and quality service to clients' improvement.

5.2 Conclusion

The study revealed that there is poor inventory management and control system of tracer program medicines in primary healthcare facilities of Hadiya zone. This can be exemplified by gap in availability on day of visit and stock out and inventory accuracy, supplier fill rate and RRF report qualities indicated poor performance. Overall availability of logistics forms which are vital for inventory management of program medicines was high. Although bin card availability is good, its utilization and updating practice showed gap which requires improvement. Average availability of tracer program medicines on the day of visit was relatively good, about half of primary healthcare facilities were stock out of tracer program medicines. The order fill rate was almost halved. This may occur most probably due to inadequate supply of medicines from supplier, stock out in supply source and/or poor data quality from facilities as reported by KIs. The RRF report quality and inventory accuracy were another major gap areas that requires improvements. Limited numbers of facilities have fulfilled good storage standards.

The operational performance of inventory management performance of program medicines reliability, responsiveness and agility is good with lower in reliability.

With respect the identified challenges related to inventory management of program medicines, technological challenges followed by human resource, financial challenges and limited capacity building training were identified as major ones both from survey and key informants.

5.3 Recommendations

Based on the study results and conclusions drawn from them, the following recommendations are suggested as means of alleviating the challenges encountered.

- The gaps observed in utilization of use of logistic records need to be improved. Besides, since LMIS data quality is essential for evidence based supply decision making, it require improvement and this can be achieved by offering on job training and regular supportive supervision with feedback.
- EPSS and Zone logistic office should keep on working strongly to ensure un interrupted availability of tracer program medicines
- Study primary healthcare facilities, particularly, HCs should work to improve bin card use and updating practice
- The primary healthcare facilities in collaboration with stakeholders should strengthen electronic and automated recording system to improve data quality and reduce work burdens
- Study facilities should improve storage conditions with respect to minimum standards so that pharmaceuticals safety quality, efficacy are will be maintained
- Arranging relevant pharmacy professionals capacity building trainings like IPLS and APTS especially for store managers by regional health bureau and non-government organizations.
- Further study should be done on inventory management of non- ART sites program medicines inventory management for further evidence generation for decision makings

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Annex: Data collection tools:

Annex 1: Health program inventory management practice

1. Back ground information of the key informant

Primary healthcare facility_____

Gender: _____Age/: _____Profession: _____Educational level: _____

Job title: _____Work experience: _____

Table 1: Inventory management practices of PHCUs in Hadiya zone, Southern Ethiopia

1. Availability of logistic Forms	
1.1 Bin card	1. Yes 2. No
1.2 IFRR	1. Yes 2. No
1.3 RRF 1.4 Stock card	1. Yes 2. No 1. Yes 2.No
2. Utilization of Logistic records	
2.1 Bin card	1. Yes 2. No
2.2 Stock card	1. Yes 2. No
2.3 RRF	1. Yes 2. No
2.4 IFRR	1. Yes 2. No
3. Availability of SOP for inventory management (IPLS)	1. Yes 2. No
4. FEFO/FIFO drug distribution system in the facility	1. Yes 2. No
5. Functional DTC	1. Yes 2. No
6. Did you receive IPLS training?	1. Yes 2. No
7. What type of trainings staffs of pharmacy unit have taken?	A. Pre-service trainings B. On job trainings C. Never been trained D. Others(specify)___
8. Is there any feedback from higher level?	1. Yes 2. No
9. If YES how often?	A. monthly B. quarterly C. six monthly D. annually E. Never
10. Is there automation in your store?	1. Yes 2. No
11. If no why?	1. Not available 2.Not functional 3. Not trained 4. Other_____

12. What LMIS forms do you use for reporting/ordering? Multiple responses are possible.	
A. IFRR	1.Yes 2. No
B. RRF	1.Yes 2. No
C. Other	If yes, specify__
13. The health facility compiles and sends RRF or reports to higher level?	1.Yes 2. No
14. If yes, does all the columns in RRF completed for all medicines?	1.Yes 2. No
15. Do major dispensing units (DUs) use IFRR for regular reporting?	
A. ART	1.Yes 2. No
B. OPD	1.Yes 2. No
C. TB	1.Yes 2. No
D. MCH	1.Yes 2. No
16. Does the facility usually stock out key essential medicines?	1.Yes 2. No
17. IF YES, WHY?	1. Resupply point does not have adequate supply 2. Resupply point was stock out 3.Order amount changed at the resupply point
18. Do you always receive the exact quantity of products ordered from the suppler, (see RRF,model 19)	A.Always B. Most Some times C. Never
19. If never ,why?	1.The resupply point does not have adequate supply 2.The resupply point was stocked out 3.Order amount changed at the resupply point 4.Other (specify)_____
20. How long does it take from the time the facility places an order until the drugs are received?	1.Less than two weeks 2.2 weeks to 1 month 3.1months-2months 4.More than two months

Table 2: DTC functionality for health center and primary hospitals

s.no	Criteria	Weight	Score
1	Assigned DTC members by official letter	10	
2	Has approved TOR	10	
3	Meets regularly at least every months with documented minute	10	
4	Has developed action plan	10	
5	Has updated health facility specific medicine and medical devices list	15	
6	Has medicine use policy and procedures	10	

7	Conduct supply and medicine use problem studies	10	
8	Take actions based on the supply and medicine use study findings	15	
9	Report its performance activities to the management	10	
	Total		
Functionality of DTC if >75%, Yes, If < 75%, No			

Table 3: Supportive and supervision practice (Health center and primary hospitals)

s.no	Name of supervising organization	Supervision on logistics and supply chain management area (yes/no)	Total supervisions during study period(six months)
1	Governmental		
2	Non-governmental		
3	Others		

Table 5: Availability, stock status and bin card utilization for key program essential medicines, selected primary healthcare facilities of Hadiya Zone, Southern Ethiopia, 2023

S.no	Item Description	unit	Managed at this Facility? (Y/N)	Stock out on day of visit? (Y/N)	Bin card Available? (Y/N)	Bin card Up dated? (Y/N)	Stock out most recent 6 months? (Y/N)	Number of Stock outs (most recent 6 months)	Total number of days of stock out(s)
1	Depo provera								
2	Implanon								
3	COC								
4	Oxytocin inj								
5	Magnesium sulfa inj								
6	Iron+folic acid								
7	Tetracycline 1%								
8	Vitamin K1								
9	Pentavalent vacc								
10	Chlorhexidine digluconate								
11	Coartem 6x4								
12	Coartem 6x3								

13	Coartem 6x2								
14	Primaquine								
15	Artesunate inj								
16	Adult TB kit**(**RHZE)								
17	Vit B6 (Pyridoxine)								
18	Amoxcillin disp tab								
19	ORS								
20	Zinc acetate								
21	TDF/3TC/DTG								
22	ABC+3TC								
23	Neverpine oral susp								
24	DTG - 50mg								
25	DTG - 10mg								

Table 6: Inventory Accuracy of_____(Health center and primary hospital) (last record with known physical status of items, unless skip)

S.no	Item Description	Bin card balance	Physical count	Is Bin card record match with physical count(Yes=1,No=0)
1	Depo provera			
2	Implanon			
3	COC			
4	Oxytocin inj			
5	Magnesium sulfa inj			
6	Iron+folic acid			
7	Tetracycline 1%			
8	Vitamin K1			
9	Pentavalent vacc			
10	Chlorhexidine digluconate			
11	Coartem 6x4			
12	Coartem 6x3			
13	Coartem 6x2			
14	Primaquine			
15	Artesunate inj			
16	Adult TB kit(RHZE)			
17	(Pyridoxine)			
18	Amoxcillin disp			
19	ORS			

20	Zinc acetate			
21	TDF/3TC/DTG			
22	ABC+3TC			
23	Neverpine oral			
24	DTG - 50mg			
25	DTG - 10mg			

Table 7: Supplier order fill of_____(Health center and primary hospital) (the recent six months period)

S.no	Item Description	Unit	Class of items	Total Quantity ordered	Total Quantity supplied
1	Depo provera				
2	Implanon				
3	COC				
4	Oxytocin inj				
5	Magnesium sulfa inj				
6	Iron+folic acid				
7	Tetracycline 1%				
8	Vitamin K1				
9	Pentavalent vacc				
10	Chlorhexidine digluconate				
11	Coartem 6x4				
12	Coartem 6x3				
13	Coartem 6x2				
14	Primaquine				
15	Artesunate inj				
16	Adult TB kit(RHZE)				
17	Vit B6 (Pyridoxine)				
18	Amoxcillin disp tab				
19	ORS				
20	Zinc acetate				

21	TDF/3TC/DTG				
22	ABC+3TC				
23	Neverpine oral susp				
24	DTG - 50mg				
25	DTG - 10mg				

Table 8: LMIS accuracy of RRF_____(Health center and primary hospital)

S.no	Item Description	Unit	Previous ending balance	Present beginning balance	Is there discrepancy(Yes/No)	Is below Mini. stock level (yes/no)
1	Depo provera					
2	Implanon					
3	COC					
4	Oxytocin inj					
5	Magnesium sulfa inj					
6	Iron+folic acid					
7	Tetracycline 1%					
8	Vitamin K1					
9	Pentavalent vacc					
10	Chlorhexidine digluconate					
11	Coartem 6x4					
12	Coartem 6x3					
13	Coartem 6x2					
14	Primaquine					
15	Artesunate inj					
16	Adult TB kit(RHZE)					
17	Vit B6 (Pyridoxine)					
18	Amoxcillin disp tab					

19	ORS					
20	Zinc acetate					
21	TDF/3TC/DTG					
22	ABC+3TC					
23	Neverpine oral susp					
24	DTG - 50mg					
25	DTG - 10mg					

Table 9: RRF Reporting & feedback of_____(Health center and primary hospital)

s.no	Reporting periods	Date of RRF submitted to respective WoHo/PFSA Hub	Reporting status(Reported =1,Not Reported=0)	Reporting on time (Yes=1, No=0)	Completeness (Yes=1,No=0)	Accuracy (Yes=1,No=0)
1	Reporting period 1					
2	Reporting period 2					
3	Reporting period 3					
4	Reporting period 4					
5	Reporting period 5					
6	Reporting period 6					

Table 10: Average lead time of_____(Health center and primary hospital)

s.no	Reporting periods	Date of RRF submitted to WoHo/EPSA	Date of items delivered to HC by WoHo/EPSA Hub	Number of days it took by_____ to deliver products
1	Reporting period 1			
2	Reporting period 2			
3	Reporting period 3			
4	Reporting period 4			
5	Reporting period 5			
6	Reporting period 6			
			Total number of days	
			No of reporting period considered for calculation	
			Average lead time	

Table 11: Observational check lists storage condition

Place a check mark in the appropriate column based on visual inspection of the storage facility; note any relevant observations in the comments column. To qualify as "yes," all products and cartons must meet the criteria for each item.

S.no	Item Description	(Yes=1, No=0)	Comment
1	Products that are ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.		
2	Products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) counting and general management.		
3	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation (fluorescent lights in the case of condoms, cartons right side up for Depo-Provera®).		
4	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory.		
5	Products are protected from direct sunlight at all times of the day and		

	during all seasons.		
6	Cartons and products are protected from water and humidity during all seasons.		
7	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of rodents [droppings or insects)		
8	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel		
9	Products are stored at the appropriate temperature during all seasons according to product temperature specifications.		
10	Roof is always maintained in good condition to avoid sunlight and water penetration.		
11	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).		
12	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).		
13	Products are stacked at least 10 cm off the floor.		
14	Products are stacked at least 30 cm away from walls and other stacks.		
15	Products are stacked no more than 2.5 meters high.		
16	Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered)		
17	Products are stored separately from insecticides and chemicals		

Annex 2: Interview Questionnaires

Addis Ababa University School of Commerce Department of Logistics and supply chain management

Respondent code No _____, Health facility code No_____

Verbal consent form before conducting interview

Greeting, my name is _____. I am working with the research team of the Department of Logistics and supply chain management, School of Commerce, Addis Ababa University. I would like to ask you a few questions concerning your knowledge, experience as well as actual practice regarding to the Health program pharmaceuticals inventory management practice, performance and related challenges in public primary health care units of Hadiya Zone, Southern Ethiopia. The interview would take 20-30 minutes of your time. The purpose of this study is to assess Inventory management practice, performance and related challenges of essential program medicines in Hadiya Zone primary heath units, which may improve availability of life saving essential medicines. Your participation is voluntary. You can refuse to answer any questions if you are not interested. You can also withdraw from the study at any time, and there is no any problem happening to you in the future. All your responses will remain strictly confidential. No one will have the access to the information you will give for me. I will not ask your name and it will not appear on the interview guide. The information you will provide is analysed through the code.

If you have/will have any questions or problems you can contact:

Mr. Mengistu Girma (Principal investigator) :+25163160408

Section I: Socio Demographic Information

Sex_____Age,_____(year). Educational background (Diploma, Degree, and above)

Profession, _____ Work experience _____ Current work position_____

Section II: Interview guideline

1. How can you evaluate LMIS quality for health program tracer medicines at your facilities? If there are discrepancies? what are the possible reasons?

   Probing (1) a. using logistics forms recording and reporting?

   b. using electronic data and software? c.training

2. Did your last supervision visit include inventory management (e.g., stock cards checked, reports checked, expired stock removed, storage conditions checked)?
3. Do you think that store management can improve inventory performances within your facilities? If yes how? If not why? **Probing (1):** With respect to:
   a. The size and design of the store space b. Equipment's and furniture c. handling of drugs and sanitation.
4. **From your experience,** what are the some of the challenges that affect overall health program tracer medicines availability and inventory management practice in your facilities?
   a. Do you encounter stock-out? If yes what are the main possible reasons & which type of products are prone to these problems?
5. What is your recommendation for improvement of Key essential medicines inventory management performances of your facilities? Is there anything more you would like to add?

Interview guide for ZHB/EPSS

1. What do you think about your commitment to timely delivery of the type and quantity of vital program medicines needed by public health facilities? How would you rate the accessibility of the most important medications?
2. What are some of the factors/obstacles that have an impact on the practice/performance of inventory management and overall critical essential medicine availability in the facilities under your catchment?
3. What recommendations do you have for enhancing public health facilities' ability to manage their inventory of key critical medicines? Are there any more points you would like to make

Annex 3: Interview Guide Amharic Version.

1. የLMIS መረጃ ጥራት(bin car, IFRR,RRF,stock card) በእርስዎ ተቋም እንዴት መገምገም ይችላሉ? ልዩነቶች ካሉ? ልሆኑ የሚችሉ ምክንያቶች ምንድን ናቸው?
   ምርመራ (1) ሀ. የሎጂስቲክስ ቅጾችን በመጠቀም መቅዳት እና ሪፖርት ማድረግን? ለ. የኤሌክትሮኒክ ዳታ እና ሶፍትዌር በመጠቀም? ሐ.ስልጠና
2. የመጨረሻው የክትትል ጉብኝትዎ የእቃ ማከማቻ አስተዳደርን (ለምሳሌ፣ የ stock ካርዶች ተፈትሸዋል፣ ሪፖርቶች ተፈትሸዋል ፣ ጊዜው ያለፈበት stock ተወግዷል፣ የማከማቻ ሁኔታ የተፈትሸዋል) ?
3. የመደብር አስተዳደር በእርስዎ መሥሪያ ቤቶች ውስጥ ያለውን የዕቃ ዝርዝር አፈፃጸም ማሻሻል ይችላል ብለው ያስባሉ? አዎ ከሆነ እንዴት? ካልሆነ ለምን?
   ማጣራት (1)፡ ስለ፡- ሀ. የማከማቻ ቦታ መጠን እና ዲዛይን ለ. እቃዎች እና የቤት እቃዎች
   ሐ. የአደንዛዥ ዕፅ እና የንፅህና አጠባበቅ አያያዝ
4. እርሶ ከልምዶ በአጠቃላይ የጤና መርሃ ግብር መከታተያ መድሀኒት አቅርቦት እና በተቋማቱ ውስጥ ያለውን የዕቃ አያያዝ አፈፃፀም የሚነኩ ተግዳሮቶች ምንድን ናቸው?
5. የመገልገያዎችን ቁልፍ አስፈላጊ የመድኃኒት ክምችት አስተዳደር አፈፃጸሞችን ለማሻሻል የእርስዎ ምክር ምንድነው? ተጨማሪ ማከል የሚፈልጉት ነገር አለ?

Interview guide for ZHB/EPSS

1. የህዝብ ጤና ተቋማት የሚፈልጓቸውን የወሳኝ ኘሮግራም መድሃኒቶችን አይነት እና መጠን በወቅቱ ለማድረስ ስላደረጉት ቁርጠኝነት ምን ያስባሉ? በጣም አስፈላጊ የሆኑትን መድሃኒቶች ተደራሽነት እንዴት ይገመግማሉ?
2. በተፋሰስዎ ስር ባሉ ፋሲሊቲዎች ውስጥ በዕቃ አያያዝ እና በአጠቃላይ ወሳኝ አስፈላጊ የመድኃኒት አቅርቦት ላይ ተፅእኖ የሚያደርጉ አንዳንድ ምክንያቶች/መሰናክሎች ምንድናቸው?
3. የህዝብ ጤና ተቋማት የወሳኝ ወሳኝ መድሃኒቶችን ክምችት የማስተዳደር ችሎታን ለማሳደግ ምን ምክሮች አሉዎት? ሌላ ማጨመር የምትፈልጋቸው ነጥቦች አሉ?