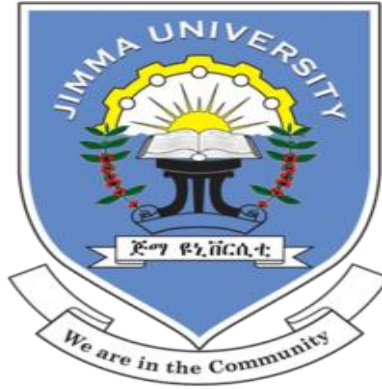Assessment of Pharmaceutical Logistics Management Performance for Key Essential Drugs in Public Health Facilities of Bench- Sheko Zone SNNPR, Ethiopia

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A Research Submitted to Jimma University, Institute of Health, and School of Pharmacy Department For The Partial Fulfillment of The Requirements for Master's Degree in Pharmaceutical Supply Chain Management

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School of Pharmacy

Assessment of Pharmaceutical Logistics ManagementPerformance for Key Essential Drugs in Public Health Facilities Found in Bench-Sheko Zone SNNPR, Ethiopia.

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DECLARATION

Jimma University Institute of Health School of pharmacy

I undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and provision of required progress reports as per terms and condition of the school of pharmacy in effect at the time of grant is forwarded as the result of this application.

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Abstract

Background*: To provide complete healthcare the situation requires availability of safe, effective and affordable medicines and related supplies of the required quality, in adequate quantity at all times. Since, in the earlier the medicine supply systems of the country had critical challenges. Therefore, the aim of this study was to evaluate the logistics management performance for key essential drugs in public health facilities in Bench-Sheko Zone SNNPR.*

Methods: *A facility based cross-sectional descriptive study design complemented with a qualitative method was done from October 22 to December 21/2020 in 25 public health facilities of Bench-Sheko Zone. The Quantitative data was collected using semi-structured questionnaire and check list implemented from logistics indicator assessment tools(LIAT)whereas the Qualitative data was collected using physical observation and in-depth interview of key informants was carried out using tools adopted from logistics system assessment(LSAT).The collected data were checked and entered into SPSS version 20 for analysis. Finally descriptive findings were presented by tables, figures and percentages.*

Result: *A total of 25 health facilities were involved in this study. All of them used bin card for logistic data recording but majority 22(88%)of them were not used stock record card. Seven (28%) of the surveyed facilities used electronic bin cards. The (68%), 13(52%), and 15(60%) of the facilities have storage, quantification and pharmaceutical waste management guide lines correspondingly. The average availability of key essential tracer drugs on the day of visit was 76.48%;Among available tracer drugs, Glucose 40% and tetanus anti toxin (TAT) were stock out thought the six months while TDF/3TC/EFV adult tab and ferrous Sulphate with folic acid tablet were the most expired tracer drugs 40% and 29.36% among others respectively. Commonly, 23 (92%) of the facilities practice consumption technique to quantify their medicinal demand and 16(64%) of the surveyed health facilities have developed their own specific drug list; similarly majority 23(92%) of the health facilities were not receive NPDs from EPSA they orders. Majority 17(68%) of the health facilities was not full filled the desired storage condition standard of (>80%).*

Conclusion:-*the study conclude that there were required to improve the logistics management performance of essential tracer drugs in the health facilities regarding to drug selection, availability, stock out rate, wastage rate, transportation access and storage practices since it was found to be deficient compared with standards. Corresponding administrations should improve their responsible actions to safe and sound commodities availability.*

Key words*: logistics management, performance, tracer drugs, public Health facilities, essential drugs, Program and non-program tracer drugs, Bench-sheko zone.*

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Acronyms

APTS: Auditable pharmaceutical transaction system

CSCMP: Council of Supply Chain Management Professionals

DTC: Drug and Therapeutic Committee

EDs; Essential Drugs

EDL: Essential Drug List

EPSA: Ethiopian Pharmaceutical Supply Agency

FEFO: First Expiry, First Out

FMHAC: Food medicine and health administration and control authority

FMOH: Federal ministry of health

HC: Health Center

HFs: Health Facilities

HMIS; Health Management Information System

HSDP: Healthcare System Development Program

IFRR: Internal Facility Report and Resupply Form

IPLS: Integrated Pharmaceutical Logistics System

LMIS; Logistics Management Information System

LIAT: Logistics indicator assessment tool

LSAT: Logistics system assessment tools

NPDs: Non-program drugs

PFSA: Pharmaceutical Fund and Supply Agency

PLM: Pharmaceutical Logistics Management

PDs: program drugs

PHF: Public health facilities

PLS: Pharmaceutical Logistics System

RRF: Report and Resupply Form

SCM: Supply Chain Management

SNNPR; South Nation, Nationality and People of the Region

STG: Standard treatment guideline

TD: Tracer Drug

WHO: World health organization

1. Background

1.1. Introduction

Essential medicines are medicines that react to the priority healthcare needs of a specific population they should be available at every times in adequate amounts, be affordable, and have a proven efficacy, safety and quality (WHO)(1).While tracer drugs (TDs) are a part of essential drugs (EDs) that should be available at the type of facility studied and satisfy the significance healthcare needs of the community which should be selected with due concern to community health importance, proof of efficacy, and safety as well as cost-effectiveness, which should be available in the HFs at all times in adequate amount at a price the individual and the most communities can afford (2,3).The health facilities also measure availability and stock out duration by using these tracer drugs (4).

According to world health organization (WHO) one of the building blocks of healthcare system is medicines which accounts 30-40% of the health care costs. (5). Ensuring healthy lives and promoting well-being for all at all ages is one of the sustainable development goals and the perception of the World Health Organization and the Universal Deceleration of Human Rights (6). Recognizing this goal requires the existence of a well operational health care system. To provide complete healthcare the situation requires availability of safe, effective and affordable medicines and related supplies of the required quality, in adequate quantity at all times (7). However in the past the medicine supply chain management systems (MSCMS) of the country had diversified challenges like: non-availability, unaffordability, insufficient storage and weak stock controlling causing high ranks of waste and stock-outs, irrational use and a set of vertical programs with multiple stakeholders were responsible for managing the SC for ART, TB/leprosy, Family Health, EPI, malaria, and essential medicines (EMs) (8,9).

To effectively tackle these problems, the federal ministry of health of Ethiopia (FMOH)established Pharmaceuticals Fund and Supply Agency (PFSA) and the present-day of EPSA in 2007 by Proclamation No. 553/2007 based on the Pharmaceuticals Logistics Master Plan. The Agency is delegated to avail affordable and quality pharmaceuticals sustainably to all public health facilities (PHF) and make sure their rational use as a result, to realize its mandate in the area of supplying pharmaceuticals, integrated pharmaceuticals logistics system (IPLS) has been established and implemented since 2010, as a key mechanism to emphasizing the integration of all products into one supply system (7,8,10,11).

A well-organized logistics management system has the potential to make a powerful contribution to the reliable availability of essential medicines (EMs), which are a crucial part of the delivery of high quality health care services at affordable cost according to a given budget, it must be well managed or controlled and are used wisely. Because medicines are costly and poor management subsequently results in waste resources (14).To meet the healthcare needs of the public, effective logistic management is mandatory(12).

According to the Council of Supply Chain Management Professionals (CSCMP), logistics is the part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customer requirement(15).

Logistics management is an integrating function, which coordinates and optimizes all logistics activities, and integrates logistics activities with marketing, sales, manufacturing, finance, and information technology (IT).Logistics activities as the operational component of supply chain management, containing quantification, procurement, inventory management, transportation and fleet management, data collection and reporting. Supply chain management (SCM) includes the logistics activities plus the coordination and collaboration of staff, levels, and functions. Also it includes global manufacturers and supply and demand dynamics, but logistics tends to focus more on specific tasks within a particular program health system. The goal of a health logistics system is to help ensure that every person is able to obtain and use quality essential health supplies whenever he or she needs them (12).

Pharmaceutical logistics management includes four basic logistics functions that support the six rights of logistics as depicted in the logistics cycle: selection, forecasting and procurement, inventory management which includes (storage and distribution) and serving customers (12). Since pharmaceutical selection involves reviewing the prevalent health problems, recognizing treatments of choice, selecting individual medicines and dosage forms, and deciding which medicines will be available at each level of the healthcare system. After products have been selected, the required quantity and cost of each product must be determined. Quantification is the process of estimating the quantity and cost of the products required for a specific health service.

After a supply plan has been developed as part of the quantification process, quantities of products must be procured. Health systems or programs can procure from international, regional, or local sources of supply or they can use a procurement agent. Procurement includes quantifying medicines, selecting procurement methods, managing tenders, establishing contract terms, and ensuring pharmaceutical quality adherence to contract terms.

After an item has been procured and received by the health program, it must be transported to the SDL where the client will receive the products. During this, the products must be stored until the customer needs them. Utilization includes diagnosing, prescribing, dispensing, and proper consumption or rational use by the patient/clients. At the centers of logistics cycle there is an LMIS. LMIS is the engine that drives the logistics cycle without information the logistics system would not run smoothly. Each activity in the logistics cycle supply excellent customer service. The whole logistics activities in public healthcare are for saving lives/ improving the health status of the people (12,14).

The importance of having medicines and other supplies available at the health facility cannot be overstated, and their availability often depends on how well or how poorly the supply chain is performing. But, to improve pharmaceutical logistics performance, understanding how it is currently performing, e.g., it needs to be measured. Showing where the logistics are inefficient and will help to determine how to address these deficiencies/gaps (16).

Performance measurement is the process of quantifying the efficiency and effectiveness of an action or activity. The purpose of performance measurement is to find out whether things are going the right way and, if not, to find what the causes that generated a poor performance were. Then to be found a solution or improving the performance (17).In general, while there are claims that presence of poor pharmaceutical logistics management practice in Ethiopia; while, studies dedicated to assess pharmaceutical management activities in the area of bench-sheko zone was limited. However, the findings from the survey will help to deliver information on the level of the logistics performance status; and also used to determine future priorities and future direction and to be found a solution in public health facilities found in Bench-Sheko Zone, SNNPR.

1.2. Statement of the problem

Poor pharmaceutical management leads to both over and under stocking of essential medicine which can cause expiration and shortage. Hence medicines need to be managed properly to avoid shortage and wastage including overstocking, pilferage and expiry. Because medicinal wastage reduces the quantity of medicines available and the quality of services provided(18). Even if there is a good stock management there is a shortage of vital medicines at almost all public HFs and this leads to a reduced customer service (19). Conversely improper stock management can cause obstruct financial resources, irrational utilization, shortage/overage resulting in expiration, increase in holding cost, reduce initiative flexibility and decline the quality of healthcare service and unavailability this might be leads a loose of customers and influences inconvenience to the prescribers and may adversely affect patients well-being especially when the medicine is life-saving(20,21).

Hence in the public health facilities there were many causes for poor medicine availability a few of them were; poor medicinal supply and distribution system, inadequate financing, low investment in the healthcare system, and high cost of medicines, lengthy procurement practices and poor logistics management and lack of information and communication, consequently, this leads to frequent stock outs and unavailability of essential drugs, forces patients to revert to the private sector and high drug cost and risks of financial crises, poverty, morbidity and death might be occur (35).Therefore to have a better medicinal availability functional logistics management system was compulsory. Well-functioning logistics management benefits public health programs in important ways it reduces loss due to over/under stocking, waste, expiry, damage, pilferage, and inefficiency, and maximizes the potential for cost recovery (18).

In developing countries most leading cause of death and disability can be prevented, treated, and alleviated using cost effective way of medicines. However, globally one third (33%) of the world's population and over half of (50%) country of Africa and Asia was deficits access to EMs (14,22).According to WHO report the main difficulties of the medicine supply of African countries were: selection and quantification with unidentified demand, lack of transparency in procurement, insufficient storage and knowledge gaps, lack of supply planning, shortage of vehicles and inadequate budget allocation, lack of medicine supply chain control, inappropriate prescribing and dispensing, poor information, communication and consumption data (24).Across in low and middle income countries (LMIC)the average

availability of essential medicine was only 27% and 44%, in the public and private sectors respectively (23).

According to study done in Tanzania, the average availability of key essential medicines was 79% and the range of stock out was between 1-183 days (27). Another study conducted in Ghana and Uganda pointed out that factors like;poor availability of medicines and repeated stock outs due to poor selection, quantification and, procurement practices, weak distribution system, deficiency of storage, unavailability of skilled labor, internal bureaucracy, lack of funding and other logistical problems were influenced the availability of essential medicines (28,29).

Another study conducted in India at SDH and PHC level, drug selection was not practiced instead of this they used national list of essential medicines, manufacturer's information, and expert judgment (25).According to study done in republic of Ghana, in the facilities there were no national essential medicine list due to this reason they accomplished weak forecasting and quantification practices (26). Another study in Lesotho challenges for logistics decisions and which in turn lead to frequent stock-outs of EMs were; incorrect recording of data and delayed report submission, lack of uniform and simple data collection tools, absences of logistics management information system (LMIS) guideline, inadequate storage space, absence of FEFO procedure, and poor record keeping (30).

In Ethiopia many reforms are introduced regarding pharmaceutical supply system however essential drugs were still unavailable, unaffordable, poor storage and weak stock management and weak distribution system including weak fleet management, resulting in high valuable of waste and stock outs(7). A national survey conducted by FMHACA the average availability of key medicine in public warehouse was only 70.7% and stock out duration of 26.6 days. According to this study, the average record keeping was found to be 65.61% (31). A survey done by federal ministry of health of Ethiopia (MOH), some facilities do not have pharmacy professionals at all; inadequate space both dispensary & store, poor utilization of logistic tools (RRF, IFRR and bin cards), poor functional drug and therapeutic committee(DTC) and availability of essential medicines and high values of wastages of valuable resources were observed (8).On the other hand, assessment done in Federal and Addis Ababa city government hospitals, the three years data average wastage rate of drugs in eight hospitals was 4.8%, amounting to 11,078,910.52 ETB (32).

Another study in East Shewa Zone, Oromia region, 40.50% of the bin cards were not updated and only 28.50% of them were correctly filled(33).Another studydone in Jimma zone, the hospitalsmet only 29.4% of the criteria of good storage practices. According to this study budget constraints, staff commitment, and repeated shortages of commodities on the suppliers sides were the major challenges of inventory management (34).

In Ethiopia a few studies have been carried out in the logistics management performance aiming to different components. Those studies focused only on logistics management performance of key RDF drugs in Addis Abeba and Awi zone Amhara region(13,36). However, the studies did not assess key essential program drugs. Besides to this they didn't show the current status of logistics management performance of key essential tracer drugs in Bench-Sheko zone public health facilities, therefore the aims of this study was to identify the logistics management performance status and the existing gaps regarding to tracer drugs in public health facilities of Bench-sheko Zone SNNPR, Ethiopia.

1.3. Significance of the study

The aims of this study was to find out the logistics management performance systems for the tracer drugs (TDs) in public health facilities found in Bench-Sheko Zone, SNNPR.

The study provides information about the status of the performance of the logistics management system for the healthcare institutions, particularly in the areas of Bench-Sheko Zone health district, the SNNPR Health bureau, the suppliers of EPSA's Jimma hub, and also used for policy makers to improve upon the efficiency and effectiveness of logistics management practices.

To health facilities

This study will help to detect the strength and gaps of the pharmaceutical logistics management performances of the health facilities and explore the challenges affecting logistics management performance system. The findings may also be used in making decision on way of improving their performance. The recommendation such as where to focus and how to improve the observed gaps in the logistics management help to enhance the pharmaceutical service for the health facilities.

To policy maker

Ethiopian pharmaceutical supply agency (EPSA) and other stack holders may find outcomes of this study of significance to check the system again and to develop policies that ensure the effectiveness of logistics management systems for both RDF and program essential medicines in health facilities and finally help to ensure product availability.

To scholars

The outcome documented in this study could be used as a reference literature by students and for others who have interested to conduct the related study in this field. It also helps to enrich knowledge in the area and show a means for further studied or investigations.

2. Literature review

This chapter explores the kinds of literatures, written by different authors on concepts and the status of the pharmaceutical logistics system and associated challenges in the performances, and it was been reviewed standard operating manual (SOP) in order to establish and provide answers to the research objectives.

2.1. Logistic management

Logistics management is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. The main activities of logistics management is; selection, quantification and procurement, inventory management such as (distribution and warehousing), and serving customers that support the six rights; the right goods in the right quantities and in the right condition delivered to the right place at the right time and at the right cost (11,12,37).

2.2. Pharmaceutical Selection

Medicinal selection should be based on vital, essential and non-essential (VEN) analysis. Selection must be limited in number, more rational use, and lower costs. The criterion depends on the pattern of prevalent diseases, treatment facilities, the training and experience of available personnel, financial resources, and environmental factors. Selection option may be STG, EML and formulary by using facilities Drug and therapeutics committees (DTC) but at national level, a national formulary and therapeutics committee, pharmaceutical board, board of physicians or other government appointed group may be responsible by using WHO model list. In Ethiopia, product selection is done at the national level by national advisory board and health programs in collaboration with Ethiopian Food and Drug Administration (EFDA) (7,8).Selected products for use will impact the logistics system, so the logistics requirements must be considered during the product selection(12).

According to study done in India at SDH and PHC level there were no policy and procedural manual for governing their drug selection processes (25).Another study in South Africa Sedibeng district and Gauteng province public health centers the main cause of DSM in the facilities was, absences of essential drug list (EML) at all facilities level (38). A study done

in ministry of Ghana, most health facilities utilized old national essential medicinal lists. According to this study all HFs had no essential list of drugs(39).

According to a national survey in Ethiopia, only 39% of the them had STG & LED(9).A study done in South West Shoa zone Oromia Regional State, medicinal selection was practiced without the use of NEML by only pharmacy unit(40).Another study in Adama HCs, 71% of the health centers developed their own EDL (41). According to study in southern Ethiopia 25% of the facilities developed their own essential drug list (42).

2.2.1. Quantification

After the list of products has been established, the requirements must be forecasted and quantified. That means estimating the quantities needed to treat the number of patients seeking services according to STGs. Quantification refers to the process of calculating the quantities of specific pharmaceuticals required for a health program for a given amount of resources available for a given budget. Techniques of quantification are summarized as: consumption method, morbidity method, proxy consumption method, and service-level projection of budget requirements. The goal of quantification is to maintain the balance between service levels and inventory costs. Poor quantification exercise leads to frequent shortage or stock out, excess stock due to over estimation, amplified disposal cost due to stock expiry, wastage of valuable pharmaceuticals & funds to be used for other purpose and death of patients due to unavailability of life-saving drugs (4,43).

A study done in ministry of Ghana all facilities exercised weak forecasting and quantification due to lack of coordination b/n the central and periphery, (39).Another study in India the facilities had no policy and procedural manual for governing their drug quantification processes (25).

Effective quantification seeks to ensure the availability of the right medicines in the right quantities, at reasonable prices, and at accepted standards of quality (44). A study done in Jordan medicinal quantification was not estimated based on hospital needs and standard procedures, besides this leads to either over/under estimating, causing in surpluses, expiration and shortages of pharmaceuticals (45).According to south Sudan studies the national forecasting for essential medicines was done manually and there were no quantification techniques (46).Another study in Rwanda, all facilities have no SOP for quantification and the quantification was done by only pharmacy unit(47).

A study done in South West Shoa zone Oromia Regional State, medicinal quantities were determined by guess and no supply planners decide on the regular procurement time (40).Another study in Awi zone, 91% of the facilities practiced consumption method to quantify their pharmaceutical demand whereas 9% of them used both morbidity and consumption techniques altogether and the mean absolute forecasting error was 41.42% (36).

2.2.2. procurement

Following selection, forecasting and quantification, and resource identification, the quantified drugs must be procured by coinciding with the available budgets to ensure the timely delivery to SDU/health facility. Health systems or programs can procure from international, regional, or local sources of supply or they can use a procurement agent. In any case, procurement should follow a set of specific procedures that ensure an open and transparent process. The main procurement methods used by health systems are open tender, restricted tender, competitive negotiation, and direct procurement, which vary with respect to their effect on price, delivery times, and workload of the procurement office. The main goal of procurement is to achieve the five rights: namely, getting the right quality, in the right quantity, at the right time, for the right price, from the right source (12,43). Some aspects of procurement performance such as inefficient processes and delayed delivery or stock outs of medical supplies may affect both efficiency and effectiveness of healthcare systems (43).

Efficient pharmaceutical procurement requires specialized knowledge and expertise in essential medicines and consumables, and the markets where quality products can be obtained. It involves careful selection of medicinal products and development of specifications, accurate forecasting, precise tender preparation, and a capacity for testing equipment, protocols, and techniques. It also involves persistent and adequate financial resources, the willingness and ability to maintain a transparent process, and strong skills in contract management (43).

A study done in Tanzania, the main procurement techniques used by the facilities were direct procurement and the main suppliers were the medical store department and a semi-autonomous unit. According to this study the medical store departments alternatively procure EDs through international competitive biddings. The PHF also procured EDs from the private sector, however, in the facilities there were no official procurement guidelines (27).According to study in south Africa Sedibeng district and Gauteng province, the main causes of DSM were, inadequacies and weaknesses of procurement practices (38). Another study in south West Shoa zone Oromia Regional State, the facilities had no supply planners

to decide the procurement time and what to procure, from where and how much to procured (40).

2.2.3. Inventory Management

After a product is procured, it enters the inventory management and distribution system. This includes all the storage facilities and transport links at the various levels throughout the system. Inadequate storage and inventory control is a challenge many drugs expire before they can be used(43). Inventory is a process of assuring that the right volume and movement are secured in order to ensure that the obtained drugs have reached to the final consumer correctly. It is the process of maintaining of stock properly all the time in the health facility. Inventory management is considered as the heart of pharmaceuticals supply management system. There are two major components of inventory management called inventory control system and storage. An inventory control system is mechanism that informs the store manager when to order or issue, how much to order or issue, and how to maintain an appropriate stock level of all products to avoid shortages and oversupply(48).

A study done in Tanzania the average availability of Ems was 79% at the dates of evaluation whereas the range of stock out was b/n 1-183 days. According to this study the Stock management systems of the facilities was weak and this contributed to the number of expired medicines and supplies (27).

A study done in East Shewa zone Oromia Regional State,40.50% of the bin cards were not updated and 72.50% of them were not correctly filled. According to this study the mean availability and stock out rate of key EMs was 72.75% and 27.25% respectively with an average stock out duration of 35.31 days. Plus on average 10.43% of the medicines were wasted resulting in loss of 174,366.98 ETB of which the value of medroxy progesterone accounted 65.74% (33).

Medicines play an important role in community healthcare programs, saving lives and drawing people to HFs, where they can also receive preventive treatment. Medicines can also help keep health care costs down (50). Poor accessibility of medicines in the public health is a significant obstruction to access to affordable EMs in developing countries especially for the deprived (23). A study done in Ghana, the availability of EDs was 80%, and the length of stock out was 29.9 days and there were no expiry drugs (39).Another study in Uganda, the average availability and stock out duration of key essentials medicines was 79.53% and

20.47% respectively(51).A study done in Nepal's, 90% of essential medicines are available in the health facilities(52). Another study done in India the overall availability of key essential medicines in the health facilities (HFs)was 45.2 %(53).

A study done in Ethiopia (North Gonder), average availability of essential medicines was 91% and stock out duration was 30.5 days(54).Another study in Adama, average availability of TDs on the day of survey was 76.3% and average stock out was 40.6 days. According to this study, ORs and paracetamol stocked out for 144 days &1.4 days respectively(41). A similar cross-sectional study in south Western Ethiopia, average availability of tracer drugs during visit was55.6%(55). Again another study in SNNPR HCs, average availability of EM during assessment was 57.67%. According to this study Ceftriaxone, OR, zinc sulfate, and cotrimoxazole were the most widely available types of medications (56). Another study in Wollega zones, the average availability of basket of medicines was 93% for hospitals and 87% for health centers (57).

2.2.4. Storage practices

After a product is selected and procured it must be stored until use. A store is a safe keeping place for pharmaceuticals and supplies. Good storage protect products from deterioration and damage whereas, inadequate storage and distribution can lead to physical deterioration and chemical decomposition, as well as reduced potency. It is vital that the storage area must be dry and well-ventilated, out of direct sunlight and maintained within acceptable temperature limits. Inadequate storage and inventory control makes many medicines expire before they can be used or used irrationally and leads to diversion including susceptible to theft (14).

A National survey in Jamaica, the average storage practices was 70%-90% in the public and in the warehouses respectively and the storage conditions were not adequate except the supplying warehouse(58). Another study in Tanzania, the health facilities met only 33% of acceptable storage conditions(27).

A study done in south West Shoa zone Oromia Regional State, the median storage conditions of the facilities meet only 50% of the standard storage conditions (40)**.** Another study in central head office EPSA, only 60% of them were met acceptable storage conditions. According to this study, deficiency of storage space, outdated warehouse designs, and insufficient warehouse aiding equipment were the major challenges affected the store(59).Another study in Awi zone Amhara regional state, 82% of the facilities did not full

filled products stacked 30 cm away from the walls and the current space of the organization should be sufficient for existing products and reasonable expansion, also have no sufficient space and safe storage conditions(36).

2.3. Transportation practices

Medicines and supplies need to be moved from the facility store to the places where they are utilized, such as treatment areas, wards, or outpatient facilities. The procedures are similar, whatever the size of the facility (14).Good distribution practices (GDP) is an essential concept of pharmaceutical SCM to ensure systematic distribution of medicinal products from manufacturing site to retailers. The main concerns during pharmaceutical distribution are: deterioration, counterfeit and pilferages (49).

A study done in Indian pharmaceutical industry the most quality of medicinal products is affected at the time of distribution. According to this study, most of the time products are exposed to direct sunlight during transportation and these are the cause of a substantial generation of impurities as a result of product degradation (43).

A study conducted in South West Shoa Zone Oromia Regional State, 9 facilities had no vehicles for transporting pharmaceuticals having to this mostly unavailability of medicine was occurred(40). Another study done in Addis Abeba City health centers,54% of the HFs didn't have their own vehicles for transporting medicines, as an alternative they use renting private vehicles (13). Another study in Amhara regional state,93.9%of the facilities not fulfilled the criteria for effective distribution of TB laboratory reagents & consumables(60).

2.4. Logistic management information system (LMIS)

Information is the engine that drives the logistics cycle. Without information, the logistics system would not run smoothly. Information about product consumption and inventory levels must be gathered before the product is procured. LMIS can be either paper based or electronics forms of communication to transfer data which can improve day today management of pharmaceuticals and inform forecasting and procurement decisions at the national or within facility level. It used for standard types of forms for recording essential data items. These are: Stock keeping records (bin card & stock record cards), Transaction records (requisition and issue vouchers), and Consumption records such as a daily activity record which tallies the amount of each product used or dispensed to patients each day (61,62).In many countries, procurement quantities have been based on incomplete data on

past use. Ideally, data should be derived from an LMIS. Alternatively, STGs can be used to develop forecasts using morbidity and demographic data. Failure to use logistics activities, demographics, or patients service data results in repeating past mistakes in commodity quantifications year to year (43).

A study done in Nigeria on contraceptive logistics management system the average bin card accuracy of the store and SDU was 66% and 57% respectively (64).

Another study conducted in Addis Ababa Public HFs, 96.2% of the facilities had Bin cards, stock record cards, IFRRs and RRFs and, 61.5% of the bin cards were updated. According to this study, 84.6% and 92.6%of the IFRR and RRF were completed respectively(55).A similar study in Addis Ababa city, all facilities used hard copy Bin card, and 87.5%of them were used HCMIs computer system (13). Another study in East Wollega Zone, 39% of the facilities utilized HCMIs computer system and 65% of the RRFs and 79.1% of bin cards were correctly filled(63).Again another study conducted in Wollega Zones, availability of bin card was 83.9% and 75.4% in hospital and health centers respectively. According to this study average updated bin card for hospitals & health centers was 43.8% & 32.9% respectively (57). A study done in Dessie, (North-East Ethiopia), 77.8% of the TDs had bin-cards and86% of them were updated. However, all of them didn't used stock record card (2).

2.4.1. Challenges of pharmaceutical logistics management

Medicine supply chains in developing countries are fraught with many problems. Ineffective supply chains weaken the overall health system's ability to respond to the healthcare needs of the population and put treatment programs at risk (14).

The most significant challenges of sub-Saharan African regions concerning to drug supply management were: lack of proper infrastructure and demand information and distribution, unbalanced urban consideration of retail or community, significant potential interruptions, imitation and corruption, absent of regulatory bodies, lack of health personnel, financial restrictions, lack of responsiveness and others (65). According to Tanzanian evaluation, the causes of medicine unavailability were limited financing, lacks of the national supply chain, poor infrastructure, manual management information system, shortage of human resource and poor stakeholder coordination (66). A study done in Addis Ababa, the root causes of logistics managements were poor supply of EDs from supplier side, lacks of transportation and infrastructures related to medicine waste management (13). A practical similar finding in South West Shoa Zone, Oromia Regional State, all informants deployed that medicines

wastage is increasing from time to time due to supplier's issuing without facilities' need and request, failure to follow FEFO principle, lack of communication b/n supplier and health facilities, insufficient number of pharmacy personnel and weak supply chain management system in the HFs. According to this study, budget restriction, recurrent stock out and crowded store were the major challenges that compromising their service provision (13,67).

2.5. Conceptual framework

A conceptual framework is an analytical tool with several variations and contexts, which is used to make conceptual distinctions and organize ideas. Conceptual framework is a structure of concepts which shows interrelationship between dependent and independent variables to operationalize a given study.
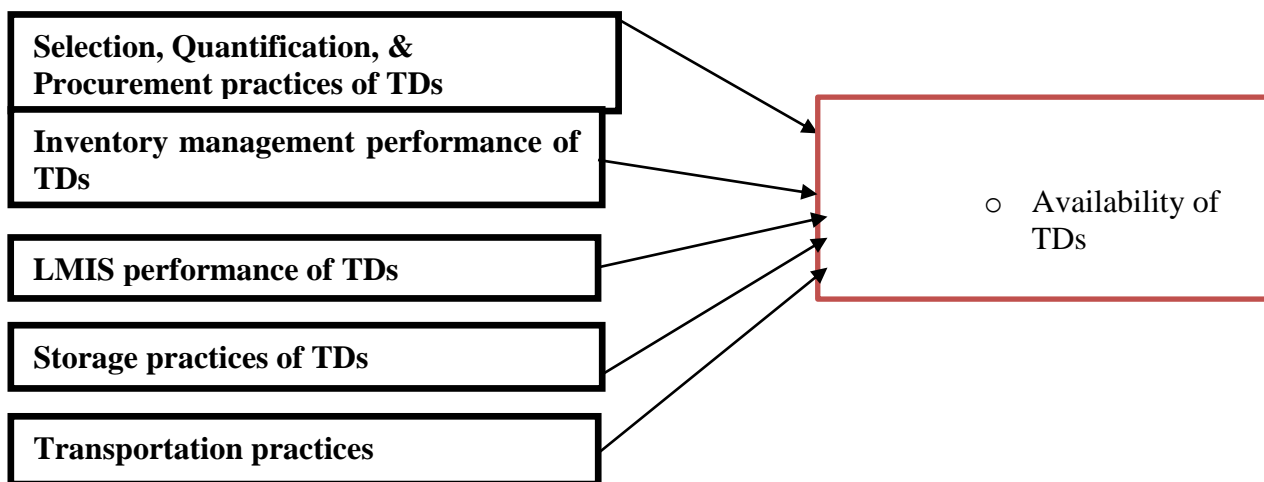
Figure 1: Conceptual Framework developed after reviewing different literatures.

3. Objectives

3.1. General Objective

To assess the logistics management performances system in selected health facilities of Bench-Sheko Zone with an emphasis on essential tracer drugs.

3.2. Specific Objectives

1. To assess the selection, quantification, and procurement practices of key EDs in PHFs
2. To assess the inventory management performance of key EDs in selected health facilities
3. To assess the LMIS performances of key EDs in selected public health facilities
4. To assess the storage conditions and transportation practices of key EDs in the HFs.
5. To identify challenges associated in controlling of key EDs in public health facilities.

4. Methods

4.1. Study area and period

The study was conducted at selected public health facilities in Bench Sheko Zone, SNNPRS (Southern Nations and Nationalities and Peoples' Region) of Ethiopia. The Zone is located in the south-western part of Ethiopia at 582 km from the capital city of Addis Ababa, and 853 km from Hawassa (the capital city of SNNPR). According to the zonal communication affairs reports (2012) E.C, the zone had a total population of 625,345 of which 309,755 are men and 315,590 of them were women with an area of 4667.6 square kilometers. There are six woreda and two town administrative units. The zone had a total of one teaching hospital,26 Health Centers and 128 Health posts currently providing the services for the communities. The study was undertaken from October 22/2020 to December 21/2020 in the public health facilities of Bench Sheko Zone, SNNPR of Ethiopian.

4.2. Study design

Facility-based concurrent explanatory mixed method strategy for quantitative and phenomenological study design for the qualitative technique was used to assess the logistics management performance of key essential drugs. The combination of both methods was helping the researcher to gain a full picture and deeper understanding of the investigated phenomenon by linking complementary findings to each other.

4.3. Populations

4.3.1. Source population

- ✓ All public HFs giving pharmaceutical services in Bench-Sheko Zone
- ✓ All documents and records that were used to manage the pharmaceuticals
- ✓ All health professionals engaged in the management of pharmaceuticals
- ✓ All pharmaceutical products available in public health facilities store
- ✓ All pharmacy departments

4.3.2. Study population/participants

- ➢ Twenty five (25) public health facilities (1 hospital and 24 health centers)
- ➢ Documents which used for tracking tracer drugs in PHFs
- ➢ Twenty five tracer drugs (TDs)
- ➢ Pharmacy heads and store managers

4.4.   Sample and Sampling methods

For this survey, census method was used by incorporating all twenty five health facilities which is (one hospital and twenty four HCs) of target population. The administered questionnaires were prepared in two types one for the store keepers and another's for pharmacy heads. In addition to this, to explore the challenges evolving in logistics management performance of key essential tracer drugs in the health facilities, 15 key informants (KI); (7 pharmacy heads, 4 store managers and 4 facilities heads) were selected based on experience and position of pharmaceutical management role using purposive method.

4.5.   Data Collection procedure

Quantitative data collection was performed by two trained data-collectors who were a druggist using semi-structured questionnaire and physical observation. The data collectors were trained for two day on the survey tool before being involved in the data collection. A semi-structured questionnaires adapted from LIAT was used to collect quantitative information from pharmacy heads and store managers. Data sources for the assessment were bin cards, physical inventory records, expiry drug registration books, facilities specific drug list documents, DTC meeting documents, model 19 and 22 and physical counts.

For qualitative data collection: in-depth interview of key informants, semi-structured interview guide was prepared from LSAT after modified to the local conditions. The interviewers explore the underlined evidence on challenges of the logistics management performance of key essential drugs from key informants. In the interview moment, full note was taken and an audio tape was supported for recording transcription. In this regard, every KI interview was engaged on average 20-25 minutes. The audio recording was listening several times and then another note was taken from the data. Then the recorded data from the key informants(KIs) interview were coded. Later, the coded data were classified under main thematic areas and observed through thematic analysis technique. Data were concise into the key thematic areas and describing themes and constructing the report. Finally, the triangulation of the qualitative results with quantitative outcomes was carried out. All this process was carried out both in and out of the offices.

4.6.   Data Collection instrument

For a quantitative data collection both a combination of semi-structured questionnaire and observation checklist were used to collect data on the logistics management performance of

key essential tracer drugs. The questionnaire was formerly developed from the logistics indicators assessment tools (LIAT) which is initially developed by USAID/DELIVER Project and modified to the local form(63). Similarly the interview guide was developed from Logistics system assessment tools (LSAT) for qualitative data to explore the factors that could influence the logistics management performance in the health facilitieswhich is originally developed by USAID/DELIVER after modified to the local form(64).

4.7. Inclusion and exclusion criteria

4.7.1. Inclusion criteria

➢ All health workers involved in the management of pharmaceuticals such as pharmacy head and store managers in Bench-Sheko Zone public health facilities**.**

➢ All Public health facilities in Bench-Sheko Zone providing pharmaceutical services

➢ Documents relevant for this study retained for 6 and above months prior to data collection

4.7.2. Exclusion criteria

➢ Health posts were excluded, because they acquire medicinal products under the health centers and no more drugs permitted to hold and most of the logistic operations be conducted at health centers and hospitals.

➢ Pharmacy Professionals other than store manager and pharmacy heads was excluded.

➢ New public HFs (less than 6months) that was provided pharmaceutical services recently

➢ Facilities which have no recording tools in the health facilities.

4.8. Study variables

4.8.1. Dependent variables

▪ Availability of tracer drugs

4.8.2. Independent variable

▪ Functional DTC
▪ Facilities own list of drugs
▪ List of tracer drugs (TDS)
▪ Medicinal selection criteria
▪ Quantification guideline

- Techniques of quantification
- Procurement guideline/policy
- Procurement schedule
- Procurement limited to essential list of drugs
- Procurement lead times
- Availability of logistics tools
- Storage practices
- Availability of storage guideline (SOP)
- Training staff on IPLS and quantification
- Qualification
- Work experience
- Transport availability
- Common types of transportation system
- Stock out rate of TDs
- Stock out days
- Wastage rate of TDs
- Inventory accuracy rate of TDs
- Availability of disposal guideline

4.9. Data processing and Analysis Technique

Once data had been collected from field, the quantitative data from questionnaire and observation checklists were labeled and then entered into the excel spreadsheet, cleaned before being entered into the statistical software. Data analysis was done with the support of statistical package for the social Science (SPSS version 20) software to analyze the results. Finally the descriptive statistics was computed and the results were presented visually by percentage (proportion), frequency tables and graphs.

For the qualitative data, the respondents were recorded and then transcription was done, and the data were analyzed with thematic analysis over assigning initial codes. The analysis began with recurrent reading of the transcripts, notes were written down in the process representing observations in relative to the operational factors influencing logistics management performance. Interview transcriptions were coded and analyzed for the major themes. Themes were recognized both by frequency of occurrence and by their importance. Patterns in responses and codes were analyzed to explore and develop significant themes useful for presenting results of the study.

4.10. Data Quality Assurance

Before data collection, data abstraction format was wisely prepared and trained data collectors on the data collection instruments and processes for a session of two days. Then, pretest was carried out 5% in two health facilities. After the pre-test, the appropriate adjustment was made to standardize the data collection tools and rearranged the sequences of the questionnaires and typing errors by principal investigator. Moreover, the principal investigator checked data for completeness, consistency on regular basis. In addition, data cleaning and editing was taken regularly.

4.11. Ethical consideration

Before commencing the data collection, the study will be approved by an ethical Institutional Review board of Jimma University Ref.No IRB00044/2012 on date of 12/09/2012 to conduct the research. Official letters was written by Jimma University Institute of Health and School of pharmacy to the respective officials of the study area Bench-Sheko Zonal Health District. Informed Verbal Consent of the respondents and the leader of the area were obtained after giving information and thoroughly explaining the aim of the study to each respondent then, the study was conducted in the selected public health facilities after permission from the health facility in-charge obtained. During data gathering process, each respondent was informed about the purpose of the study, confidentiality of the data and written consent was taken from each respondents.

4.12. Operational Definitions

- **Acceptable storage condition**: -stores that met at least 14 of the 17 criteria (>80 yes response to the criteria set by good storage practice).
- **Bin card update**:-had to be updated within the prior 30 days and also if the bin card was last updated with a balance of zero and the facilities has no received any of those drugs
- **Essential drugs:**-Those drugs which available in adequate quantity for controlling the most common health problems in the study facilities.
- **Essential medicine Availability**: The presence of at least a single unit of usable/ unexpired stock on hand in the facility store at the day of visit.
- **Health facilities**: public institution, including hospitals and health centers providing health care services.
- **Inventory accuracy rate**: the stock balances between recorded in the bin card and physical count. It measures the overall inventory management performance

- **Key informants**:-participants who are supposed to have sufficient information and knowledge about the challenges in the logistics system of key essential drugs.
- **Lead time**: the time interval between request and actual receipt in the facilities.
- **Logistics tools:**-it includes bin cards, stock record cards, internal facility report and resupplying form, report and requesting forms and electronics dagu 2 systems.
- **National essential drug list:**-A document having list of drugs agreed for use in Ethiopia
- **Stock out: -** unavailability of usable stocks in the store or a balance of zero on the bin cards at store.
- **Tracer drugs: -** are drugs which are selected by the health facilities to treat top ten diseases during data collection.
- **Facility specific drug list**:-is a document that used for as a reference tool in pharmaceutical procurement.
- **Wastage rate**: the proportion of the stock of products in value those are unusable because of expiration and damage.

4.13. Dissemination plan of the study finding

The finding of this study will be disseminated to all concerned bodies such as Jimma University Institute of Health Science, school of pharmacy and Bench-Sheko Zone Health Districts. Finally, the study paper will be submitted to reputable professional journal for publication, to be used as a reference.

4.14. Indicators

A set of standard indicators was selected to provide an assessment of logistics management performance for essential TDs. The Indicators that used was valuable for assessing logistics management system performance. Because it is difficult to measure directly the overall performance to judge whether it is poor or good, therefore it needs to be known the indicators to measure whether performed well or poor performance(4).

Indicator 1: Percentage of tracer drug availability: First, facility specific percentage of tracer drugs available on the day of assessment, using the following formula:

Total TDs available in stock x100

Total number of TDs in the study

Then, the average percentage of products available on the day of visit for the facility sample was obtained as follows: *Average % tracer drug availability=*

Sum of % of TDs in stock on the day of assessment for each facility

Total number of facilities in the sample

If a product was not available (stocked out) for one day in the month, and then it will be considered as not available for the whole months. Ideally the standard of availability was >80%

Indicator 2: Average percentage of day out of stock: It Indicates the system's capacity to maintain a constant supply of products over time by minimizing the duration of stock outs. It will be assessed based on average % of time that products will be out of stock for the past 6 months. The first step will be to obtain the facility specific average % of time day out of stock of the tracer drugs, using the following formulas:

Total number of stock out days for all tracer drugs x100

365xTotal number of tracer drugs in the study

Then after, the average percent of time out of stock of the tracer products for the facility sample will be obtained using the following formula:

Average % of days that tracer drugs were out of stock in all facilities=

Sum of average % for each facilities

Total number of facilities in the sample

Ideally no tracer drugs were required to be stock out in everyday activities. Therefore =0 days

Indicator 3: Percentage of stock records that is accurate: It indicated that, the quality of the record-keeping system by identifying the percentage of records that will be accurate. The first step will be to obtain the facility specific percentage of stock records of tracer drugs that will be accurate corresponding with physical counts will be obtained, using the following formulas:

% of stock records corresponding with the physical count=

Count of records that are accurate x100

Total number of tracer drugs in the study

Then after, the average percent of stock records that is accurate for the tracer drugs for the Facility sample is obtained using the following formula:

Sum of average % Total number of facilities in the sample

- ▪ Ideally record accuracy will be expected to 100%

Indicator 4: storage condition: facilities are categorized based on total scores they obtained in the storage condition checklist. Those scored >80%-100% will be categorized as excellent, 70%-89% acceptable and below 70% as unacceptable group.

% of facilities that maintain acceptable storage condition=

#of storage meeting acceptable storage condition X 100

 Total number of facilities surveyed

Indicator 5: wastage rate of tracer drugs: The percentage of the stock of products, in value, that are unusable because of the expiration or damage during a period to the total value of the products received during the same period plus the quantity of the products found during the beginning of the period.

Wastage rate by amount=*Unusable stock of tracer drugs during a period of 6 months in value x100*
Beginning stock + received stock during the same period in monetary value
Unusable stock that will be accumulated for long period and will not be disposed previously should not be included during calculation of this indicator. The target in HSTP is to reduce wastage of pharmaceuticals to less than 2%.

5. Result

5.1. Socio-demographic characteristics of Store managers and Pharmacy Heads

Twenty-five health facilities (1 teaching hospital and 24 HCs) were surveyed to assess logistics management performance for tracer drugs at Bench-Sheko zone, SNNP regional state. Store managers and Pharmacy heads were principal persons involved in logistics management of tracer drugs in these facilities. In the assessment majority 27(54%) of the respondents were Nurses and only 4% of them were pharmacist. Among surveyed facilities, 50% had a working experience of 1 to 5 years. Around half (52%) of the respondents didn't take IPLS training but sixteen (64%) of them had taken training on quantification (**Table 1**).

Table 1: Demographic characteristics of health professionals involved in logistics activities in selected public health facilities of Bench-Sheko zone, SNNPR region, October 2020.

S. No	Variable		Store manager Freq. (%)	Pharmacy heads Freq. (%)	Total Freq. (%)
1	Educational qualification	Pharmacy degree	1(4%)	1(4%)	2(4%)
		Druggist	9(36%)	12(48%)	21(42%)
		Diploma Nurse	15(60%)	12(48%)	27(54%)
2	Working experience	< 1 year	8(32%)	6(24%)	14(28%)
		1 - 5 years	11(44%)	14(56%)	25(50%)
		>5 years	6(24%)	5(20%)	11(22%)
Trainings					
3	IPLS training	Yes	12(48%)	12(48%)	24(48%)
		No	13(52%)	13(52%)	26(52%)
	Quantification	Yes	17(68%)	15(60%)	32(64%)
		No	8(32%)	10(40%)	18(36%)

Availability of logistics tools and guidelines

All assessed health facilities had manual LMIS forms like bin cards, internal facility report and resupply form (IFRR), and report and resupply forms (RRF). However, stock card and electronic HCMIS were not available and utilized in majority of the health facilities. Storage guideline, quantification guideline, and medicinal waste management guideline were available in 17(68%), 13(52%), 15(60%) facilities respectively. Majority (88%) of the facilities lack procurement guideline. There are different committees responsible for logistics

management of tracer drugs. In the current study, 21(84%) of the facilities had DTC from which only 11(44%) were functional, and 19(76%) had waste disposal committee (**Table 2**).

Table 2: Availability of logistics data recording tools, guidelines and effective committee in selected public health facilities of Bench-Sheko zone, SNNPR, October/2020.

S. No	Variables	Yes	No	Total
	LMIS Tools	Freq. (%)	Freq. (%)	Freq. (%)
1	Bin card	25(100%)	0(0%)	25(100%)
2	Stock record card	3(12%)	22(88%)	25(100%)
3	IFRR	23(92%)	2(8%)	25(100%)
4	RRF	25(100%)	0(0%)	25(100%)
5	Electronics HCMIS	7(28%)	18(72)	25(100%)
	Guidelines			
6	Storage guidelines	17(68%)	8(32%)	25(100%)
7	Quantification guidelines	13(52%)	12(48%)	25(100%)
8	Procurement guidelines	3(12%)	22(88%)	25(100%)
9	Medicinal waste management	15(60%)	10(40%)	25(100%)
	Availability of Committees			
10	DTC	21(84%)	4(16%)	25(100%)
11	Functional DTC	11(44%)	14(56%)	25(100%)
12	Disposal Committee	19(76%)	6(24%)	25(100%)

5.2.   Selection, Quantification, and Procurement

In the current study, 16(64%) of the HFs had their own drug list, and 20(80%) of them used national Essential drug list. In these facilities, DTC was the main responsible body for medicinal selection and all of them used pattern of prevalence disease as a selection criteria. Furthermore, 32% of them considered cost of the drug as selection criterion. Majority of them (92%)were used consumption method for quantifying demand for future use (**Table 3**).

Table 3: Selection and Quantification practice of tracer drugs at public health facilities of Bench-Sheko zone, October/ 2020.

S. No	Variable	Responses	Freq. (%)
1	The facility has its own EDL	Yes	16(64%)
		No	9(36%)
2	Availability of the most recent	Yes	20(80%)
	NEDL at the facility	No	5(20%)

3	Who is responsible body for TDs selection	Pharmacy unit	5(20%)
		The DTC	16(64%)
		Nurses	4(16%)
4	TDs Selection Criteria	Pattern of prevalent disease	25(100%)
		Efficacy and safety	5(20%)
		Cost of the drugs	8(32%)
		Well known drugs	3(12%)
5	Who initiate quantification	Pharmacy unit	9(36%)
		The DTC	13(52%)
		No quantification conducted	3(12%)
6	Method of quantification	Consumption method	23(92%)
		Consumption and morbidity	2(8%)
7	At least annually Updated forecast	Yes	12(48%)
		No	13(52%)

As indicated, in **figure 1**, 21(84%) of the facilities had procurement schedule, 11(44%) of them place order quarterly, and majority of them 22(88%) alternatively can procure non-program essential drugs from private supplier. Among requested non-program medicinal quantity only 2(8%) were fully received from EPSA. Majority of the facilities 20(80%) had a procedure for emergence order, and 9(36%) had put emergence order once. Regarding the procurement led time, 19(76%) of facilities stated that it took 1 to 2 months to receive program drugs from EPSA (**Figure 2**)
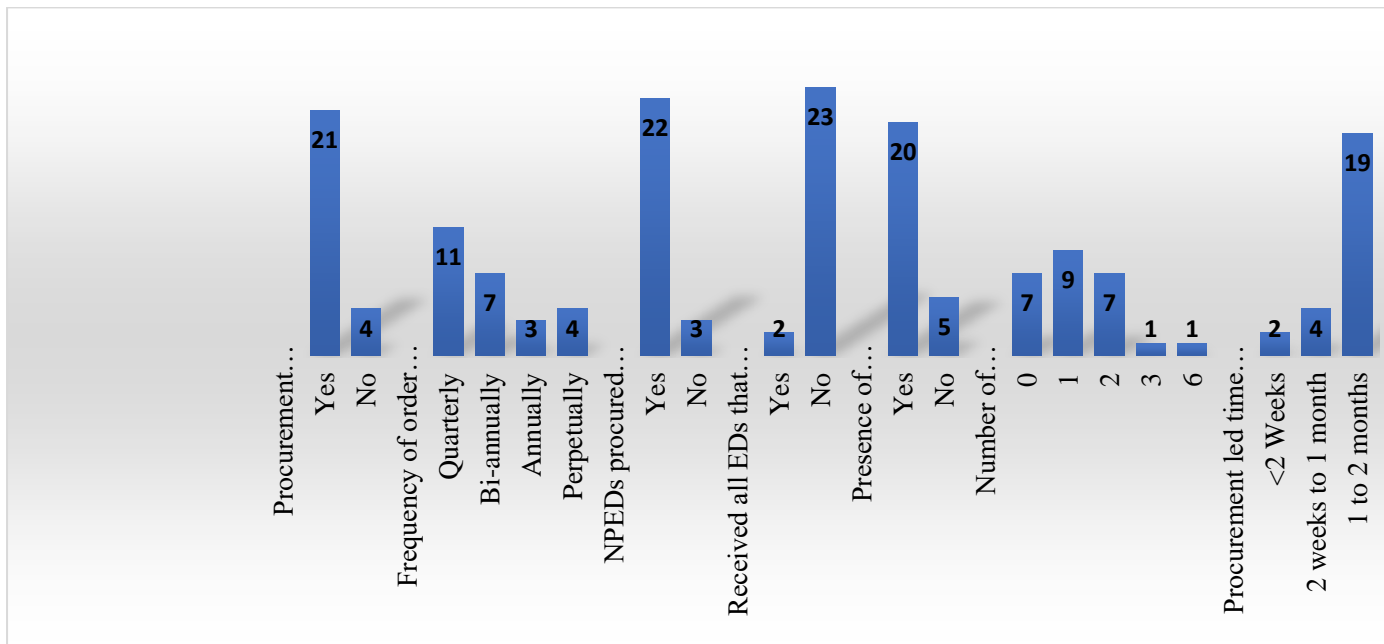
Figure 2: Tracer drugs Procurement performance of Bench-Sheko zone public Health facilities, October, 2021

5.3. Transportation Management

Regarding transportation, majority 22(88%) of the facilities picked non-program drugs by themselves, whereas, EPSA was responsible for transporting program drugs. In these study Ambulance was the most common type of vehicle used to transport non-program drugs, while, supplier vehicle/truck was the common types of transportation for program essential drugs (**Table 4**).

Table 4: Responsible body for transportation of tracer drugs and type of transport used to transport tracer drugs in public health facilities of Bench-Sheko zone October/ 2021.

S. No	Variable	Responses	Freq(%).
1	Transport responsible when NPEDs collected from EPSA	EPSA	1 (4)
		HO/Health bureau delivers	6 (24)
		This facility	22(88)
2	Transport responsible when PEDs collected from EPSA	EPSA	25(100)
		HO/Health bureau delivers	6(24)
		The facility	6(24)
3	Type of transportation most commonly used for NPEDs	Facility ambulance	14(56)
		Facility vehicle	1(4)
		Private vehicle	7(28)
		Public transport	3(12)

5.4. LMIS Performance

Regarding logistics record keeping, all facilities utilized bin cards for all tracer drugs; updated 70.88% of the bin cards and 67.04% of them were accurate. The most updated and accurate bin cards were Amoxicillin dispersible tablet Bin card, Glucose 40% bin card, and Tetanus Anti Toxins (TAT) injection's bin card. The least updated bin cards were bin cards for Medroxyprogesterone injection, Adrenaline injection, pentavalent vaccine, TDF/3TC/EFV adult tablet, and Oxytocin 10uU/ml injection (**Table 5**).

Table 5: Bin card availability and updating of TDs in Public Health Facilities of, Bench-Sheko Zone, SNNPR region, October/ 2020.

S. No	Product name	Bin card available	Bin Card Updated	Bin Card Accurate	Bin Card Inaccurate
1	Amoxicillin dispersible tablet	25(100%)	25(100%)	25(100)	0(0%)
2	ORS rehydration salts	25(100%)	22(88%)	22(88%)	3(12%)
3	Zinc tablet	25(100%)	23(92%)	22(88%)	3(12%)
4	Gentamycin 80mg/2ml iv	25(100%)	17(68%)	17(68%)	8(32%)
5	Co-trimoxazole 400mg/80mg	25(100%)	15(60%)	15(60%)	10(40%)
6	Magnesium Sulphate inj 20%	25(100%)	15(60%)	15(60%)	10(40%)
7	Oxytocin 10uU/ml	25(100%)	10(40%)	9(36%)	16(64%)
8	Enalapril tablet	25(100%)	22(88%)	22(88%)	3(12%)
9	Medroxyprogesterone	25(100%)	8(32%)	7(28%)	18(72%)
10	Glibenclamide tab	25(100%)	22(88%)	22(88%)	3(12%)
11	Adrenaline injection	25(100%)	22(88%)	22(88%)	3(12%)
12	Pentavalent vaccine	25(100%)	6(24%)	5(20%)	20(80%)
13	Glucose 40%	25(100%)	25(100%)	25(100%)	0(0%)
14	DNS 1000 ml	25(100%)	15(60)	14(56%)	11(44%)
15	Ferrous sulfate + folic acid	25(100%)	11(44%)	10(40%)	15(60%)
16	Ciprofloxacin	25(100%)	21(84%)	19(76%)	6(24%)
17	Ceftriaxone injection	25(100%)	22(88%)	22(88%)	3(12%)
18	Hydralazine injection	25(100%)	18(72%)	19(76%)	6(24%)
19	TDF/3TC/EFV adult	25(100%)	7(28%)	7(28%)	18(72%)
20	RHZE/RH	25(100%)	19(76%)	20(80%)	5(20%)
21	Tetanus Anti Toxins (TAT)	25(100%)	25(100%)	25(100%)	0(0%)
22	Tetracycline eye ointment	25(100%)	18(72%)	17(68%)	8(32%)
23	Artimetrine+Lumefantrie	25(100%)	19(76%)	19(76%)	6(24%)
24	Artesunate injection	25(100%)	20(80%)	20(80%)	5(20%)
25	Implanon NXT	25(100%)	16(64%)	14(56%)	11(44%)
	Average	100	70.88	67.04	30.56

5.5. Availability of tracer drugs (TDs)

Availability of tracer drugs were assessed by availability on the day of visit, stock out status in previous six months, and mean stock out duration immediately 6 months before the study period. The Overall average availability of tracer drugs on the day of visit was 19(76.48%).Oxytocin, Gentamycin 80mg/2ml injn, oxytocin 10uU/ml injection, pentavalent vaccine, DNS 1000 ml, Ferrous sulfate + folic acid, Ciprofloxacin tablet, and RHZE/RH tablet were available in all facilities. On the other hand, Glucose 40% injection and Tetanus Anti Toxins (TAT) injection were not available in any facility on the day of visit. Glucose 40% injection and Tetanus Anti Toxin (TAT) had maximum mean stock out duration (almost they were stock out throughout the six months), whereas pentavalent vaccine, DNS 1000ml injection, RHZE/RH, and Implanon NXT were least stock out tracer drugs among others (**Table 6**).

Table 6: Availability, stock out, and mean Stock out duration of TDs in the public health facilities of Bench-sheko zone, SNNPR region, October/ 2020 (N=25).

S. No	Product name	Availability on the day of visit	SO during 6 Mos.	Mean SO duration in Prev. 6MOs	Mean freq. of SO
1	Amoxicillin dispersible tablet	12(48%)	13(52%)	36.52	1.64
2	ORS rehydration salts	12(48%)	13(52%)	34	2.20
3	Zinc tablet	10(40%)	15(60%	31.92	2.16
4	Gentamycin 80mg/2ml inj.	25(100%)	0(0)	3.28	.20
5	Co-trimoxazole 400mg/80mg	24(96%)	2(8%)	4.56	.36
6	Magnesium Sulphate inj 20%	17(68%)	7(28%)	23.72	1.40
7	Oxytocin 10uU/ml	25(100%)	0(0%)	3.04	.20
8	Enalapril tablet	22(88%)	3(12%)	6.28	.20
9	Medroxyprogesterone	24(96%)	1(4%)	2.08	.12
10	Glibenclamide tab	16(64%)	10(40%)	36.12	1.52
11	Adrenaline injection	22(88%)	3(12%)	35.56	1.52
12	Pentavalent vaccine	25(100%)	0(0%)	1.68	.08
13	Glucose 40%	0(0%)	25(100%)	177.60	1.0
14	DNS 1000 ml	25(100%)	0(0%)	1.80	.20
15	Ferrous sulfate + folic acid	25(100%)	0(0%)	10.24	.40
16	Ciprofloxacin	25(100%)	0(0%)	1.12	.16

17	Ceftriaxone injection	20(80%)	5(20%)	13.16	.60
18	Hydralazine injection	23(92%)	2(8%)	12.56	.52
19	TDF/3TC/EFV adult	22(88%)	5(20%)	6.60	.20
20	RHZE/RH	25(100%)	0(0%)	0.80	.00
21	Tetanus Anti Toxins (TAT)	0(0%)	25(100%)	176.40	1.08
22	Tetracycline eye ointment	14(76%)	6(24%)	19.28	1.12
23	Artimetrine+Lumefantrie	24(96%)	0(0%)	11.96	0.60
24	Artesunate injection	12(48%)	13(52%)	40.52	2.44
25	Implanon NXT	24(96%)	1(4%)	0.60	0.04
	Mean	19.12(76.48%)	6(23.84%)	67.04	

5.6. Storage condition

Regarding to storage conditions, all study facilities were secured the storage area with a lock & key and protected products from water and direct sun light. Twenty-four 96% of the facilities were follow medicines pharmacologically and first expiry first out (FEFO) procedures. Twenty-one (84%) of them separated unwanted items from usable stock and stored in good conditions. Twenty three (92%) of them arranged products in ID labels in visible way whereas, 72% of them maintained the roof in good condition to avoid sunlight and water penetration and stored products separately from insecticides & chemicals. However, almost all facilities didn't have sufficient space and not stacked products at least 10cm off the floor, 30cm from wall and not greater than 2.5 meter high. According to these study the average storage conditions for the facilities was 76.48% and only 8 (32%) of them were fulfilled the desired storage criteria standard of (>80%) (**Table7**).

Table 7: Number and percentage of warehouses that fulfill desirable storage condition criteria at public health facilities of Bench-Sheko zone, SNNPs region, Ethiopia, October/ 2020(N = 25)

S. No		Freq.	%
1	Products are arranged pharmacologically/Alphabetically	24	96
2	Unwanted items separated from usable products	21	84
3	Products arranged ID labels in visible	23	92
4	products stored & organized in FEFO procedures	24	96
5	Products protected from direct sun light	25	100
6	Storeroom is maintained in good condition	14	56
7	The currents space is sufficient	8	32

8	The storage area is secured with a lock & key	25	100
9	The storage area is free from harmful insects & rodents	19	76
10	Cartons &products are in good condition	21	84
11	Fire safety equipment is accessible	13	52
12	Products stacked at least 10 cm off the floor, 30 cm from wall & 2.5cm from high	9	36
13	Cold products are stored in a refrigerator	16	64
14	Products are protected from water during all seasons	25	100
15	Products are stored separately from insecticides & chemicals	18	72
16	Roof is maintained in good condition to avoid sunlight and water penetration	20	80
17	Products are stored at appropriate Temperature specification	18	72
	Average storage condition		76%

5.7. Pharmaceutical wastage

A total value of wasted tracer drug in 6 month was 168,869.9 ETB (3518.12US$) from a total usable stock of 5507586 ETB (114741.38US$). TDF/3TC/EFV adult dose contributed 40% of this value, followed by Ferrous Sulfate which contributed 29.31% to the total expired medicines. The wastage rate due to expire/damage was 3.07% ranging from the highest (42.17%) for Enalapril, followed by (29.36%) for Co-trimoxazole 400mg/80mg tablet to the lowest (0.45%) for Glucose 40% injection (**Table 8**).

Table 8: Values and proportions of wasted tracer drugs in 2019 in public health facilities of Bench-Sheko zone, SNNP region, Southwest Ethiopia, October/ 2020.

S. No	Name of products	Value of usable stock (ETB)	Value of expired stock (ETB)	Proportion	% Proportion
1	Amoxicillin dispersible tab	26250	2625	10	1.554451
2	ORS rehydration salts	43750	1925	4.4	1.139931
3	Zinc tablet	17200	1440	8.37	0.852727
4	Co-trimoxazole 400mg/80mg tab	49050	14400	29.36	8.527275
5	MgSO$_4$ inj.	7824	1488	19.02	0.881152
6	Oxytocin 10uU/ml	129000	3825	2.97	2.265057
7	Enalapril tablet	14950	6305	42.17	3.733643

8	Medroxyprogesterone	170400	2580	1.51	1.527803
9	Glibanclamide tab	11,100	2280	20.54	1.350152
10	Adrenaline injection	11640	1164	10	0.689288
11	Pentavalent vaccine	72800	945	1.3	0.559602
12	Glucose 40%	68200	308	0.45	0.182389
13	DNS 1000ml iv fluid	31850	2625	8.24	1.554451
14	$FeSO_4$ + Folic acid tablet	180,000	49500	27.5	29.31251
15	Ciprofloxacin	54,000	540	1	0.319773
16	TDF/3TC/EFV adult	1423380	68229.87	4.79	40.40381
17	RHZE/RH	110700	8100	7.32	4.796592
18	TTC eye ointment	3770	125	3.32	0.074021
19	Arthemeter + Lumefantrine tab.	60102	465	0.77	0.27536
	Total amount	**5507586**	**168869.9**	**3.07**	**100**

5.8. Qualitative Results

To explore the challenges evolving in logistics management performance of key essential tracer drugs in the health facilities15 key informants (KI); namely (7 pharmacy heads, 4 store managers and 4 facilities heads) were selected based on experience and position of pharmaceutical management role using purposively.

Selection, quantification and inventory management

Majority of the KIs claimed different challenges regarding pharmaceutical selection, quantification and inventory control system. Among them; absence of functional DTC, Lack of training such as IPLS, DTC, and forecasting, shortage of pharmacy manpower, and skill gaps among available professionals.

Lack of functional DTC

Regarding to these most of the KIs claimed lack of functional DTC as a challenge for not developing different guidelines, and essential facilities own drug list. Again, they also stated that available professionals didn't take trainings regarding pharmaceutical management. This is explained by one of the KIs as:

"*In our facility there is DTC. But we have never had meeting as far as I know. I don't know the role of DTC well. Most of the pharmaceutical management works (like selection and procurement) are determined by the facility pharmacy unit.*"(The6 year work exp.Male store man).

The other added:

"In our health center the DTC was functional and meeting also held in every 2 months but the committee were mostly spent his time on pharmaceutical procurement process rather than other DTC activities". (The 7 year work exp. Male store man).

Shortage of pharmacy professionals

Another problem revealed by KIs was deficiency of pharmacy professionals in the health center. This can be exemplified by:

"Due to lack of pharmacy professionals in our facility the store manager is nurse. As you know nurses cannot prepare EDL, procurement guideline, quantification guidelines and do not follow FEFO procedures…" due to this reason utmost times in our health center products were expired. *(The 5 yr work exp. Female facility head)*

The other added:

"There has been a shortage of pharmacists for a long time and high numbers of professional turnover at our health center. The main reasons for this are the lack of overtime pay incentives and overtime pay" (The 6 years' work exp. Male facility head)

Challenges for Availability of Tracer drugs

Regarding availability and stock out of tracer drugs, most of the KIs stated: Unavailability of essential drugs at supplier side, supplying non-demand based, Shortage of budget/financial resources at health facilities and bureaucracy, long lead time especially program drugs, over or under procurement due to poor quantification were common challenges they were facing. For example, one of the KI said:

"EPSA do not give or supplied as all the drugs we order. They reduce the quantity for certain items, and do not give us at all others. Due to these we face unavailability of essential drugs at all times and moreover to purchase those drugs from private suppliers we face shortage of budget and the procedure is also very bureaucratic. Again, we usually order non-program drugs in small quantity due to shortage of budget."(The6 yrs. male pharmacy head)

Infrastructure related challenges

Lack of infrastructures, like computer, internet access, poor storage space, and lack of transportation were also another challenge that contributed to poor logistics performance. This was explained by one of the KIs as follows:

"EPSA do not transport non-program drugs by themself to our facility. Hence we do not have our own vehicle to transport drugs. Therefore, we are using either an ambulance or renting public transport." (The 5yrs. Work exp. male pharmacy head)

Regarding the pharmaceutical store, one of the KIs stated that

"Our store is very small and has no sufficient space. There is also no enough shelves and pallets. We simply put the cartoons on the ground as you see" (the 6yrs. work exp. Male store man)

To add more one KIs illustrated as,

"I had working in store in our health center, and during that I have no experience of storing medications and furthermore, I have not taken the short-term training on the IPLS and electronics DAGU system on pharmaceutical management of tracer drugs in addition to these there were no internet access. Hence, I always face challenges in quantifying, preparing purchase orders, receiving for these products and preparing RRF reporting to send EPSA"(The 7yrs. Work exp. Male pharmacy head).

Wastage due to Expire

This study explored the reason for wastage of tracer drugs due to expire through in-depth interview. Then, majority of the KIs explained the reason as: EPSA pushes near expiry program medicines they do not need, there is poor forecasting by the facility due to absence of functional DTC. One of the KIs explained this as follows:

"Sometimes EPSA deliver a bulk program drug to us. Some of them have short expire dates. They simply expire at our facility after a while…" (The6yrs. Work exp. Female facility head)

To enhance more one KI illustrated as,

"In our health center, high amount of drugs were expired the key reason was drug selection was not based on the indigenous disease". (The 5 yrs. Work exp. Female facility head).

6. Discussions

Ensuring medicines availability in the health facility is an important goal for healthcare system as medicines are an important building block in the health system (5).However the average availability of tracer drugs in this study was 19(76.48%) ranging from 0(0%) to 25(100%). This result is in line with study conducted in North-east Ethiopia 74.71% and Adama 76.3% (2,53).However, this study better than studies conducted in Uganda63.45%, North India45.2%, and Ethiopia (West Wollega)61.30%(51,53,68). The probable reason for the difference could be the number of facilities and type of products included in the study. The current study encompasses few numbers of facilities with few numbers of products than the former study. On the other hand, the current study accompanied both program and non-program tracer drugs. On the other hand, the result of this study was lower than the studies done in Nepal90%, Uganda83.5%, Ethiopia in Gonder town 91%and Awi zone85.6%(36,52,54,69).Unavailability of tracer drugs caused in service interruption and forces the patients to purchase medicines from private pharmacies with high prices. The underlying challenges to medicines low availability were supported by qualitative method. Accordingly medicine unavailability at supplier side, poor medicinal selection, and quantification due to poor functionality of DTC, poor store managers' skill were identified as contributing challenges. One of the KI said that:

"*EPSA do not give or supplied as all the drugs we order. They reduce the quantity for certain items, and do not give us at all others. Due to these we face unavailability of essential drugs at all times and moreover to purchase those drugs from private suppliers we face shortage of budget and the procedure is also very bureaucratic. Again, we usually order non-program drugs in small quantity due to shortage of budget.*"

Gentamycin 80mg/2ml injn, Oxytocin 10uU/ml injection, Pentavalent vaccine, DNS 1000 ml IV fluid, Ferrous sulfate + folic acid, Ciprofloxacin tablet, and RHZE/RH tablet were available in all facilities. Conversely, Glucose 40% injection and Tetanus Anti Toxins (TAT) injection were not available in any facility on the day of visit. Similar finding was reported in Amhara region, which is Oxytocin was available in all facilities and in East Shewa zone, pentavalent vaccine was not stock out in preceding six months from the study period(29,51).Therefore, unavailability of Glucose 40% and TAT injection is an alarming issue that needs immediate intervention. Because those are vital medicines that save life and there stock out can lead to loss of precious human life.

Concerning to the long term stock out status, tracer drugs were stock out on average in 6(24%) of the assessed facilities at least once in six months preceding the study period. The

mean stock out duration during this period was 67.04 days. This study agrees with the study conducted in Dessie (North-East Ethiopia)65.4 days and west Wollega (west Ethiopia) 70.30days(2,68). Conversely, the results of this study was worse than the study conducted in Adama East Shewa zone 40.6 days and Awi zone 44.86 days(36,41). The difference might be due to the study area. The current study was done far from the capital city or suppliers compared to the previous study. Again, budget allocation for medicines differs across different regions (41). The most challenges related with stock out were; unavailability of essential drugs at supplier, Shortage of budget/financial resources and bureaucracy in health facilities, long lead time especially program tracer drugs, Over/under procurement due to poor quantification and selection was presented by in-depth interview. Previous studies conducted in the country also revealed similar challenges (33,68).

Drug selection has a significant impact on the quality of patient care and cost. Therefore, it is cost-effective area of intervention (22). Health facilities should have their own essential drug list (EDL), and all drugs should be procured from those lists(70). In this study 16(64%) of the study facilities established their own specific drug list. Moreover, the current study result was better than studies conducted in South Africa, Tanzania, Ethiopian national survey, south west and South Ethiopia where, no facility had its own drug list (9,27,38,40,69). on the other hand, the study finding was less than the study conducted in Ethiopia Awi zone86% (41) and in Addis Abeba 95.8% (13). The difference might be due to functional drug and therapeutic committee (DTC).Majority of the current study facilities had no functional DTC compared to the previous study setting. Drugs and therapeutic committee (DTC) is responsible in preparing, promoting, and introducing different manuals and guidelines in health facilities, health facilities that lack functional DTC might not have different manuals and guidelines including drug list. This may lead to irrational selection of drugs, which may lead in turn to procuring unnecessary, high price drugs and wastage.

An effective quantification seeks to ensure the availability of the right medicines in the right quantities, at reasonable prices, and an accepted standards of quality (44).Majority 23(92%) of the current study facilities used consumption method while the rest used both morbidity and consumption technique. The current finding was similar to the study in Awi zone(Ethiopia)91%(41) and Rwanda 95%(47). However the current finding is better than the study conducted in Uganda and South Sudan where, the facilities used neither morbidity nor consumption methods to estimate medicinal demand for feature use (69).

Effective and responsive health service depends on always having medicines when and where they are needed, which requires secure and proper transport of medicines and medical supplies. Transportation of pharmaceuticals can be provided by the subject facility, the supplier, or outsourced transport services (22). According to this study majority 14(56%) of the facilities were used ambulance to transport non-program drugs. On the other hand, all program drugs were transported via supplier vehicles. Oppositely, the use of ambulance to transport pharmaceuticals may result in poor response to emergency cases(71) because the objectives of ambulance was delivering emergency patients. Some facilities also used renting public transportation to carriage non-program pharmaceuticals but this is not a secure and safe transportation mode. The current study finding was in line with south west Shoa zone Ethiopia all facilities didn't have facility vehicle/Car for transporting medicines(40).However the current study result was lower than studies in A/A,46% of them using their own vehicles for shipping medicines(13). The challenge was also stated by key informants and explained KIs as follows:

"*EPSA do not transport non-program drugs by themself to our facility. Hence we do not have our own vehicle to transport drugs. Therefore, we are using either an ambulance or renting public transport*."

Information is an engine that drives the logistics activities. To keep accurate data, logistics record and report tools should be compulsory. Accordingly, almost all study facilities were used bin-cards, IFRR, and RRFs. According to this study 70.88% of the bin cards were updated and 67.04% of them were accurate. The result of this study was in agreement with the study done in Dessie, East Gojjam, and West Wollega zone (2,68,72). The current finding was better compared to studies in Nigeria60%, south Sudan37% and in Ethiopia (west Wollega)52.45%(46,68,73). The possible reason for the difference might be accessibility of logistics forms like bin cards. The study done in Nigeria, there was a gap of logistics recording tools and study conducted in west Wollega, 21.60% of the products had no bin cards. Oppositely, the current result was less than study done in Ethiopia (East Wollega), in which, 80.36% of the bin cards were accurate (63). The possible reasons might be the respondent's level of education and position. Lack of computer and IPLS training was some of the challenges concerning to LMIS.

The storage system must be dry, well-lit, well ventilated, out of direct sunlight, complete with safety equipment, clean, sufficient space with standard aiding materials like pallets and shelves(14). So, the current study facilities meet only 32% of the required storage standard of

>80%. Equally this study slightly higher than study done in East Shewa25%and Jimma zone 30.4%(33,34). The difference might be due to IPLS training, available storage guideline, using FEFO procedure, quantity of products surveyed and the sample taken. Majority of the current studies didn't have IPLS trainers and storage guidelines similarly the current study conducted in 25 facilities whereas the previous study in Jimma zone was only in 9 HFs. and also might be due to FEFO procedures. Majority of the present study facilities follow FEFO procedures to store medicines conversely, this study was less compared to study conducted in west Wollega 73.91% (74). The difference might be due to study setting, level of facilities, respondents' profession and types of products in the study. Commonly majority of the present study was non-pharmacy, different drugs and majority of them was health HCs. Shortage of pharmacy man power and deficit storage space and lack of electronics HCMIS was the contributing factor as KIs claimed. One of the KIs explained as follows:

"I had working in store in our health center, and during that I have no experience of storing medications and furthermore, I have not taken the short-term training on the IPLS and electronics DAGU system on pharmaceutical management of tracer drugs in addition to these there were no internet access. Hence, I always face challenges in quantifying, preparing purchase orders, receiving for these products and preparing RRF reporting to send EPSA"

Tracer drugs wasted due to expire

Pharmaceutical waste has a high impact on the healthcare budget and negative effects on the environment. Therefore, preventing this waste through the pharmaceutical chain forms an interesting approach to achieve sustainable supply and use of medication.

However the current study explored the monetary value of wasted tracer drugs due to expire. In this study the total value of expired medicines was 168,869.9 ETB(3,518.12US$) from a total usable stocks of 5507586 ETB (114741.375US$). The wastage rate of the present study was 3.07%.Thisfinding was less than the finding of east Shewa10.43%(174,366.98 ETB)and by far less than the results of study conducted in west Wollega8.04%(357,920.52 ETB)(74,75). The difference might be due to the difference in a number and type of medicines included in the study. The current study encloses both program and non-program tracer drugs and the number of drugs included in the study was less than the previous once and the major contributing causes of wastage in this study was due to expire from program drugs, while this agrees with the previous studies. Oversupplying of near expiry drugs by EPSA and lack of pharmacy man power was the contributing factor as KIs claimed. One of the KIs explained this as follows:

"Sometimes EPSA deliver a bulk program drug to us. Some of them have short expire dates. They simply expire at our facility after a while…" (The 6 yrs. Work exp. Female facility head)

7. Limitations of the study

- This study didn't address all components of the logistics cycle.
- The study also included program and non-program drugs and was not suitable for processing report and requisition form (RRF) data quality because data quality only works for program drugs. RRF report was done for only program drugs.
- Some variables like order fill rate was left out during the pre-test time due to lack of information from the study facilities.

8. Conclusion and recommendation

8.1. Conclusion

The logistics management performance system evaluated, with the exception of bin card, RRF and IFRR availability and utilization, were all found to be unsatisfactory owing to poor medicinal selection, longer lead times for collecting program drugs, high stock out rates and unavailability, insufficient store and high stock wastage rate due to expiries discovered.

In addition to this, unavailability of essential drugs from EPSA, insufficient storage space, lack of budgeting in the facilities, lack of medical transportation and longer lead times for collecting program drugs, Shortage of pharmacy manpower, and Skill gaps among available professionals were among the most claimed problems from the key informants.

8.2. Recommendation

Based on the outcome of this study the following recommendations can be drawn

The health facilities

- ✓ Decision making on reorder quantities using facilities DTC
- ✓ Provisions of sufficient store (building sufficient store) in the health facilities
- ✓ Rebuilding the facilities drug and therapeutic committee (DTC).
- ✓ Giving on job training on IPLS and quantification process

Zonal health department

- ✓ should be work in collaboration with the health facilities,
- ✓ Regular supportive supervision of the health facilities
- ✓ Regular training on stock management should be planned for and facilitated to improve capacity of new and existing staff
- ✓ Financial support to renovate and construct the medicine stores and to use computerized/electronic stock management system.

Ethiopian pharmaceutical supply agency (EPSA)

- ✓ should be stock sufficient quantities of program and non-program medicines and distribute to facilities based on their demand and consumption
- ✓ Regular training on logistics management should be planned for and facilitated to improve capacity of new and existing staff collaborating with other stake-holders

Regional health bureau

- ✓ Should be support the health facilities via training and ensuring financial support for renovating and constructing the medicine stores.
- ✓ Try to see the availability of tracer drugs from health management information system and to make immediate decisions.

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Annexes

Annex 1: Consent form

Consent to join in a study in the title of: ''key essential drugs logistics management performance in public health facilities of Bench-sheko zone, SNNPR.''

Hello I'm Mereke Belay, a student from Jimma University Institute of Health following Master of Science (MSc) program in pharmaceutical supply chain management.

Purpose of the study

The objectives of this study were to assess key essential medicine logistics management performance in public health facilities of Bench-sheko zone.

Participation

If you decide to join the study, you will be friendly requested to answer the entire questions that will be asked by the data collector.

Confidentiality

Evidence gained from you will be treated confidentially and will never be used for any purpose other than this study.

Risk

No impairment is estimated to happen to anyone participating in this study

Benefit

Your participation in this study will support us to understand how key essential drug logistics management is currently performing in Bench-sheko zone public health facilities and recommend ways to improve it.

If you agree to participate in this study choose YES, if not agree choose NO

◯   YES   ◯   NO

Thank you in Advance for your Cooperation!

For comments or questions, please contact Mereke Belay (0983494137)/0937171043, Email merebelay@gmail.com

Note: for the answer indicated YES/NO circle only one answer but for answer A, B, C, D, W you may have more answers.

Section: 2. Facility Identification

Health facility code---------------Types of the facility-----------------Woreda----------

Name of Interviewer: -------------------------

Date of Interview _____

3	Section 3. Demographic characteristics of the respondents		
S.N	Specification	Code classification	Comments
3.1	Educational level?	Pharmacist------------------------1 Druggist ------------ -------------2 Diploma Nurse--------------------3	
3.2	Work experience?	6 month-1 year---------------------1 1 -5 year----------------------------2 Above 5 year-----------------------3	
3.3	Received IPLS training?	Yes------------1 No---------------0	
3.4	Received Quantification training?	Yes------------1 No---------------0	
4	Section 4. Selection, quantification and procurement of essential TDs		
4.1	Does the facility have own EDL?	Yes----------------------------1 No-----------------------------0	
4.2	How often it is revised?	Annually................................ 1 Every 2 years........................... 2 Every 6 years........................... 3 Never updated..........................4	
4.3	Who ensures the selection?	Pharmacy unit only -------------1 The DTC-------------------------2 Other (specify) -------------------9	
4.4	Criterion used for essential Drugs selection in the facility? (Circle all the appropriate applied)	Pattern of prevalence disease-----A Efficacy and safety-----------------B The costs of the drugs--------------C Preference for well-known drugs-D Others------------------------------W	
4.5	A NEDL available in the health facility?	Yes--------------1No---------------0	
4.6	Is there a quantification process in your facility	Yes---------------------------------1 No----------------------------------0	
4.7	Who ensures the quantification process?	Pharmacy unit----------------------1 DTC--------------------------------3	

			Head of health facility-----------4	
4.8	Which types of quantification methods are mostly employed at the facility? (Circle all applies)		Consumption method....................1 Morbidity method........................2 Other (Please specify) _____ _9	
4.9	Are forecasts updated at least annually?		Yes--------------1 No--------------0	
4.10	Is there standard procurement schedule?		Yes--------------1 No--------------0	
4.11	How often do place orders for **RDF** drugs?		Monthly----------------------------1 Bimonthly--------------------------2 Quarterly---------------------------3 Every 6 month---------------------4 Annually --------------------------5 Others(specify)--------------------9	
4.12	How often do place orders for **program** drugs?		Monthly----------------------------1 Bimonthly-----------------------2 Quarterly-------------------------3 Every 6 month--------------------4 Annually ------------------------5	
4.13	Is the procurement limited to the EDL?		Yes------------1, No-------------2	
4.14	Is the procurement made by generic?		Yes------------1, No--------------0	
4.15	Which procurement methods are mostly used?		Direct procurement......................1 Open tender.................................2 Closed tender.............. ..-……….3	
4.16	Do you purchase **non-program EDs** from private suppliers?		Yes--------------1 No------------0	If the answer is no, skip **Q4.28**
4.17	Do you receive the quantities that you orders from EPSA?		Yes--------------1 No------------0	
4.18	Who determines this facility's resupply quantities of **program EDs**?		EPSA------------------------------1 Facility itself................................2 Health office (HO)/health bureau.3	
4.19	Who determines this facility's resupply quantities of **non-program EDs**?		EPSA------------------------------1 Facility itself................................2 Health office/health bureau..........3 Other (specify) _____9	

4.20	Are there established procedures for placing an emergency orders for EDs?	Yes-------------1, No-------------0	
4.21	Numbers of emergency order placed in the past 6 months	No------------------	
4.22	On average, approximately how long does it take b/n ordering and receiving **program drugs** from EPSA?	Less than 2 weeks------------------1 2 weeks to 1 month----------------2 More than two months-----------3	
4.23	On average, approximately how long does it take b/n ordering and receiving **NPDs** from EPSA?	Less than 2 weeks------------------1 2 weeks to 1 month----------------2 More than two months-----------3	
4.24	On average, approximately how long does it take b/n ordering and receiving **NPD**s from private suppliers?	Less than 1 week........................ 1 2 week to 1 month ....2 > 2 months.................................. 3	
5	**Section 5. Distribution/Transportation**		
5.1	Who is responsible for transporting **non-program** drugs to your facility when EDs is purchased from **EPSA**?	EPSA----------------------------A HO/health bureau delivers—--B This facility----------------------C Others specify------------------W	
5.2	Who is responsible for transporting **program drugs** to your facility when EDs is collected from **EPSA**?	EPSA delivers.........................A HO/health bureau delivers. ---B This facility collects.............…C Other (specify).......................W	
5.3	What type of transportation is mostly used for **program Drugs**?	Facility ambulance............. …1 Facility vehicle **----------------**2 Private vehicle........................3 Supplier vehicle...................…4 Others specify........................9	
5.4	What type of transportation is mostly used for **non-program** Drugs?	Facility ambulance...............…1 Facility vehicle ---------------2 Private vehicle................... ...3 Supplier vehicle..................…4 Others specify.................. …9	

Annex II. Consent form

Consent to join in a study in titled: ''key essential drugs logistics management performance in public health facilities of Bench-sheko zone, SNNPR.''

Hello I'm Mereke Belay, a Masters student from Jimma University Institute of Health following Master of Science (MSc) degree in pharmaceutical supply chain management.

Purpose of the study

The objectives of this study were to assess key essential medicine logistics management performance in public health facilities of Bench-sheko zone.

Participation

If you decide to join the study, you will be friendly requested to answer the entire questions that will be asked by the data collector.

Confidentiality

Evidence gained from you will be treated confidentially and will never be used for any purpose other than this study.

Risk

No impairment is estimated to happen to anyone participating in this study

Benefit

Your participation in this study will support us to understand how key essential drug logistics management is currently performing in Bench-sheko zone public health facilities and recommend ways to improve it.

If you agree to participate in this study choose YES, if not agree choose NO

◯　　YES　　　　　　◯　　NO

Thank you in Advance for your Cooperation!

For comments or questions, please contact Mereke Belay (0983494137)/0937171043, Email merebelay@gmail.com

Note: for the answer indicated YES/NO circle only one answer but for answer A, B, C, D, W you may have more answers.

Section: 2. Facility Identification

1.1 Health facility code--------------Types of the facility----------------woreda---------

1.2 Name of Interviewer: ------------------------

1.3 Date of Interview _____

3	**Section 3. Background characteristics of facilities medical store manager**		
S.N	Specification	Code classification	Comments
3.1	Educational level?	Pharmacist--------------------------1 Druggist ----------------------------2 Diploma Nurse---------------------3	
3.2	Work experience?	6 month-1 year---------------------1 1 -5 year----------------------------2 Above 5 year-----------------------3	
3.3	Received IPLS training?	Yes--------------1 No---------------0	
3.4	Received Quantification training?	Yes------------1 No----------------0	
	Section: 4 Inventory management of TDs		
4.1	Physical inventory conducted in the store?	Yes------------------------------1 No ------------------------------0	If no, skip **Q #. 4.2**
4.2	How often physical inventory conducted in the store?	Monthly-------------------------1 Quarterly ----------------------2 Every 6 month------------------3 Annually------------------------4	
4.3	Do you conduct an ABC and VEN analysis in the HF?	Yes-----------1 No-------------0	
4.4	Are there certain TDs that you often stock out of before resupply?	Yes------------------------------1 No-------------------------------0	If No, skip Q no, 4.5
4.5	List the main reasons contribute to stock out of TDs		
	a. For program TDs (possible multiple answers)	Delay in resupply--------------A Unavailability at suppliers----B Non quantity requested--------C Supply of near expire----------D Inadequate skill--------------- -E Consumption variation --------F Others (specify) ---------------W	
	b. For non-program TDs (possible	Week selection-----------------A	

		Error in forecasting-----------B	
	multiple answers)	Financial shortage-------------C	
		Unavailability at suppliers----D	
		Consumption variation -------E	
		Other (specify)-----------------W	
4.6	Do you often have a surplus/overstock of certain TDs before resupply?	Yes--------------------1 No---------------------0	**If no, skip Q #, 4.7**
4.7	Is there a system of redistribution of surplus/over stock essential TDs?	Yes--------------------1 No---------------------0	
4.8	Is there a written guideline for storage & handling of all products, (e.g., manuals, posters, & others etc)?	Yes--------------------1 No---------------------0	
Section: 5. Availability of logistics data recording tools, guidelines, and committees			
5.1	Bin card	Yes-------------1 No---------------0	
5.2	Stock record card	Yes-------------1 No---------------0	
5.3	IFRR	Yes-------------1 No---------------0	
5.4	RRF	Yes-------------1 No---------------0	
5.5	Electronics HCMIS	Yes-------------1 No---------------0	
5.6	Do you utilize the following LMIS forms to manage EDs?		
	A. Bin cards	Yes------------1 No-------------0	
	B. Stock record cards	Yes------------1 No-------------0	
	C. IFRR	Yes------------1 No-------------0	
	D. RRF	Yes------------1 No-------------0	
	E. electronics HCMIS	Yes------------1 No-------------0	
5.7	Storage guidelines	Yes-------------1 No---------------0	
5.8	Quantification guidelines	Yes-------------1 No---------------0	
5.9	Procurement guidelines	Yes-------------1 No---------------0	
5.10	Medicinal waste management guidelines	Yes-------------1 No---------------0	
5.11	DTC	Yes-------------1 No---------------0	
5.12	Functional DTC	Yes-------------1 No---------------0	
5.13	Disposal Committee	Yes-------------1 No---------------0	
5.14	Does the HF report **PED**s to EPSA?	Yes-------------1 No---------------0	
5.15	How often facilities report **program**	Monthly -----------------------1	

	PEDs to EPSA?	Bimonthly--------------------2
		Quarterly----------------------3
		Annually----------------------4
5.16	Do you able to submit your report in the specified schedule	Yes-------------1 No---------------0
5.17	Do the reports for TDs include the following essential data items?	
	a. Stock on hand	Yes-------------1,No-------------0
	b. Quantities issued	Yes-------------1,No-------------0
	c. Loss/ adjustment	Yes-------------1,No-------------0
5.18	All DU submit IFRR reports to facility store for resupplying?	Yes----------------------------1 No----------------------------0
5.19	How often IFRR reports are submitted to facility store for resupply EDs?	Weekly------------------------1 Biweekly----------------------2 Monthly----------------------3 Other(specify)----------------9

Annex: III Storage conditions

Storage conditions items 1-14 should be assessed for all facilities for products that are ready to be issued or distributed to clients. Please a check mark in the appropriate column based on visual inspection of the storage facility: note any relevant observations in the column must meet the criteria for each item.

S.N	Description	Yes	No	Comments
1	Products are arranged systematically (pharmacological/alphabetical)			
2	Are unwanted items (damaged or expired drugs, non-Pharmaceutical items, etc.) in the storeroom separated from the usable stock?			
3	Products are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible.			
4	The products are stored and organized in a manner accessible for first-to-expire, first-out (FEFO) issuing.			
5	Products are protected from direct sunlight and high heat at all times.			
6	The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well -organized).			
7	The currents space and organization is sufficient for Existing products.			
8	The storage area is secured with a lock and key.			
9	The storage area is visually free from harmful insects and rodents			
10	Cartons and products are stored in a good condition.			
11	Fire safety equipment is accessible (any item identified as being used to promote fire safety should be considered)			
12	Products are stored at the appropriate temperature according to product temperature specifications.			

13	Products are stacked at least 10 cm off the floor, 30 cm away from the walls, and no more than 2.5 meters high.			
14	Cartons and products are protected from water during all seasons.			
15	Products are stored separately from insecticides & chemicals			
16	Roof is maintained in good condition to avoid sunlight and water penetration			
17	Products are stored at appropriate Temperature specification			

Annex IV: Interview Guide

Do your facilities have own essential drug list? If yes, how do you assess from selection to procurement in your health facility?

With respect to

 Challenges in developing facilities own ELDs and its utilization?

 Major challenges of quantification and procurement process in your health facility?

What major challenges encountered concerning to inventory management and logistics management information system in your facility?

Are there mostly or frequently stock outs and over stocks/surplus of TDs at your facilities? If yes, what are the reasons of stock out & over stocks and which type of commodities are mostly stock outs and surplus?

How do you assess the storage and distribution practices in your facility

With respect to:

The size, location and sanitation of the store

Means of pharmaceutical Transportations

How do you assess the pharmaceutical wastages in your facility?

With respect to:

 Reasons for wastage/expiry of TDs.

What mechanisms used to reduce TDs wastage level?

Is there anything more you would like to add? ---------------------------------------

I will be analyze the information you and others will be given me, and I will be submitting a drafted report to my advisor at department of pharmacy, Jimma University, and I was happy to send you a copy to review at that time, if you are interested.

Thank you for your time and cooperation!!

Annex: V Data Abstraction-formats and Observation Checklists

Stock Status for 6 month and the day of visit

 Column:

Name of Tracer Drugs (TDs)

Unit of count for the product

 Note: Columns 1 and 2 should be filled out before questionnaires are printed for the survey.

Whether or not the product is managed at this facility, answer Y for yes or N if no. Note that for some products, at certain levels all facilities should manage the product. In such cases, this column should be marked Y.

Check if the stock card is available, answer Y for yes or N for no.

Check if the stock card had been updated within the last 30 days, answer Y for yes or N for no. Note: If the stock card was last updated with the balance of 0 and the facility has not received any resupply, consider the stock card up-to-date.

Record the balance on the bin card.

Record if the facility has had any stock out of the product during the most recent 6 full months before the survey, answer Y for yes or N for no.

Record how many times the product stocked out during the most recent full 6 months before the survey, according to stock cards, if available, or to a key informant if not. Note source information.

Record the total number of days the product was stocked out during the most recent full 6 months before the survey.

Record the number of months the issued data represents (may be less than 6); record the months for which there are any data recorded, including 0. Note: If column 4 is N, record NA in this column.

Record the quantity of product in open containers. Estimate the quantity of the product to 1/4, 1/2. Or 3/4 full using the smaller unit of count established in column 2.

 Record if the facility is experiencing a stock out of the product on the day of the visit, according to the physical inventory, answer Y for yes or N for no.

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

Tracer Drugs (TDs)	Unit of count	Managed at this facility Y/N?	Bin card available ? (Y/N)	Bin card updated ? (Y/N)	Balance on bin card	Stock out during in past 6 months (Y/N)	Number of stock outs	Total number of days	# of months of data available	Physical inventory in the Store	Stock out today? (Y/N)
1	2	3	4	5	6	7	8	9	10	11	12
Amoxicillin dispersible tablet											
ORS											
Zinc											
Gentamycin 80mg/2ml iv											
Co-trimoxazole 400mg/80mg											
Magnesium Sulphateinj 20%											
Oxytocin 10uU/ml											
Enalapril tablet											
Medroxyprojestrone											
Glibanclamide tab											
Adrenaline injection											
Pentavalent vaccine											
Glucose 40%											
Sodium chloride 0.9%1000ml											
Ferrous sulfate + folic acid											
Ciprofloxacin											
Ceftriaxone injection											
Hydralazine injection											
TDF/3TC/EFV adult											
RHZE/RH											
Tetanus Anti Toxins (TAT)											
Tetracycline eye ointment											
Artimetrine +Lumefantrine(Coartem) tablet											
Artesunate injection											
Implanon NXT											

Annex: VI TDs Expiry Data Collection Form

Date..........................Facility Name.. Facility type..............................
Data Collector..

Ask the store manager or responsible body to show expired tracer drugs list if possible with physical check the amount and take the price from model 19, or ask to give price list of expired products.

List of Products expired	Unit of count	Quantity expired	Unit price	Total expired price	Comments

Annex: VII List of Visited Health Facilities

S.N	FACILITY NAME	FACILITY ID	FACILITY TYPE
1	Mizan health center	01	Health Center
2	Debrework health center	02	>>
3	Zsazse health center	03	>>
4	Bebeka health center	04	>>
5	Sheko health center	05	>>
6	Bir health center	06	>>
7	Bibita health center	07	>>
8	Kuda health center	08	>>
9	Mizan tepi university teaching hospital	09	Teaching Hospital
10	Kite health center	10	Health Center
11	Genja health center	11	>>
12	Dizu health center	12	>>
13	Iteka health center	13	>>
14	Gezmeret health center	14	>>
15	Gichi health center	15	>>
16	Tikemt-eshet health center	16	>>
17	Meskerem-fire health center	17	>>
18	Maz health center	18	>>
19	Gabika health center	19	>>
20	Biftu health center	20	>>
21	Siz health center	21	>>
22	Kulagucha health center	22	>>
23	Kasheta health center	23	>>
24	Gacheb health center	24	>>
25	Gedu health center	25	>>

Annex: VIII . List of Tracer Drugs (TDs)

S.N	List of Tracer drugs (TDs)	Remark
1	Amoxicillin dispersible tablet	
2	ORS dispersible tablet	
3	Zinc	
4	Gentamycin 80mg/2ml iv	
5	Co-trimoxazole 400mg/80mg	
6	Magnesium Sulphateinj 20%	
7	Oxytocin 10uU/ml	
8	Enalapril tablet	
9	Medroxyprojestrone	
10	Glibanclamide tab	
11	Adrenaline injection	
12	Pentavalent vaccine	
13	Glucose 40%	
14	DNS1000ml iv infusion	
15	Ferrous sulfate + folic acid	
16	Ciprofloxacin	
17	Ceftriaxone injection	
18	Hydralazine injection	
19	TDF/3TC/EFV adult	
20	RHZE/RH	
21	Tetanus Anti Toxins (TAT)	
22	Tetracycline eye ointment	
23	Artimetrine +Lumefantrine(Coartem) tablet	
24	Artesunate injection	
25	Implanon NXT	