ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

ASSESSMENT OF PHARMACEUTICALS DISTRIBUTION EFFECTIVENESS: THE CASE OF CENTRAL PHARMACEUTICAL FUND AND SUPPLY AGENCY

BY

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External examiner	Signature	Date

DECLARATION

I, the undersigned, declare that this study on the "Assessment of Pharmaceuticals Distribution Effectiveness: The case of central Pharmaceuticals Fund and Supply Agency" is my original work and has not been presented for a degree in any other University, and that all sources of material used for the study have been duly acknowledged.

Declared by:

Name _____

Signature _____

Date _____

Statement of Certification

This is to certify that Gulilat Zebene has carried out his research work on the topic entitled "Assessment of pharmaceutical distribution effectiveness: The case of central Pharmaceutical Fund and Supply Agency". The work is original in nature and is suitable for submission for the award of Master Degree in Logistics and Supply Chain Management (M.A in LSCM)

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Advisor: Busha Temesgen, PhD

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Date:

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LIST OF ACRONYMS AND ABBREVIATIONS

CMS: Central medical store

FEFO: First expiry, first out

FMOH: Federal Ministry of Health

GDP: Good distribution practices

LMIS: logistics management information system

M &E: Monitoring and Evaluation

MIS: Management information system

PDRO: Private Drug Retail Outlet

PFSA: Pharmaceuticals Fund and supply Agency

PHCF: Public Health Care Facility

PLMP: Pharmaceutical Logistics Master Plan (PLMP)

PWH: Public Warehouse

RDF: Revolving drug Fund

RRF: Requisition and report form

SCM: Supply chain management

WHO: World health organization

ABSTRACT

The objective of this study was to assess the pharmaceutical distribution effectiveness at central Pharmaceuticals Fund and Supply Agency. To achieve the research objective the study employed a descriptive method and used quantitative research approach. Since the researcher target population was less than 100, total populations of pharmaceuticals and medical supplies storage and distribution directorate staffs were involved by using census method in the study. Accordingly 51 questionnaires were distributed, from which 44 questionnaires were properly filled and returned. The collected data were analyzed using descriptive statistics. The major finding from the study was improper pharmaceutical arrangement, inconvenient warehouse floor for movement of goods, fire safety equipment is unavailable and inaccessible, lack of security controlling system in the warehouse are identified as the major gap of the Agency for pharmaceutical storage practice. Regarding inventory control practice, there is no common data base, among central, branches and health facilities, to share the information about available products, stock out items and any transaction of health commodity to assist decision makers. Based on the result it can be concluded that the information management practice of PFSA is very poor. Furthermore, the original quality of the products will be lost before they reach to the end user due to exposure of harsh environmental condition during transportation. Generally, the health care needs of the public do not satisfied by Pharmaceutical Fund and Supply Agency. Therefore, the researcher recommend that the logistics management information system shall be improved and integrated with the health management information system and stock management of health facilities to improve forecasting and quantification of pharmaceuticals.

Key words: Pharmaceutical, warehouse, distribution, transportation, storage

CHAPTER ONE

1. INTRODUCTION

This chapter deals with the background of the study which begins by describing pharmaceutical logistics, statement of the problems, research questions , general and specific objectives of the study, significance and scope of the study. In addition an overview of how the paper is organized would be highlighted.

1.1 Background of the study

The status of health is one of the most important indicators of social development and progress. The provision of healthcare is also a major challenge to human life, and the treatment of disease is considered one way to achieve community health. The management of the drug circulation process to advance the aims of healthy people for sustainable development is an important issue. Each country should have a national drug policy as a main part of its health society policy so as to ensure the provision of effective, safe, qualified and affordably priced drugs for the government and people (Jahanbani *et al*., 2016).

To meet the health care needs of the public, effective pharmaceutical logistic management is required. According to Council of Supply Chain Management Professionals definition, logistics is the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from point of origin to point of consumption for the purpose of conforming to customer requirements (USAID | DELIVER PROJECT, 2011).

The goal of a health logistics is much larger than simply making sure a product gets where it needs to go. Ultimately, the goal of every public health logistics system is to help ensure that every customer has commodity security. Commodity security exists when every person is able to obtain and use quality essential health supplies whenever he or she needs them. A properly functioning supply chain is a critical part of ensuring commodity

security; financing, policies, and commitment are also necessary (USAID | DELIVER PROJECT, 2011).

The main purpose of pharmaceutical logistics is to achieve the six rights (right product, right quality, right quantity, right cost, right time, and right place). Pharmaceutical logistics involves the following main activities, selection, quantification, procurement, storage, distribution and use ((USAID | DELIVER PROJECT, 2011).

Pharmaceuticals distribution is one of the logistics activities as; it is the process by which medicines are transported from a central warehouse to storage depots and health facilities. Effectively designed pharmaceuticals supply system ensures that procurement, warehousing and transportation are seamlessly linked to form a network that can deliver the requested health commodities to health facilities and pharmacies in appropriate time, at the required quantities and at the lowest possible cost (Yadav *et al*., 2011).

In Ethiopia, a country wide assessment of the pharmaceuticals supply management system was undertaken to document the challenges faced in the procurement, storage and distribution of pharmaceuticals. The assessment revealed that long procurement lead times, inadequate storage infrastructure, and unsystematic distribution practices were major constraints to pharmaceuticals supply management system in the country. Based on the assessment result the main causes of these problems are poor procurement planning due to the lack of a logistics management information system (LMIS), inadequate staff capacity in the Federal Ministry of Health (FMOH) Pharmaceutical Administration and Supply Service and non-optimal administrative procedures at federal and regional government levels (FMOH, 2005).

Accordingly, Ethiopia`s Federal Ministry of Health (FMOH) has been working to ensure an efficient and high-performing healthcare supply chain that ensures equitable access to affordable medicines for all Ethiopians. However, there are various challenges remain, including an inadequate supply of quality and affordable essential pharmaceuticals, poor storage conditions, and weak stock management, which has resulted in high levels of waste and stock outs (Shewarega *et al*., 2015).

To address these challenges, FMOH began with the development of Pharmaceutical Logistics Master Plan (PLMP) in 2006. The PLMP proposed establishment of one government organization that will handle the public pharmaceutical supply chain management. Accordingly, Pharmaceuticals Fund and Supply Agency (PFSA) was established in 2007 by proclamation number 553/2007 (Shewrega *et al*., 2015)

Since its establishment in 2007, Pharmaceutical Fund and Supply Agency (PFSA), the lead organization managing the health care supply chain of the country, has been working to ensure the availability, accessibility, and affordability of essential medicines with appropriate quality, safety, and efficacy (Shewarega *et al*., 2015) .

In order to carry out its duties and responsibilities in an effective and efficient manner, PFSA is organized into four sub-processes (i.e. forecasting and capacity building, procurement, storage & distribution and medical equipment utilization and follow-up) and four supporting processes (fund management, human resource & general service, planning M &E, and MIS directorate) at head office level. And nineteen branches in the different regions of the country. The demand of the customer is considered to be sole drive for every function of the pharmaceutical supply management system. This implies that the data /information regularly obtained from public health facilities, which are the major stakeholders and customers of PFSA, is the basis for subsequent forecasting, procurement, storage, distribution and even capacity building activities (PFSA,2017).

1.2 Statement of the problem

Drug supply management is one of the important components of the health care system in particular for the proper, uninterrupted, and affordable supply of drugs and medical supplies. Especially a country like Ethiopia where the morbidity and mortality rate is very high which are preventable and treated with constant supply of affordable essential drugs; it requires to be given great attention and concern especially for the proper use of the limited resource (Getachew,2009).

It is estimated that pharmaceuticals may constitute up to 40% of health care budget in the developing countries .So worse in Ethiopia the total public health expenditure per capita is 15.5 Birr (2006/07). When estimating only 40% of this value to be used for

pharmaceuticals; one can imagine how large the value is and understands the requirement of using it rationally and systematically. According to current studies as many as 70% of pharmaceuticals on the world market today are duplicative or non essential, which makes it more complicated. For this and other basic reasons the selection, quantification, procurement, distribution, storage and use of drugs should be given utmost care and attention to get the maximum benefit out of the limited resource the country has (Getachew,2009).

For the proper and rationally use of drugs there should be an appropriate storage condition with maintained room temperature, humidity level, appropriate lighting, adequate security system and clean & pest free environment for all drugs. It is expected that drugs are arranged in their pharmacological or alphabetical order in the store so that they are easily identified and picked and may minimize accidental errors when issuing. More over a good storage practice encourages that the expiry dates of stored drugs should be clearly seen for follow up purpose and their sequence of usage should follow the FEFO or FIFO system. There should also be possibly a separate place to stock damaged or expired drugs so that they are not mixed with the usable ones and simple human errors can be avoided. In general manufacturer's recommendation for the storage of a particular drug/s/ stated on the labels should be followed. High value products including ARVs should be stored in relatively more secured place. For all this functions and to keep the drugs safe and secured and to maintain their quality throughout their life cycle, the drug storage facility should be designed and constructed to fit the purpose intended (Getachew,2009).

The distribution of pharmaceutical product is frequently handicapped by inadequate infrastructure (storage and transportation) and lack of effective management information systems. The information systems for tracking stock and associated documentation may be poorly managed, leading to gaps in the control of orders at all levels. Mismanagement of distribution is therefore common, leading to both the oversupply of unnecessary products and the under supply or stock-outs of essential items, including life-saving and other essential medicines (Adzimah *et al* 2014).

The handling, storage and transportation of pharmaceutical products also need special attention to avoid degradation, deterioration and fraud before reach to user. Therefore,

Good distribution practices (GDP) is an essential concept of pharmaceutical SCM to ensure systematic distribution of pharmaceutical products from manufacturing site to retailers at their original quality. The main problems arising during pharmaceutical distribution are: deterioration, counterfeit, pilferage, damage and theft during storage and transportation (Kumaar & Jha, 2015).

Global Fund audit report (2017) showed that inventory management system of PFSA is manual based, entry of the names of the medicines by different persons. This allows staff to enter a particular receipt more than once in the system by different users. This creates multiple receipts of the same medicine in the system and affects subsequent stock reconciliations. Incoming new goods do not visible at the system upon arrival, it lasts too much time in the warehouse. Therefore, these systems have not been aligned to enhance the reliability of financial and stock information provided by PFSA.

Based on observation of the company, the researcher observe that, in the warehouse of the given company its evident that there is a sign of poor distribution practices, for instance; some storage areas were overfilled while others are underused (poor layout), absence of information communication technology infrastructure, poor warehousing facilities, warehousing activities were performed through manually and such type of problems will create insufficient movements of the items, lead to great exposure of potential injuries, high time exhausted in the process of loading/unloading items. In addition there is a significant quantity of expired and damage drugs, poor product arrangement; filmable products are stored together with other products. Furthermore, transportation of pharmaceutical products were managed by drivers, the warehouses are located in different area it takes too much time and exposed to harsh condition to collect and load a truck from scattered warehouses for transportation.

In the other way, professionals at different levels of governmental health facilities said that they don't get most of their ordered quantity from PFSA and make them difficult to avail essential medicines at their health facilities. As a result most of the patients who are served by government health facilities get their prescribed medicines and ordered laboratory

investigations from private health institution due to stock out of essential medicines and laboratory reagents in the facility.

Therefore, this study was conducted to examine the existing pharmaceuticals distribution practice of PFSA by assessing the pharmaceutical storage condition, inventory control practices, order fulfillment and transportation of pharmaceutical products.

1.3 Research questions

1. How does PFSA distributing health commodities with their original quality throughout the distribution process?
2. To what extent PFSA supply health commodities to health facilities?
3. How does the Pharmaceuticals Storage practice of PFSA looks like?
4. What are the strategies adopted by PFSA to minimize wastage which might result for expiry, damage and theft?

1.4 Research objective

General objective

The main objective of this study is to assess the current status of the Pharmaceutical distribution practice in central PFSA with the aim of identifying the gaps, potentials and constraints for development of effective and efficient pharmaceutical distribution systems.

Specific objective

- To assess how PFSA distributing health commodities with their original quality throughout the distribution process.
- To determine the extent of PFSA supplying health commodities to health facilities.
- To assess the pharmaceuticals storage practice of pharmaceuticals Fund supply Agency.
- To investigate strategies adopted by PFSA to minimize wastage which might result for expiry, damage and theft?

1.5 Significance of the study

The findings of this study may benefit the Agency in understanding its pharmaceutical distribution practices and provides a ground for the Agency to reduce its wastage and external costs that could be resulted due to poor distribution practices. Moreover, the finding and the recommendation of the study could help the Agency to examine the gaps in the pharmaceuticals distribution system and design appropriate remedial action to address the identified gaps. Furthermore, findings of this study will provide base line information for other researchers who want to do further research on this topic.

1.6 Scope of the study

Ethiopian Pharmaceutical Fund and Supply Agency (PFSA) is the only governmental organization with its 19 branches in different region of the country to manage the pharmaceuticals supply chain. The Agency`s core activities are pharmaceuticals selection, quantification, procurement and distribution. The main focus of this study was on the pharmaceutical distribution system in central pharmaceutical Fund and Supply Agency. Pharmaceutical distribution majorly covers: Receiving, storage, warehousing, inventory management, cold chain management, order processing, security, transportation, dispatching, loading and unloading. Because of time and resource constraint this study focused only pharmaceuticals storage condition, transportation management of pharmaceutical products, order fulfillment and inventory control practice. The research was conducted using quantitative method of study.

Geographical scope of this study was restricted on Central Pharmaceutical Fund and Supply Agency in Addis Ababa as a case study. Pharmaceutical and Medical Supplies Storage and distribution Directorate Director, officers and Warehouse managers were included in the study. The data collecting tool was structured self administered questionnaires.

1.7 Operational definition of terms

Public health Facilities: are government owned hospitals and health centers who receive pharmaceuticals from PFSA.

Warehouse managers: are professionals who manage pharmaceutical products at different warehouses of pharmaceutical fund and supply agency.

Pharmaceuticals: are all medicines, laboratory reagents, medical supplies and medical equipments.

Distribution: Distribution is the process by which products are physically transferred from central PFSA warehouse to its hub and health facilities.

Warehouse: is large building where pharmaceuticals are stored prior to the distribution.

1.8 Limitation of the study

In conducting this study the researcher has faced many limitations and constraints. Lack of reference materials and previously conducted research in pharmaceutical distribution effectiveness which could help the researcher to see the existing research gaps were the major limitation. In addition, due to limitation of finance, time and manageability and geographic distance, the study is limited in assessing only some pharmaceutical distribution activities at central Pharmaceutical Fund and Supply Agency. Assessing the whole distribution functions and activities would be needed to get better conclusion.

1.9 Organization of the study

This research paper is organized in to five chapters. The first chapter deals with background of the study, statement of the problem, basic research questions, objectives of the study, definition of terms, significance of the study, limitation of the study and scope of the study. The second chapter deals with related literature review; third chapter presents methodology of the study; under this topic description of the study area, research approach, research design, study population, data source and type, data collection procedure ,data analysis, validity and reliability test and ethical consideration being included. The fourth chapter includes result and interpretation part. The last chapter deals with summary, conclusion, recommendation and future research forward.

CHAPTER TWO

2. RELATED LITERATURE REVIEW

This chapter contains theoretical review; empirical literature review; conceptual framework and identified literature gap. Theoretical literature deals with concepts and definition of pharmaceutical distribution by different scholar's, practical aspects of pharmaceutical distribution management in Ethiopia, key pharmaceutical distribution operations like storage, transportation, inventory control and order fulfillment would be presented in detail.

2.1 Theoretical Literature review

2.1.1 General views of Pharmaceutical Distribution Management

According to Weiss and Gershon, 2002, cited in Yeboah *et al*., 2013 noted that, distribution describes all the logistics involved in delivering a company's products or services to the right place, at the right time, for the lowest cost.

Distribution plays a key role within the marketing mix, and the key to success is its successful integration within the mix, ensuring that customers get their products at the right place and at the right time. If the product cannot reach its chosen destination at the appropriate time, then it can erode competitive advantage and customer retention (Yeboah *et al*., 2013).

Physical distribution management is the term used to describe the management of every part of the distribution process (Little and Marandi, 2003, cited in Yeboah *et al*., 2013). Physical distribution management includes the following functions: customer services; order processing; materials handling; warehousing; stock/inventory management & transportation. The key success factors of physical distribution management include all elements of the marketing mix: that is Product characteristics; packaging; pricing; promotional campaigns and timing is a critical element of pharmaceutical distribution management (Yeboah *et al*., 2013).

Distribution channel consists of a group of individuals or organizations that assist in getting the product to the right place at the right time. Distribution plays a vital role, primarily because it ultimately affects the sales turnover and profit margins of the organization (Yeboah *et al*., 2013).

The major challenge now facing the distribution activities is the power of the customers or buyers. This is because the customers are becoming increasingly knowledgeable, impatient, not wishing to wait for the suppliers' products for any period of time. This coupled with the fact that firms are now trying to implement specific distribution strategy or practices based upon their unique set of competitive priorities and business conditions to achieve the desired level of performance, has led to an investigation into the various distribution strategies and practices available with the view to establish the strategy or practice which has the most influence on distribution performance (Yeboah *et al*., 2013).

In the pharmaceuticals distribution system there are two main approaches that is pull or push system are used to distribute stock from the higher level store to a lower level store or health facility. In a push system, the central medical store (CMS) or the regional or district store determines what quantities of medicines are to be issued to each lower level store or the health facility, based on centrally estimated allocation quantities. In a pull system, each health facility determines the medicines requirements to be requisitioned or bought from the higher level warehouse. Pull system use local information about demand, which often does not reach the CMS and depends on good decision making ability and accountability at the decentralized level. A push system is robust to weak order and stock management capabilities at the lowest level of the distribution system (Yadav *et al*., 2011).

The push system is generally used for the distribution of medicines from vertical programmes and in countries where the funding of medicines is ensured by the government and managed at the central level. For countries where there is a cost recovery system in place (most of the Francophone countries in Africa), the pull system is used (Yadav *et al*., 2011).

The choice of a push or a pull system depends largely on in-country capacity to conduct stock planning and forecasting at each level of the supply chain as well as the level of maturity of the supply chain. Often a combination of push and pull systems is used in

which the regional or district stores pull stock from the CMS but then in turn use push-based allocation to distribute stock to the health facilities. Such an arrangement is currently used in multiple countries as it acknowledges the lack of stock planning capacity at the health facility level while achieving the benefits of the pull system for the primary leg of distribution i.e. from CMS to district or regional stores (Yadav *et al*., 2011).

Another important variable in the design of the distribution system is the resupply interval. In distribution models such as the ones currently in use in Kenya or Gambia, each health facility receives a delivery of stock every three months. This ensures the transport cost of the distribution system is reduced. A more frequent resupply interval is used in three-tiered distribution models, such as in the United Republic of Tanzania or Zambia, where delivery from the central medical store to the health facilities through district-level stores is once a month. Although more frequent resupply intervals lead to higher transport costs, they also result in a shorter forecast horizon for the health facilities, thereby allowing for better stock management and a lower chance of stock-outs (Yadav *et al*., 2011).

The quantity of stock held at each tier is based on a system of minimum-maximum rules for each level. Under such a system, orders are placed by the health facilities or lower level stores at regular intervals, but a product is ordered only if it has reached its minimum stock level; products reaching the minimum stock level are ordered/ resupplied to the maximum stock level. Although most countries surveyed have some form of minimum-maximum rule, strict adherence to the ordering rules remains poor (Yadav *et al*., 2011).)

2.1.2 Pharmaceuticals distribution cycle

According to Management Science for health (2012) the distribution cycle begin when pharmaceuticals are dispatched by the manufacturers or suppliers, it ends when medicine consumption information is reported to the procurement unit.

The major activities of pharmaceutical distribution cycle include the following steps: 1.Port clearing (for importing products); 2.Receipt and inspection; 3.Inventory control; 4.Allocation of supplies; 5.Delivering; 6.Dispensing to patient's 7.Consumption reports.

Port clearing: It is the process of clearing cargos from a land, sea or airport. Port delays can have costly consequence such as: Reduced shelf life or for vaccines and other very temperature sensitive items, possibly a complete loss of potency; deterioration of product; damage to product carton and other package or damage to outer identification; increased chance of theft; storage fee (demurrage) & stock out, resulting in emergency purchase made at higher unit cost and with the potential for unsure quality (MSH, 2012).

Receipt and inspection: Central store staff must carry out a complete inspection of every shipment as soon as it is received from the port or local supplier. The shipment must be kept separate from other stock until this inspection has been completed. Inspectors should check for damage and missing items and for compliance with the contract condition concerning drug type, quantity, and presentation, packaging, labeling and special requirements (MSH, 2012).

Inventory control: Establishing and maintaining effective inventory records and procedures are the basis for coordinating the flow of pharmaceuticals through the distribution system and primary protection against theft and corruption. The inventory control system is used for requisitioning and issuing medicines, for financial accounting, and for preparing the consumption and stock balance reports necessary for procurement. Record keeping must be sufficiently detailed to provide an audit trail that accurately traces the flow of medicines and funds through the system (MSH, 2012).

2.1.3 Public pharmaceuticals distribution Practice in Ethiopia

In Ethiopia, IPLS is the primary mechanism by which all public health facilities obtain essential and vital health products. The system explains not only physical flow of products but also the flow of information for decision making (PFSA, 2016).

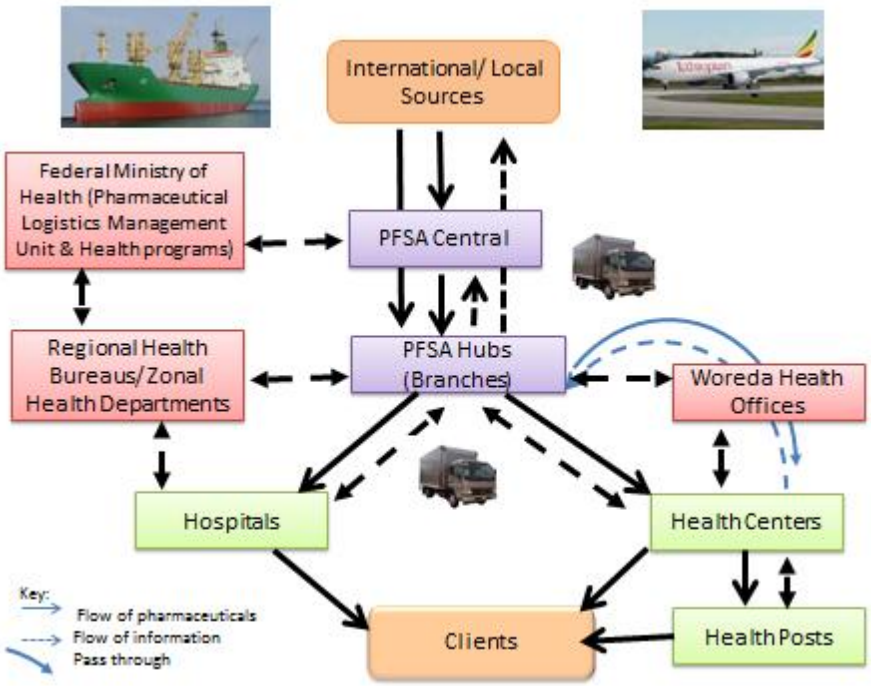


Figure 1.1: Overall flow of commodities and information in IPLS (Standard Operating Procedures Manual for the Integrated Pharmaceuticals Logistics System in Health Facilities of Ethiopia, 2015).

PFSA is managing Revolving drug Fund (RDF) and health program pharmaceuticals in parallel. Program pharmaceuticals are ordered every two months by hospitals and health centers and delivered by PFSA to these facilities directly or indirectly. Direct delivery sites are facilities that receive program pharmaceuticals directly from PFSA hubs whereas non-direct delivery sites are health centers that receive products from PFSA hubs through Woreda Health Offices (Standard Operating Procedures Manual for the Integrated Pharmaceuticals Logistics System in Health Facilities of Ethiopia, 2015).

Health posts report to health centers monthly and collect pharmaceuticals from those health centers; the health centers use the data in the health Post report to calculate consumption and re-supply quantities. For revolving drug fund (RDF) pharmaceuticals, health centers and hospitals will complete RRF as per the facilities review period which can be every two month, every quarter or every six months and collect products from affiliated PFSA branch (PFSA, 2015).

2.1.4 Effective pharmaceutical distribution management

For any organization to be effective in the pharmaceutical sector there should be effective distribution management process to convey finished products from the manufacturer to the final consumers. This is because without distribution the best product will not be delivered and the marketing mix will break down and fail (Yeboah *et al.*, 2013)

A well established drug supply management system facilitates the best use of financial & human resources, develops the essence of essential drugs, assures the continuous supply of affordable drugs, promotes the rational use of drugs and in general improves the quality of the health care system and access to essential medicines (Getachew, 2009).

In order to manage medicine distribution in an appropriate manner, there is a necessity of deep understanding of its management. The challenges of the pharmaceutical products supply chain are its specified shelf life and specified storage conditions. Managing quality of pharmaceuticals during distribution is a critical operation. There are various dosage forms of medicines example tablets, syrups, injectables etc. Each of them is to be stored at different
environmental conditions defined on the basis of stability of drug products. The desired features have high requirements for supply chain management and planning to achieve the goal of ensuring availability in health facility without increasing the quantity of wasted products (Kumar and Jha, 2015).

According to Management Science for Health, (2012) effective pharmaceutical distribution has the following features: Maintain a constant supply of medicines, Keep medicines in good condition throughout the distribution process, Minimize medicine losses caused by spoilage and expiry, Maintain accurate inventory records, Maintain medicines within their recommended storage points, Reduce theft and fraud and Provide information for forecasting of medicine needs.

2.1.5 Pharmaceutical distribution management

2.1.5.1 Pharmaceuticals storage management

Pharmaceuticals require secure storage in controlled climatic conditions and a reliable method of stock rotation. The FEFO rule (first expiry, first out) helps ensure that first expiry stocks are used up first. Security is another major consideration, access to the storehouse must be carefully controlled so that theft and embezzlement are minimized, and the persons who control access must themselves be trustworthy (Adzimah *et al,* 2014).

Proper storage conditions, including minimizing exposure to heat, light, and humidity, are important for drugs. For example tetracycline products, which become toxic when exposed to heat and oxytocin and ergometrine, which lose their potency when exposed to light and heat; all should thus be stored in the refrigerator. The same applies to insulin and, of course, most vaccines .Correct FEFO stock rotation will ensure that exposure to harsh conditions is minimized and that potency is preserved as much as possible. Ensuring good air circulation and preventing direct water contact are most important (Adzimah *et al,* 2014).

Principles of good storage:

Follow the manufacturer or shipper's directions when stacking, and follow labels for storage conditions; Place liquid products on the lower shelves or on the bottom of stacks. Store products that require cold storage in appropriate temperature-controlled zones; Store high-security and high-value products in appropriate security zones; Separate damaged or expired products from usable stock without delay, and dispose of them using established disposal procedures; Store all commodities in a manner that facilitates FEFO policy for stock management; Arrange cartons so arrows point up and identification labels, expiry dates, and manufacturing dates are visible. If this is not possible, write the product name and expiry date clearly on the visible side (MSH, 2012).

2.1.5.2 Pharmaceutical products transportation management

Transportation refers to the movement of products from one location to another such as moving products from the beginning of a supply chain to the customer's hands. It plays a

key role in every supply chain as products are rarely produced and consumed in the same location. The ability to transport goods quickly, economically and reliably is vital to a nation's prosperity and capacity to compete in global market (Fekadu, 2013).

The pharmaceutical manufacturer's original outer packing should withstand normal handling and transportation. At the intermediate store, this outer packing often must be removed to allow the assembly of small consignments; these must be repacked for transport in strong cartons. Empty space in partially filled cartons should be filled with newspaper, straw, wood shavings, or other loose material to stop the content from rattling about and prevent cartons from being crushed. Pallets and cartons should be carefully and systematically loaded into vehicles on a first-in /last-out basis. They must then be held secure by straps, nets, or other means .The vibration caused by travel over rough road can damage tablets and other breakable products; long journeys over rough roads should be avoided whenever possible (MSH,2012).

The people responsible for the transportation of pharmaceutical products should be informed about all relevant conditions for storage and transportation. These requirements should be adhered to throughout transportation and at any intermediate storage stages. Pharmaceutical products should be stored and transported in accordance with procedures such that: The identity of the product is not lost; the product does not contaminate and is not contaminated by other products; adequate precautions are taken against spillage, breakage, misappropriation and theft; appropriate environmental conditions are maintained, e.g. using cold chain for heat sensitive products (WHO, 2010).

Transportation and storage of pharmaceutical products containing hazardous substances, such as toxic, radioactive material, and other dangerous pharmaceutical products presenting special risks of abuse, fire or explosion (e.g. combustible or flammable liquids, solids and pressurized gases) should be stored in safe, dedicated and secure areas, and transported in safe, suitably designed, secured containers and vehicles. In addition, the requirements of applicable international agreements and national legislation should be met. Products containing narcotics and other dependence-producing substances should be transported in safe and secure containers and vehicles and be stored in safe and secure areas (WHO, 2010).

The interiors of vehicles and containers should remain clean and dry while pharmaceutical products are in transit. Packaging materials and shipment containers should be of suitable design to prevent damage of pharmaceutical products during transport. Seal control programmers' should be in place and managed properly. Drivers of vehicles should identify themselves and present appropriate documentation to demonstrate that they are authorized to transport the load. Damage to containers and any other event or problem that occurs during transit must be recorded and reported to the relevant department, entity or authority, and investigated. Pharmaceutical products in transit must be accompanied by the appropriate documentation (WHO, 2010).

2.1.5.3 Pharmaceuticals inventory management

Commodity management refers to overseeing the logistics of receiving, storing, transporting and distributing commodities along with maintaining commodity accounts and documents, preparing necessary commodity reports and keeping commodity losses to an acceptable minimum (Adzimah *et al* ,2014).

2.1.5.3.1 Pharmaceutical Logistics Management Information Systems

According to USAID | DELIVER PROJECT (2011) definition, a logistics management information system (LMIS) is the system of records and reports that you use to collect, organize, and present logistics data gathered across all levels of the system. Most important, a LMIS enables logisticians to collect the data needed to make informed decisions that will ultimately improve customer service.

To manage distribution effectively, LMIS should be in place. A logistics management information system collects, organizes, and reports data that enables people to make logistics decisions like resupply decision. The data collected is about pharmaceutical commodities, i.e., quantities issued, used, received, lost/stolen/damaged, ordered, etc. Data are analyzed daily to assess stock status (USAID | DELIVER PROJECT, 2011).

Essential Data for Decision-making:

If data are to be collected for decision-making, you need to know what data to collect and how frequently to collect it. To decide what data to collect, look at the decisions you will need to make. Think about the questions logistics managers might ask. What information would they need to answer those questions and make informed decisions? The questions might include the following: How long will current supplies last? ; When do we need to order more supplies? ; Where are our supplies in the pipeline? ; Do we need to move supplies from higher to lower levels? ; Where is consumption the highest? ; Do those facilities need more resources? ; Are we losing products from the system that requires us to take action? ; Are supplies flowing smoothly through the pipeline? ; Do we need to adjust our pipeline to account for bottlenecks in the distribution system? ; Are any products about to expire? ; Should we take them out of the pipeline? & can we redistribute them; can they be used before they expire (USAID | DELIVER PROJECT, 2011).

To make logistics decisions, a logistics manager needs three essential data items: Stock on hand: the quantities of usable stock available; Consumption (issued): the quantity of stock issued to facilities or used during a particular time period; Losses and adjustments: Losses are the quantity of stock removed from the pipeline for any reason other than consumption by clients or use at the service delivery point due to expiration, theft, damage, etc (USAID | DELIVER PROJECT, 2011).

2.1.5.3.2 Pharmaceutical Inventory Control and Record Keeping

Inventory control is an integrated process to protect stored items from loss, damage, theft, or wastage and to manage the reliable movement of supplies from source to user. The purpose of inventory control system at health facility level is to record the receipt & issuance of stock, maintain sufficient stock, maintain stock at the lowest possible cost, and prevent expiration of drugs. Any inventory control procedure to manage proper stock and purchasing process should address: safety stock, minimum and maximum stock levels, reorder frequency and reorder quantity (Getachew, 2009).

Inventory records should be maintained for all products on stock. Standard Forms used for inventory control include: bin cards, stock cards, stock movement cards, requisition/issue voucher, receiving forms and delivery note and others. As a basic working principle the

following minimum information should be incorporated on stock records for drugs:- Product name (dosage, strength,), stock on hand/beginning balance, unit cost and total cost, receipts/issues, losses/adjustments, closing/ending, balance, and lot no./expiry dates/bin location on shelves (Getachew, 2009).

From a logistics point of view, only three things can happen to supplies in a pipeline they can be stored, moved (in transit), or consumed (used). Because we want to monitor products at all times in the pipeline, we need three types of logistics records to track the pharmaceutical products. Each record type has a distinct form and use: Stock keeping records- It keeps information about products in storage. Example: bin card, stock card; transaction records- It keeps information about products being moved. Example: stock transfer voucher/issue voucher, RRF, etc. consumption records. It keeps information about products being consumed, issued or used. Examples: daily registration forms (USAID | DELIVER PROJECT, 2011).

2.1.5.4 Order fulfillment management

Order fulfillment is a key process in managing the supply chain. It is the customers' orders that put the supply chain in motion, and filling them efficiently and effectively is the first step in providing customer service. However, the order fulfillment process involves more than just filling orders. It is about designing a network and a process that permits a firm to meet customer requests while minimizing the total delivered cost. This involves more than logistics, and it needs to be implemented cross-functionally and with the coordination of key suppliers and customers (Croxton, 2003).

Order fulfillment involves generating, filling, delivering and servicing customer orders. In some cases, it is only through this process that the customer interacts with the firm, and therefore, the order fulfillment process can determine the customer's experience .To accomplish these tasks, management must design a network and a fulfillment process that permits a firm to meet customer requests while minimizing the total delivered cost. At the operational level, the order fulfillment process focuses on transactions, while at the strategic level, management can focus on making critical improvements to the process that influence the financial performance of the firm, its customers and its suppliers. For

instance, order fulfillment directly affects product availability which influences total sales volume (Croxton, 2003).

2.2 Empirical Literature Review

Global Fund (2017) audit report showed that, the inventory management system in PFSA has duplicate records for medicines and automated controls have not been fully activated, which does not allow adequate monitoring of changes to stock balances. Audit report in the audit sample, around 20% and 54% of anti-malarial and TB medicines respectively could not be traced due to the multiplicity of systems at the central level. For instance, stock balances are often adjusted in the system without adequate approval. There are delays in the procurement processes. Expired medicines had also accumulated in various PFSA warehouses last four years, with increasing storage costs for unusable medicines (Global Fund, 2017).

The utilization rate of the PFSA's central warehouse at the time of the audit was 65%. Nine out of the 10 regional warehouses visited had severely damaged floor space, which limits their ability to use the available racks in those warehouses. Also, most of the stores in health facilities visited had up to one third of storage space filled with expired medicines. Expired medicines at PFSA's owned and rented warehouses and all health facilities visited have accumulated over five years (Global Fund, 2017).

The research done by Beyen Gashu (2016) at the Addis Ababa University entitled "Improving Inventory Management at SUR Construction Company" indicate that major inventory management techniques such as minimum-maximum level, safety level, lead-time analysis, and inventory cost decision and economic order quantity are not applied in the company. Hence, researcher concludes that the main contributing factor for inventory management in effectiveness to the construction company, which results in high stocks outs and non-moving obsolescence items, rush ordering, unplanned and urgent purchasing items, is the staff development and capacity incompetence.

In the assessment of the pharmaceutical supply system conducted in Tanzania indicated that stock availability of twenty tracer medicines was at an average of 79% at the dates of evaluation in the zonal Stores. The stock out situation measured by the number of days the

item has been out of stock in a year ranged between 1-183 days. Stock management techniques also were found to be weak except for traceability of batches and the definition of minimum stock levels. This could have contributed highly on the number of expired medicines and supplies which was found to be 3.7% of sales for the year for 2006 at the central store.

The assessment also found that, most facilities studied had a functioning pharmacy system (88.9%) and kept essential medicines (92.9%). However, in most of the pharmacies, a general inadequacy of storage space, storage equipment and facilities for controlling temperatures were found. For example only 33% of pharmacies reported to have adequate storage capacity, only 52% had facilities for cold storage and only 22% had adequate storage equipment. Important parameters in stock management such as maximum and minimum levels of stock were not determined in almost all facilities. The assessment showed the level of stock management in almost all of the pharmacies needed to be improved. Although availability of tracer medicines was high at health facilities, the same facilities also presented a considerable number of stock-out days. Some medicines were out of stock for 4 months (MOH Tanzania, 2009).

For most products assessed, the percentage of facilities resupplied with the quantity ordered was about 60 percent, both at the hospital and health center level. At the health center, ORS, hormonal implants, and nevirapine were resupplied in more than 70 percent of facilities .At hospitals, eight products out the 15 analyzed were resupplied in about 70 percent of the facilities. At both the hospitals and health centers, the resupply with the requested quantities was near or below 50 percent for amoxicillin (33 percent at hospitals and 40 percent at health centers) and dextrose (50 percent at hospitals and 42 percent at health centers) (Shewarega, *et al.,* 2014).

The survey tried to assess the perceptions of facility staff on the timeliness and the resupply of products, as per their request. Regardless of the type of product, more than 80 percent of both hospitals and health centers say they usually receive products requested within one month or less. Only 4 percent of the facilities reported waiting for more than two months to receive products after placing orders (Shewarega, *et al.,* and 2014).

According to Dessalegn (2015) study result the data visibility at PFSA is poor coordination, lack of accountability and lack of data management and dissemination skills. As a result stock on hand, procurement and pipeline information, and stock out notifications were not organized and shared to both FMOH and stakeholders on regularly bases. The data visibility concerns at health facility were mostly lack of accountability, poor adherence to schedule, and lack of completeness and quality of reports.

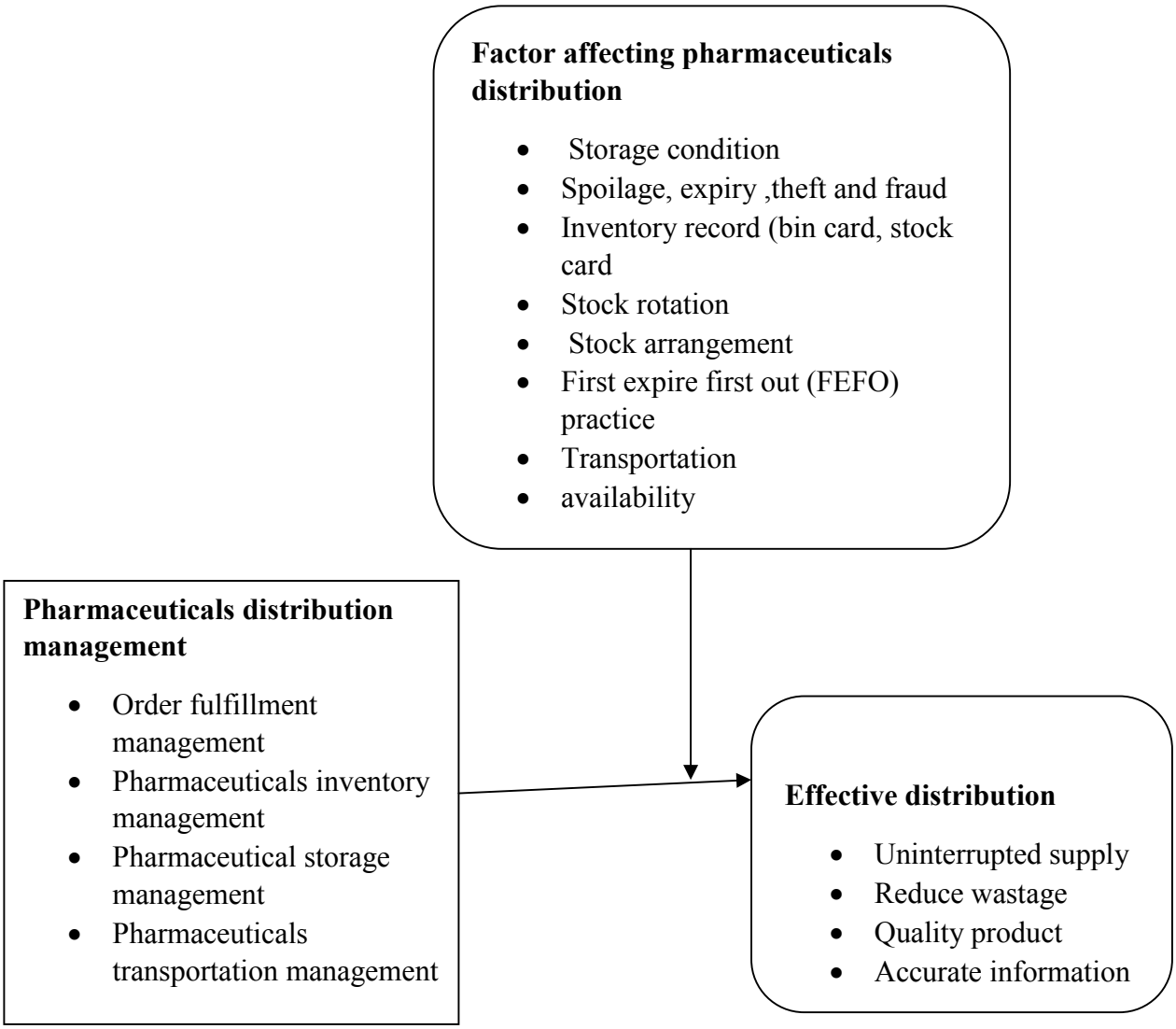
The National assessment of the pharmaceutical sector in Ethiopia, 2010 also showed that the storage conditions of the stores and dispensaries of both PHCF's and PDRO's were inadequate. In PHCF's, among the criteria considered for proper storage, only 68.3% for the stores and 78.1% for the dispensaries were fulfilled. The situation also observed for the PDRO's was 70% for the stores and 80% for the dispensaries. PWH's were observed to have ideal storage conditions (median of 100%). No expired drug was observed for the public warehouses, public health facilities and PDRO's surveyed (WHO and MOH, 2010).

The study conducted on quality perspective of 'good distribution practices in Indian pharmaceutical industry showed that most of the quality of pharmaceutical products is affected at the time of distribution. According to the survey result most of the time products are exposed to direct sun light during transportation and these are the cause of substantial generation of impurities as result of product degradation (Kumaar & Jha, 2015).

The other study conducted on factors affecting for distribution performance of pharmaceuticals in Kenya public sectors in 2012, showed that financial capacity directly and positively related to distributional performance. The findings indicate that relations with government, donors and transport outsourcing followed by information technology and financial capacity have the greatest influence on distribution performance respectively (Achuora *et al.*, 2012).

2.3 Conceptual Framework

Determinants of effective distribution are congregated into four constructs of pharmaceutical transportation management, storage management, inventory control management & order fulfillment management. The relationship between these constructs with effective distribution is conceptualized as follows.



(MSH, 2012)

Figure 2.1: Factors affecting distribution performance

2.4 Identified literature gap

For this study, the researcher reviewed a lot of empirical and theoretical literature which are relevant to the present thesis. Most of the studies are focused on the availability of the storage areas, cost minimization, warehousing management practice, distribution channel etc. The potential areas that will affect pharmaceuticals original quality such as pharmaceutical transportation management, storage condition for example how does heat sensitive pharmaceutical products are stored and transported, inventory control practice which tell the decision maker about stock on hand, monthly consumption, issued quantity, maximum and minimum level of the product, order fulfillment which affects customer satisfaction were not assessed by this revealed empirical research. The researcher was tried to fill these gaps on the areas which are not researched by other.

CHAPTER THREE

3. METHODOLOGY OF THE STUDY

This chapter presents the research design and methods that are used to achieve the objectives of the research. It includes description of the study area, research approach, research design, study population, data source and type, data collection procedure ,data analysis, validity and reliability test and ethical consideration that are used to achieve the objectives of the research.

3.1 Description of study area

Pharmaceuticals Fund and Supply Agency (PFSA) is the study area of this research. It was established in 2007 by proclamation number 553/2007 with mandated to avail affordable and quality pharmaceuticals sustainably to all public health facilities and ensure their rational use. It has 19 branches in different regions which will supply pharmaceuticals for more than 3,500 public health facilities of the country. The head office is located in Addis Ababa Gullele Sub-City approximately 2.8 km west of Piazza. There are also 12 warehouses managed by Central PFSA in Addis Ababa that are located 2 in Nifas silk Lafto Sub-city around Lebu, 5 in Akaki Kality Sub-city around Saris Abo ,1 in Bole Sub-city around Jakros ,5 in Gullele Sub-city, out of which 4 are inside head office in front of St. Paulos hospital and 1is around Shegole.

3.2 Research approach

The research was used quantitative research approach. Quantitative research as a type of research that is `explaining phenomena related to the research topic by collecting numerical data that could be analyzed using mathematically based methods (in particular statistics).

3.3 Research design

Research design is the blueprint for fulfilling research objective and answering research questions. There are three types of research design, namely exploratory (emphasize discovery of ideas and insights), descriptive (concerned with determining the frequency

with which an event occurs or relationship between variables) and explanatory (concerned with determining the cause and effect relationship) (John, A.H.,*et al*.,2007). In order to describe and examine the current distribution practices of the case company, the researcher followed a descriptive research design. Descriptive research allows the researcher to assess and describe the present situation of distribution practices of the selected company. The data was collected by using closed-ended questions which are found on questionnaires.

3.4 Population

The target population numbers for this research were 51. These defined to be 28 warehouse managers, 20 storage and distribution officers, 2 team coordinators, and Pharmaceuticals and medical supplies storage and distribution directorate director. Since the population size for this research are less than 100, all target populations were included in the study using census method.

3.5 Data source and type

For this research primary data was used as a data source. The primary data was collected by using questionnaires, which have closed ended questions.

3.6 Data collection procedure

A formal letters of support were issued from AAU school of commerce to PFSA. During data collection first respondents were asked their consent, after getting their consent questionnaire was distributed to participants for data to be collected by questionnaire.

3.7 Data analysis

For the purpose of this study data were analyzed using Statistical Packages for the Social Sciences (SPSS version 20) soft ware. Frequency table and percentage were used to summarize the demographic information of respondents; whereas, descriptive statistics such as mean and standard deviations of the respondents scores on all dimensions were assessed in order to determine the extent of distribution performance of the company. Finally, the discussion of result and interpretation of analysis was provided. Based on findings of the study conclusions and recommendation was forwarded.

3.8 Validity and Reliability test

Validity test

In the validation process of this study, copies of the questionnaire and copies of the research questions were given to some experts. The comments of the experts were included in the questionnaires. Having validated the questionnaire, a pilot testing was carried out on 3 storage and distribution officers and 2 warehouse managers in order to see how the subject will react to the questionnaire whether the items are clear enough and easily understood and whether there is the need to include more items in certain areas. Accordingly, all five distributed questionnaire were returned with some comments. Then, the comment found from pilot study was incorporated to the main questionnaires.

Reliability test

Reliability is the extents to which a variable or set of variables is consistent in what it is intended to measure and the rationale for this internal consistency is that the individual items or indicators of the scale should all be measuring the same construct and thus be highly inter-correlated. A high value of the Cronbach alpha coefficient suggests that the items that make up the scale are internally consistent and measure the same underlying construct. A value of Cronbach alpha above 0.70 can be used as a reasonable test of scale reliability (Cronbach, 1951).The resulting Cronbach's alpha values of the dimensions are presented in the table that follows:

Table 3.1 Cronbach's Alpha test result from SPSS

	Reliability Statistics	
	Cronbach's Alpha	N of items
Pharmaceuticals storage practice	0.838	7
Pharmaceuticals transportation practice	0.820	5
Pharmaceuticals inventory control practice	0.789	7
Order fulfillment practice	0.724	4
Indicator of effective distribution	0.749	4
Total N		27

As shown in the above table, the reliability of the scale was determined by Cronbach's alpha method. Cronbach's Alpha test result of 0.7 and above implies acceptable level of internal reliability; therefore, the result indicated that all the questioners are within acceptable range.

3.9 Ethical consideration

Before the start of data collection, supportive letters was delivered to PFSA's storage and distribution directorate to get permission for data collection. Oral consent was obtained from the directorate and respondents and confidentiality was assured for any information regarding this research. All the information and documents including the questionnaire filled by the customers were used ethically without falsifying the original intention of the respondents and also kept confidential. To insure the confidentiality of the respondents the researcher told the respondents not to write their name in the questionnaire. Respondents have the right to safety from physical or psychological harm, to be informed at all aspects of a research task, keep their privacy and Confidentiality and also have the right to withdraw from the research any time.

CHAPTER FOUR

4. RESULT AND INTERPRITATION

In this chapter, the data collected from respondents have been presented and discussed. The chapter begins by presenting the response rate, background information of respondents under the demographic variables, followed by data presentation and discussion.

4.1 Response rate

As indicated in chapter three, the respondents were from pharmaceuticals and medical supplies storage and distribution directorate which includes pharmaceutical and medical supply storage and distribution officers, warehouse managers, team coordinators and director at PFSA head office. To collect the data and facts about pharmaceuticals distribution performance at central PFSA 51 questioners were distributed and 44(86 %) were returned with full information. From distributed questionnaires 7 (14%) were not returned. And finally data collected from 44 respondents were analyzed.

4.2. Result of the survey and discussion

4.2.1 Demographic characteristics of the respondents

The first part of the questioner contains the socio-demographic information of participants. This part of the questioner requested a limited amount of information related to general demographic background of the respondents. Accordingly, the following variables about the respondents were summarized in Table 4.1. These variables are Gender, Age, Educational background, Job position, Years of service at PFSA and Working department.

Table 4.1 Sex of respondents

S.N	Charactherstics of respondants		Frequency	Percentage (%)
1	Gender	Male	33	75
		Female	11	25
		Total	44	100

Source: Field survey, 2018

In this study, a total of 44 respondents were participated of which 33(75 %) male and 11 (25 %) female respondents were involved. This shows that most of pharmaceuticals and medical supplies storage and distribution directorate staffs are male.

Table 4.2 Age of respondents

S.N	Charactherstics of respondants		Frequency	Percentage (%)
2	Age	Less than 25	3	6.8
		25 - 34 years	30	68.2
		35 - 54 years	11	25
		Above 55 years	0	0

Source: Field survey, 2018

Concerning their age 30 (68.2%) fall in the category of 25-34 years, 11(25 %) fall within 35 to 54 years and 3 (6.8 %) are fall less than 25 years. Therefore, it indicates greater number of respondent fall within 25 to 34 years which represents 68.2%. It is assumed that majority of the respondent fall within the working force since the youth are also part of the force to achieve PFSA's objective.

Table 4.3 Educational background of respondents

S.N	Charactherstics of respondants		Frequency	Percentage (%)
3	Educational background	Certeficate	0	0
		Diplaoma	13	29
		Degree	28	64
		Master	3	7
		Others	0	0

Source: Field survey, 2018

Regarding educational background of the respondents 28 (64%) were with qualification of Degree and the remaining 13(29%) and 3(7%) were with Diploma and Masters Degree respectively. This showed 71 % of the respondents with qualification of Degree and Masters. Therefore, it can be assumed that they are able to understand and clearly identify the existing distribution practices and its challenges. Moreover, it increases the validity of the findings.

Table 4.4 Work position of respondents

S.N	Charactherstics of respondants		Frequency	Percentage (%)
4	JobPosition	Director	1	2.3
		Team coordinator	2	4.6
		Storage and distribution officer	17	38.6
		Warehouse manager	24	54.5
		Others	0	0

Source: Field survey, 2018.

Analysis of respondent's job position revealed 24(54.5%) were warehouse managers, while 17(38.6%) were storage and distribution officers, the rest 2(4.5%) and 1(2.3 %) were team coordinators and storage and distribution directorate director respectively. This implies that the data was taken from the right place that able to answer the raised question.

Table 4.5 Work experience of respondents

S.N	Charactherstics of respondants		Frequency	Percentage (%)
5	years of service at PFSA	Below 5 years	30	68.2
		5 - 8 years	13	29.5
		9 - 12 years	1	2.3
		Above 13 years	0	0

Source: Field survey, 2018

In the case of work experience in PFSA majority 30(68.2%) of total respondents have work experience below 5 years, the remaining 13(29.5%) between 5-8 years and 1(2.3%) within 9-12 years respectively. This shows that about 68 % of the respondents less than 5 years work experience in PFSA. This implies that there will be the considerable challenges in handling large transaction at PFSA head office.

Table 4.6 Work department of respondents

S.N	Charactherstics of respondants		Frequency	Percentage (%)
6	working directorate	Storage and distribution	44	100
		General service and properties administrative	0	0
		Others		

Source: Field survey, 2018

Regarding working department all 44 (100 %) of the respondents were from pharmaceutical and medical supply storage and distribution directorate. This shows that the entire variable included in this study can be answered by pharmaceuticals and medical supplies storage and distribution directorate staffs.

4.2.2 Assessment of pharmaceuticals distribution management

Concerned respondents' perceptions were captured along 28 items corresponding to the five dimensions using likert scale that were introduced to measure the study constructs. Respondents rated their extent of perception from strongly disagree to strongly agree. 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

4.2.2.1 Pharmaceutical products storage management of PFSA

Table 4.7 Pharmaceutical storage practices

Pharmaceuticals product warehousing and storage practice	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
Products are arranged on shelves with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible	4(9.1)	30(68.2)	5(11.4)	5(11.4)	0	2.25	0.781
The floor is convenient for movement of goods during receiving, put away, and dispatching activities like forklift.	7(15.9)	28(63.6)	4(9.1)	5(11.4)	0	2.16	0.834

Products are not stored at the appropriate temperature according to product temperature specifications (8°–30°C) and including cold chain storage (2°–8°C), as required for certain products.	4(9.1)	29(65.9)	3(6.8)	6(13.6)	2(4.5)	2.39	0.993
There are not backup source of power like generator and solar energy for cold chain storage.	3(6.8)	23(52.3)	11(25)	6(13.6)	1(2.3)	2.52	0.902
Storage area is visually free from harmful insects and rodents.	2(4.5)	33(75)	4(9.1)	5(11.4)	0	2.27	0.727
Fire safety equipment is available and accessible.	3(6.8)	27(61.4)	6(13.6)	7(15.9)	1(2.3)	2.45	0.926
There is security controlling system in the warehouse with camera and alarms.	3(6.8)	31(70.5)	7(15.9)	3(6.8)	0	2.23	0.677
							Mean of Mean= 2.324

Source: Field survey, 2018

The mean values of each of the items of pharmaceuticals transportation management indicator were calculated between 2.16 and 2.52 with almost comparable standard deviations that range between 0.677 and 0.993. The lowest mean value is registered in the case of the warehouse floor is convenient for movement of goods during receiving, put away, and dispatching activities like forklift and defined availability and accessibility of security controlling system in the warehouse with camera and alarms in the second place followed by the mean score for product arrangement on shelves with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible and storage area is visually free from harmful insects and rodents in the third and fourth place respectively, while products are not stored at the appropriate temperature according to product temperature specifications in the fifth place; whereas, fire safety equipment is available and accessible in the sixth place and there are not backup source of power like generator and solar energy for cold chain storage place comes last in the ascending order.

As summarized in the above table 4.7 regarding pharmaceutical products arrangements on shelves with identification label 68.2 % of the respondents rated as disagree, while 9.1 % of respondents strongly disagree,11.5 % neutral and 11.5 agree with the mean score value

2.25. The result showed that warehouses infrastructure at PFSA such as shelves and racks are not installed. Since, most of the agency's warehouses are rented from private sectors which are not furnished with shelves and racks for the purpose of pharmaceutical product arrangement. If products are arranged directly on the floor or on the pallet, it make difficult to warehouse managers to distribute the product with FEFO procedure. Because, warehouse manager do not easily see the product's information such as expiry date, manufacturing date, batch number, and product description .The installation of the proper equipments, instruments, and furniture in the warehouse is equally important to that of the physical facility and facilitates the work flow, storage condition, issuance and generally handling of drugs.

Whereas, the respondents asked to quantify their level of perception about, quality of the warehouse's floor that is convenient for movement of goods during receiving, put away, and dispatching activities, 63.6 % of the respondents said disagree and 15.9 % strongly disagree, 9.1 % said neutral; while 11.4 % agreed with the mean score value 2.16. This result showed that the probability of products to be damaged during dispatching would be high due to rough surface of the floor, Global Fund (2017) audit report support the findings. The Global Fund field survey result showed that, nine out of the 10 regional warehouses visited had severely damaged floor space, which limits their ability to use the available forklift in those warehouses.

In response to the suggestion to quantify their level of perception, 75 % of the respondents said disagree, while 6.8 % of respondents have no idea and 18.1 % agreed with mean score value 2.39 on pharmaceutical products are not stored within specified storage temperature. Every activity in the distribution of pharmaceutical products such as storage and transportation should be carried out according to recommended storage temperature set by manufacture. Therefore, the result showed that products at PFSA are stored at the appropriate temperature according to product temperature specifications (8°–30°C) and including cold chain storage (2°–8°C). For the proper and rationally use of drugs there should be an appropriate storage condition with maintained room temperature, humidity level, appropriate lighting.

The respondents perception for the question that there are no back up source of power like generator and solar energy for cold chain storage, majority (59.1%) of the respondents said disagree, while 14.9 % of respondents agreed and 25 % of the respondents have no idea with mean score value 2.52. The result showed that; heat sensitive products are maintained within their storage condition, without power interruption at PFSA. Cold chain product shall be maintained within 2-8 degree centigrade throughout the distribution process to deliver products with their original quality. If the temperature exceed from the range products will lose their potency, efficacy and safety.

The respondents were also asked to rate the degree of their perception on storage area is visually free from harmful insects and rodents; majority (79.5 %) respondents said disagree; 11.5 % said agree, while 9.1 % of the respondents have no idea with mean score value 2.27. This result showed that products in the warehouse are arranged on the floor without shelf and rack; it is favorable condition for insects and rodents to exist there. It leads to the products being damaged by insects and rodents.

As high as 68.2 % of respondents rated as disagree and 18.2 % said agree while 13.6 % of respondents have no idea with mean score value 2.45 on the availability and accessibility of fire safety in PFSA warehouse. The result revealed that fire safety is not available and accessible in PFSA warehouse. Since pharmaceutical products incurs significant cost and susceptible to fire risk, pharmaceutical storage warehouses should be secured and being accessible with fire safety equipment. The installation of a pressurized hydrant system should be in place to protect unforeseen fire outbreaks. In a place like the drug storage where easily ignited and burnable chemicals are stacked, a small fire accident can bring great damage to property and human life that proper training and intervention should change the situation.

Regarding availability of security controlling system in the warehouse with camera and alarms 77.3 % of the respondents said disagree; 6.8 % agreed while 15.9 % said neutral. The result revealed that PFSA has not any mechanism to track those who are attempted to theft and fraud. The equipments are not so much expensive that they can be installed easily and the proper safety and security system of the drug storage and as a whole the warehouse is maintained and unexpected severe damage and theft avoided.

Generally, represented mean scores of the items of pharmaceutical storage management indicator suggest that respondents in the company believed that lower efforts have been made by Pharmaceutical Fund and Supply Agency to enhance pharmaceutical storage practices except in the case of product storage temperature and availability of back up source of power for cold chain items.

4.2.2.2 Pharmaceutical products transportation management

Table 4.8 Pharmaceutical products transportation practice

Pharmaceuticals products transportation practice	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
The people responsible for the transportation of pharmaceutical products have enough knowledge about the product character and its relevant conditions for storage and transportation.	12(27.3)	27(61.4)	3(6.8)	2(4.5)	0	1.89	0.722
The interiors of vehicles and containers remain clean and dry while pharmaceutical products are in transportation.	7(15.9)	30(68.2)	5(11.4)	2(4.5)	0	2.05	0.68
Heat sensitive products such as vaccines, biological products and reagents are not transported by vehicle fitted with refrigerator.	6(13.6)	20(45.5)	13(29.5)	5(11.4)	0	2.36	0.865
Pharmaceutical products are protected from direct sun light, humidity and contaminants during transportation.	7(15.9)	29(65.9)	6(13.6)	2(4.5)	0	2.07	0.695
GPS is placed on vehicles that are transporting pharmaceuticals products	4(9.1)	28(63.6)	7(15.9)	5(11.4)	0	2.3	0.795
						Mean of Mean = 2.134	

Source: Field survey, 2018

The mean values of each of the items of pharmaceuticals transportation management indicator were calculated between 1.89 and 2.36 with almost comparable standard deviations that range between 0.68 and 0.865. The lowest mean value is registered in the case of level of knowledge of the person who are responsible for product transportation about characteristics of product and defined the extent of cleanness and dryness of interior

vehicle while pharmaceutical product transportation in the second place followed by the mean score for pharmaceutical products are protected from harsh condition during transportation and placement of GPS on the vehicle that are transporting pharmaceuticals products; while using vehicle fitted with refrigerator for transportation of heat sensitive products comes last in the ascending order.

As depicted on table 4.8 in the transportation management practice, for the level of respondent's perception majority (88.7 %) disagreed, 4.5 % agree while 6.8 % of the respondents have no idea with mean value 1.89 on the extent of knowledge of the person who are responsible for the transportation of pharmaceutical products about characteristics and storage condition of the product. The result showed that pharmaceutical products in the PFSA distribution system are transported by persons who are not trained about characteristics and storage condition of products. To maintain product within its original quality, safety and efficacy during transportation, the responsible person shall be trained about product's physical and chemical characteristics and how to maintain their storage conditions during transportation. While pharmaceutical products are placed beyond recommended storage temperature during transportation, the product cannot survive and there will be substantial generation of impurities as result of product degradation. In such cases impurities will be harmful to patient's health.

Whereas respondent level of perception for the question that, the interiors of vehicles and containers remain clean and dry while transportation of pharmaceutical products, 84.1% said disagree, 4.5 % agree, while 11.4 % said neutral with mean score value 2.05. The result showed that pharmaceutical products have the probability to decay and contamination during transportation. When pharmaceutical products are loaded on vehicle that its interior body is wetted, product will be decomposed and loses its original quality.

Respondent's perception on the question that, heat sensitive products such as vaccines; biological products and reagents are not transported by vehicle fitted with refrigerator 59.1 % said disagree, 11.4 % agree, while 29.5 % of respondents have no idea with mean value 2.36. The result showed that heat sensitive pharmaceutical products are transported by vehicle fitted with refrigerator to maintain storage temperature of the products during

transportation. Heat sensitive products such as vaccine, reagent and biological products at PFSA are stored within range of temperature 2-8 degree centigrade during transportation.

For the question, that pharmaceutical products are protected from direct sun light, humidity and contaminants during transportation 81.8 % disagree, 4.5 % agree, while 13.6 % neutral (has no idea on the issue.) with mean value 2.07. The result revealed that the trucks available at PFSA for transportation of pharmaceutical products do not designed to protect direct sun light; humidity and contaminants.

For the question, that pharmaceutical products are transported with vehicles that are placed with GPS 72.7 % disagree, 11.4 % agree while, 15.9 % neutral with mean value 2.3. The result showed that, there is no controlling mechanism for vehicles to secure products during transportation. The global positioning system (GPS) technology is very common in developed countries which enable them to control their product at time of transportation.

The noticeably represented mean scores of the items of pharmaceutical transportation management indicator suggest that respondents in the company believes that lower efforts have been made by Pharmaceutical Fund and Supply Agency to enhance pharmaceutical transportation practices except in the case of heat sensitive products such as vaccines; biological products and reagents are transported by vehicle fitted with refrigerator with .

4.2.2.3 Pharmaceutical products inventory control management

Table 4.9 Pharmaceutical products inventory control practices

Pharmaceuticals inventory control practice	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
Over-stocked products are distributed by communicating with private health sector before the products are expired.	2(4.5)	27(61.4)	15(34.1)	0	0	2.30	0.553
Pharmaceutical products are not issued according to first expiry/first out inventory control procedures.	0	25(56.8)	18(40.9)	1(2.3)	0	2.45	0.548

Damaged/expired products are not removed from usable stock records	1(2.3)	28(63.6)	14(31.8)	1(2.3)	0	2.34	0.568
Fast moving and slow moving items are followed and reported periodically.	1(2.3)	25(56.8)	16(36.4)	1(2.3)	1(2.3)	2.45	0.697
Products which have near expiry are reported and distributed timely to health facilities.	1(2.3)	23(52.3)	18(40.9)	2(4.5)	0	2.48	0.628
There are no Logistic records in the warehouse to track the pharmaceutical products.	0	23(52.3)	19(43.2)	2(4.5)	0	2.52	0.589
There are inventory visibility among Central PFSA, Hubs and health facilities.	0	25(56.8)	16(36.4)	3(6.8)	0	2.50	0.629
						Mean of Mean =2.434	

Source: Field survey, 2018

The mean values of each of the items of pharmaceuticals transportation management indicator were calculated between 2.3 and 2.52 with almost comparable standard deviations that range between 0.548 and 0.697. The lowest mean value is registered in the case of over-stocked products are distributed by communicating with private health sector before the products are expired, and whereas damaged/expired products are not removed from usable stock records in the second place followed by pharmaceutical products are not issued according to first expiry/first out inventory control procedures and fast moving and slow moving items are followed and reported periodically in the fourth place , while products which have near expiry are reported and distributed timely to health facilities in the fifth place, whereas there are inventory visibility among Central PFSA, hubs and health facilities in the six place while there are no logistic records in the warehouse to track the pharmaceutical products comes last in the ascending order.

As summarized in the table 4.9 regarding perception of employees on pharmaceutical products inventory control practices, from the requested respondents 66.1 % rated as disagree, while 34.1 % felt as neutral with mean value 2.3 for the question over-stocked products are distributed by communicating with private health sector before the products are expired. The result showed that inventory management practice at PFSA is not well developed to minimize wastage of products due to expiry by communicating with health facilities before products are expired. Inventory control is one of an integrated process to

protect stored items from loss or wastage by expiry and managing the reliable movement of supplies by redistributing products where they are needed.

On the other hand, 56.8 % of respondents said disagree, while 40.9 % perceived as neutral with mean value 2.45 on that pharmaceutical products are not issued according to first expiry/first out inventory control procedures. From the result obtained, it can be said that PFSA has good practice to minimize expiry by distributing products in the principle of first expiry first out. More over a good storage practice encourages that the expiry dates of stored drugs should be clearly seen for follow up purpose and their sequence of usage should follow the FEFO or FIFO system.

As high as 65.9 % respondents disagree, while 31.8 % felt as neutral with mean value 2.34 on that damaged/expired products are not removed from usable stock records. The result showed that usable stock recurred is separately managed from unusable stock, to avoid misinterpreting of available stock on hand in the system. There should also be possibly a separate place to stock damaged or expired drugs so that they are not mixed with the usable ones and simple human errors can be avoided.

More over 59.1 % respondents disagree, while 36.4 % rated neutral with mean value 2.45 on that fast moving and slow moving items are followed and reported periodically. The result indicated that, warehouse managers do not identifying and reporting product that have slow transactions and those have fast moving scenario. It is one of the mechanisms to minimize expiry by reporting slow moving items to decision makers for the purpose of transfer product to the place where it is demanded. Decisions can only be as good as the data that inform them. When data is transmitted to decision makers quickly, they can make well informed assessments so that inventories are maintained at sufficient levels, stock-outs are avoided, emergencies are quickly addressed, and important trends are detected. When data is old or inaccurate, decisions may not reflect the current supply and needs, leading to a sustained period of stock-out while overstocked health commodities expire. In resource-limited environments where inventories are routinely maintained at low levels, a slight change in demand can quickly result in a stock-out.

From the respondent asked to quantify their level of perception about products which have near expiry are reported and distributed timely to health facilities, 54.6 % of the respondents disagree, while 40.9 felt as neutral with the mean value 2.48. The result showed that, stock rotation is not practiced at PFSA to minimize expiry. Any inventory control procedure to manage proper stock and avoid expiry there shall be accurate information such as safety stock, minimum and maximum stock levels, reorder frequency and reorder quantity.

In response to the suggestion to quantify their perception regarding the issue, that are no logistics records in the warehouse to track the pharmaceutical products, 52.3 % of respondents disagree, while 43.2 % felt as neutral mean score value 2.52. The result showed that bin card and stock are functioned in the warehouse to track each item's balance without physical inventory. Bin card and stock card used for record the transaction of each items in the warehouse. The purpose of logistic record is to record the receipt & issuance of stock, maintain sufficient stock, maintain stock at the lowest possible cost, prevent expiration of drugs, etc.

As the respondents asked, to quantify their level of perception on that there are inventory visibility among Central PFSA, Hubs and health facilities 56.8 % of the respondents disagree, while 36.4 % felt as neutral with mean value 2.5. The result showed that there is no common data base, among central PFSA, branches and health facilities to share the information about available products, stock out items and any transaction of health commodity to assist decision makers.

Generally, represented mean scores of the items of pharmaceutical inventory control management indicator suggest that respondents in the company believes that lower efforts have been made by Pharmaceutical Fund and Supply Agency to enhance pharmaceutical inventory control practices except in the case of applying FEFO principle, use different record for usable and unusable stock and logistic records in the warehouse to track the pharmaceutical products.

4.2.2.4 Order fulfillment practice

Table 4.10 Pharmaceutical products order fulfillment practice

Order fulfillment practice	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
The full quantity of the requested health commodities are distributed to health facilities & branches.	2(4.5)	37(84.1)	3(6.8)	2(4.5)	0	2.11	0.538
Products are distributed to health facilities and branches timely upon requested.	2(4.5)	7(15.9)	20(45.5)	14(31.8)	1(2.3)	3.11	0.868
All the requested kind of items is supplied to health facilities and branches.	2(4.5)	32(72.7)	2(4.5)	7(15.9)	1(2.3)	2.39	0.895
Medical equipments are distributed to health facilities with full package of their accessories.	0	8(18.2)	21(47.7)	14(31.8)	1(2.3)	3.18	0.756
						Mean of Mean =2.70	

Source: Field survey, 2018

The mean values of each of the items of pharmaceuticals transportation management indicator were calculated between 2.11 and 3.18 with almost comparable standard deviations that range between 0.538 and 0.895. The lowest mean value is registered in the case of the full quantity of the requested health commodities are distributed to health facilities & branches, and whereas all the requested kind of items is supplied to health facilities was in the second place followed by medical equipments are distributed to health facilities with full package of their accessories while products are distributed to health facilities and branches timely upon requested comes last in the ascending order.

The objective of this sub topic is to investigate the extent of order fulfillment practices of PFSA to health facilities & branches. From the respondents were asked about the position of PFSA, on that PFSA is distributing the full quantity of the requested health commodities to health facilities & branches, majority (88.6 %) of the respondents rated as disagree with mean score value 2.11. The result shows that, PFSA does not constantly supplying the

requested quantities of health commodities to health facilities and its branch. Therefore, it make difficult to the public to get the required service from governmental health facilities and they are obliged to pay high price for private market.

In response to the question on the issue that, requested products are distributed within specified period of time, 20.4 % of the respondents disagree; while 45.5 % of the respondent's perception was neutral and 34.1% agreed with mean score value 3.11. The result indicates that, available products averagely distributed within specified period to the customers. This means if product is available at the warehouse, customers have got the product upon their request.

In the mean time respondents were asked to quantify their opinion about all the requested kind of items are supplied to health facilities and branches, accordingly 77.2 % of the respondents disagree while 15.9 % said agree with mean score value. The result shows that facilities and branches do not get all the requested varieties of items from central PFSA. Therefore, PFSA does not meet the health care needs of the public at large, because health facilities will procure stock out products from private importers to avail the product.

Regarding level of perception of respondents on that medical equipments are distributed to health facilities with full package of their accessories, 47.7 % of the respondents said neutral, while 31.8 % rated as agree and 18.2 % respondents said disagree with mean score value 3.18. The result shows that averagely medical equipments are distributed with their accessories to health facilities. Therefore, medical equipments are able to install upon delivery at its destination. In some case the machines might not be shipped with full accessories, in this case the machine being stored for long period of time with huge capital without function. Therefore, the patients are obliged to pay high price for private market to get the service.

Generally, represented mean scores of the items of pharmaceutical order fulfillment practice, indicator suggest that respondents in the company believed that lower efforts have been made by Pharmaceutical Fund and Supply Agency to enhance pharmaceutical order fulfillment practices except in the case of somehow, available products are timely distributed and medical equipments will distributed with their accessories.

4.2.2.5 Pharmaceutical distribution performance

Table 4.11 Indicators of effective pharmaceuticals distribution.

Indicators of effective pharmaceutical distribution	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
PFSA is successful in uninterrupted supply of medicines	1(2.3)	33(75)	7(15.9)	3(6.8)	0	2.27	0.624
PFSA is successful in reduce wastage of medicine	1(2.3)	29(65.9)	7(11.4)	8(18.2)	1(2.3)	2.52	0.902
PFSA is used accurate information for decision making	0	26(59.1)	10(22.7)	8(18.2)	0	2.59	0.787
PFSA is supplying medicine with its original quality throughout the distribution process	0	21(47.7)	10(22.7)	13(29.5)	0	2.82	0.870
						Mean of Mean =2.55	

Source: Field survey, 2018

The mean values of each of the items of pharmaceuticals transportation management indicator were calculated between 2.27 and 2.82 with almost comparable standard deviations that range between 0.624 and 0.902. The lowest mean value is registered in the case of PFSA is successful in uninterrupted supply of medicines, and whereas the indicator PFSA is successful in reduce wastage of medicine in the second place followed by PFSA is used accurate information for decision making and PFSA is supplying medicine with its original quality throughout the distribution process third and fourth place respectively in the ascending order.

AS shown at table 4.11 respondent's perception regarding on indicators of effective distribution practice at PFSA were collected. Accordingly, 77.3 % of the respondents disagree while 15.9 % of the respondents have no idea and 6.8 % agreed with mean value 2.27 on the indicator uninterrupted supply of health commodities to health facilities. The result revealed that the health care needs of the public do not satisfied by PFSA. As the

field survey result that is conducted on order fulfillment practice, showed that the full quantities and each varieties of requested health commodities do not supplied by PFSA. Therefore, health facilities are obliged to procure products from private importers, with relatively expensive unit price, and then patients will pay extra price to get the products. These may have great impact to the public at large especially for low income patients.

With regard to the indicator reduce wastage, significantly high percentage of the respondents (68.2%) was rated as disagree, while 18.2 % of the respondents agreed and 11.4 % of the respondents have no idea with mean value 2.52. whereas the survey result showed on table 4.9 the inventory management practice at PFSA, over stock products do not redistributed to the place where products are demanded to minimize wastage of products due to expiry by communicating with health facilities before products are expired. In addition, fast moving and slow moving items are not identified and reported periodically to the decision makers. Furthermore, as survey result showed on the table 4.8 at the time of transportation, products have high probability of contact with wetted body of the trucks, which leads product being damaged. The survey conducted on the warehouse management as showed on the table 4.7 also showed that, PFSA warehouses are not visually free from harmful insects and rodents. These assessed survey results indicates that PFSA is unsuccessful in reducing wastage of products

On the other hand, 59.1 % of the respondents disagree, 18.2 % said agree and 11.4 % of the respondents have no idea with mean value 2.59 on that PFSA is successful in using accurate information for future forecasting needs. The result showed that the information management practice of PFSA is very poor. As indicated on survey result from inventory control practices showed that warehouse managers uses manual stock record keeping, in addition Global Fund audit report also showed that products are registered more than once in the system by different users. This gives wrong information for decision maker regarding stock on hand and quantification of future needs. The accumulation of expired drugs in the warehouse is indication of insufficient information management practices.

Besides, 47.7 % of the respondents disagreed, 29.5 % agreed while 22.7 of respondents have no idea with mean value 2.82 on PFSA is supplying medicine with its original quality

throughout the distribution process. The result showed that the probability of products to loss their original quality before they reach to the user is very high. The survey result in table 4.7 on warehouse and storage management practice showed that products are stored within recommended storage temperature, however during transportation; products could be exposed to different harsh condition and altered from their original composition.

CHAPTER FIVE

5. SUMMARY, CONCLUSION, RECOMMENDATION AND FUTURE RESEARCH FORWARED

This chapter presents summary of the findings, conclusion, recommendations and future research forward based on the findings extracted from the questionnaire.

5.1 Summary of the findings

The main purpose of this study was to examine the distribution performance of central Pharmaceutical Fund and Supply Agency (PFSA) comparing with feature of effective pharmaceutical distribution practice adopted from management science for health (2012).

To address the study gap, 27 questions were constructed on the following factors those affects level of pharmaceutical distribution performance:

1. Pharmaceutical storage management
2. Pharmaceutical transportation management
3. Pharmaceutical inventory control management
4. Order fulfillment management
5. Indicators of effective pharmaceutical distribution

Pharmaceutical storage management

Based on the discussion of the data, the following summaries of findings were drawn:

Regarding pharmaceutical products arrangements on shelves with identification label 68.2 % of the respondents rated as disagree, while 9.1 % of respondents strongly disagree,11.5 % neutral and 11.5 agree with the mean score value 2.25. The result showed that warehouses infrastructure at PFSA such as shelves and racks are not installed. Since, most of the agency's warehouses are rented from private sectors which are not furnished with shelves and racks for the purpose of pharmaceutical product arrangement. Majority of the respondents agreed that the warehouse floor is not convenient for movement of goods during receiving, put away, and dispatching activities like forklift. Global Fund (2017) survey report supports the findings. Regarding availability of security controlling system in the warehouse with camera and alarms 77.3 % of the respondents disagree. The result

revealed that the warehouse of PFSA exposed for theft and fraud because, there is no mechanism to trace events.

Almost all of the respondents agreed that pharmaceutical products are stored within recommended storage temperature at PFSA with the presence of back up source of power like generator and solar energy for cold chain storage to avoid power interruption.

Pharmaceutical transportation management

This result shows that pharmaceutical products in the PFSA distribution system are transported by persons who are not trained about characteristics and storage condition of products. Majority (84.1 %) of the respondents disagree on that the interiors of vehicles and containers remain clean and dry while transportation of pharmaceutical products. The result shows that pharmaceutical products have the probability to decay and contaminated with dirt during transportation. As majority agreed that heat sensitive products such as vaccines; biological products and reagents are transported by vehicle fitted with refrigerator. On the other hand, the survey result revealed that the trucks available at PFSA for transportation of pharmaceutical products are not designed to protect direct sun light; humidity and contaminants. The vehicles at PFSA do not with GPS that is; there is no controlling mechanism for vehicles to secure products during transportation.

Pharmaceutical inventory control management

The result shows that inventory management practice at PFSA is not developed to minimize wastage of products due to expiry by communicating health facilities before products are expired. Inventory control is one of an integrated process to protect stored items from loss or wastage by expiry and then managing the reliable movement of supplies by redistributing products where they are needed. On the other hand, 56.8 % of respondents said disagree, while 40.9 % perceived as neutral with mean value 2.45 on that pharmaceutical products are not issued according to first expiry/first out inventory control procedures. From the result obtained, it can be said that PFSA has good practice to minimize expiry by distributing products in the principle of first expiry first out.

Moreover, the result indicated that, warehouse managers do not identifying and reporting product that have slow transactions and those have fast moving scenario. It is one of the

mechanisms to minimize expiry by reporting slow moving items to decision makers for the purpose of transfer product to the place where, it is demanded. Decisions can only be as good as the data that inform them. Regarding inventory visibility among central PFSA, hubs and health facilities 56.8 % of the respondents disagree, while 36.4 % felt as neutral with mean value 2.5. The result showed that there is no common data base, among central PFSA, branches and health facilities to share the information about available products, stock out items and any transaction of health commodity to assist decision makers.

Order fulfillment management

Majority (88.6 %) of the respondents rated as disagree with mean score value 2.11. The result showed that, PFSA does not constantly supplying the requested quantities of health commodities to health facilities and its branch. Therefore, it make difficult to the public to get the required service from governmental health facilities and they are obliged to pay high price for private market. In addition the survey result showed that facilities and branches do not get all the requested varieties of items from central PFSA. The result revealed that the health care needs of the public do not satisfied by PFSA.

Indicators of effective pharmaceutical distribution

Respondent's perception regarding on indicators of effective distribution at PFSA were collected. Accordingly, 77.3 % of the respondents disagree while 15.9 % of the respondents have no idea and 6.8 % agreed with mean value 2.27 on the indicator there is uninterrupted supply of health commodities to health facilities. The result revealed that the health care needs of the public do not satisfied by PFSA. As the field survey result that is conducted on order fulfillment practice, showed that the full quantities and each varieties of requested health commodities do not supplied by PFSA. With regard to minimizing the indicator reduce wastage, significantly high percentage of the respondents (68.2%) was rated as disagree, while 18.2 % of the respondents agreed and 11.4 % of the respondents have no idea with mean value 2.52. On the other hand, 59.1 % of the respondents disagree, 18.2 % said agree and 11.4 % of the respondents have no idea with mean value 2.59 on that PFSA is successful in using accurate information for future forecasting needs. The result showed that the information management practice of PFSA is very poor. Besides, 47.7 % of the respondents disagreed, 29.5 % agreed while 22.7 of respondents have no

idea with mean value 2.82 on PFSA is supplying medicine with its original quality throughout the distribution process. The result showed that the probability of products to loss their original quality before they reach to the user is very high.

5.2 Conclusions

This research was conducted towards an attempt to investigate the status of pharmaceutical distribution performance of central PFSA whether it is effective or not. The following conclusions have been drawn on the bases of the findings of the data analysis.

In this study, based on the result it can be concluded that, improper pharmaceutical arrangement, inconvenient warehouse floor for movement of goods during receiving, put away, and dispatching activities like forklift, Storage area is exposed for harmful insects and rodents, fire safety equipment is unavailable and inaccessible, lack of security controlling system in the warehouse with camera and alarms are identified as the major gap of PFSA on pharmaceutical warehousing and storage practice. However, pharmaceutical products at PFSA are stored within recommended storage temperature with the presence of back up source of power like generator and solar energy for cold chain storage to avoid power interruption.

According to the survey result, the health care need of the public does not satisfied by PFSA. The full quantities and each variety of requested health commodities couldn't be supplied by PFSA. Therefore, health facilities are obliged to procure products from private importers, with relatively expensive unit price, and then patients will pay extra cost to get the products. These may have great impact to the public at large especially for low income patients.

With regards wastage, over stock products do not redistributed to the place where products are demanded to minimize wastage of products due to expiry by communicating with health facilities before products are expired. In addition, fast moving and slow moving items are not identified and reported periodically to the decision makers. Furthermore, at the time of transportation, products have high probability of contact with wetted body of the trucks, which leads product being damaged. Therefore, PFSA is unsuccessful in reducing wastage of products

On the other hand, based on the result, it can be concluded that, the information management practice of PFSA is very poor. As indicated on survey result from inventory control practices, warehouse managers uses manual stock record keeping, there are also duplication of records, this implies that, products are registered more than once in the system by different users. This might leads to wrong information for decision maker, regarding stock on hand and quantification of future needs. Products are stored within recommended storage temperature; however during transportation; products could be exposed to different harsh condition, and then the probability of products to loss their original quality before they reach to the end user is very high.

Finally, based on the assessment conducted on transportation management; storage management; inventory control management; order fulfillment management and indicator of effective distribution can be concluded that PFSA's pharmaceutical distribution practices have various gaps while comparing with feature of effective pharmaceutical distribution adopted from management science for health (2012). To be effective pharmaceutical distribution, the requirements are maintain a constant supply of medicines, keep medicines in good condition throughout the distribution process, minimize medicine losses caused by spoilage and expiry, maintain accurate inventory records, maintain medicines within their recommended storage points, reduce theft and fraud and provide information for forecasting of medicine needs.

5.3 Recommendation

The findings discussed above outlined some challenges of pharmaceutical distribution activities at central Pharmaceutical Fund and Supply Agency. Thus, the researcher forwarded the following recommendation.

1. Pharmaceutical hubs and warehouses should be constructed and strategically located to improve proximity and effectiveness in distribution.
2. Alternative approaches, including outsourcing, shall be used to ensure cost effectiveness in the transportation of pharmaceuticals to service delivery points while maintaining quality of the products.

3. The logistics management information system (LMIS) shall be improved and integrated with the health management information system (HMIS) and stock management of health facilities to improve forecasting and quantification of pharmaceuticals.
4. Regular operational research shall be conducted to improve efficiency of the supply chain management on a continuous basis.
5. Strengthen and standardize working procedures concerning pharmaceutical distribution is recommended
6. Continuous training or technical support through mentorship program should be given to all branches and health facilities to increase the distribution effectiveness and efficiency.

5.4 Future Research forward

Findings from this research work can be used as a stepping stone for further study on the area of pharmaceutical distribution in PFSA. However additional research is needed to analyze other distribution functions such as warehousing, order processing, human resource management and efficiency, those activities were not explored in this research work. Conduct research and identify the gap on this area will alleviate the problem of distributing pharmaceutical product at the right quantity, at the right quality, at the right time, at the right cost in Pharmaceutical Fund and Supply Agency. In further research it would be interesting to consider exploring inter relationships that might exist between health facilities; branches and central PFSA to increase inventory visibility and get right information such as stock on hand, average monthly consumption, good in transit for decision making.

REFERENCE

Adzimah,E., Awuah-Gyawu,M., Aikins,I., Duah,P. (2014) An assessment of health commodities management practices in health care delivery; a supply chain perspective. The case of selected hospitals in ashanti region-ghana. *European Journal of Business and Social Sciences*. Vol. 3, No. 8, PP. 78 – 103.

Achuora, O.J.,Arasa,M.R.,Nzioki, W.,Ochiri, G. Muangangi,P.(2012) Factors Affecting Distribution Performance for Pharmaceutical Products in Kenya's Public Sector. *IMS Manthan.*Vol.3, No.8.

Croxton, K.L. (2003) The Order Fulfillment Process. *The International Journal of Logistics Management.* Vol. 14 Issue no. 1, pp.1932.

Beyene,G. (2016) Improving Inventory Management at Sur Construction Company. Master's of Art.Addis Ababa University, Addis Ababa.

Cronbach,L.J.,(1951) Coefficient alpha and the internal structure of tests.

Dessalegn,T.(2015)The study of Ethiopia Public health supply chain management: Before and After Pharmaceutical Fund and Supply Agency. Master's of Art. St. Mary's University School of Graduate Studies.

Getachew,A. (2009) Base-line Survey on Drug Supply Management System, Addis Ababa Ethiopia.

Global Fund Grant to Federal Democratic Republic of Ethiopia (2017) Audit Report.

Fekadu M. Debela, (2013) Logistics Practices in Ethiopia, Uppsala, Sweden.

Federal Ministry of health of Ethiopia and World Health Organization (2010) Assessment of the pharmaceutical sector in Ethiopia. Addis Ababa, Ethiopia.

Federal Democratic Republic of Ethiopia Ministry of Health (2015) Annual TB.An bulletin extract of TB, TB/HIV and leprosy control program analysis Volume 6, No. 6.

Jahanbani,E., Shakoori,R.,Kahkesh,B.M.(2016) Drug Supply Chain Management and Implementation of Health Reform Plan in Teaching Hospital Pharmacies of Ahvaz, *Iran. Hospital Practices and Research*.Vol.1 No.4:PP. 141-145.

Management Science for Health (2012) MDS-3: managing access to medicines & health technology, Arlington, VA: Management science for health.

Kumar, N.,Jha,A.(2015) Quality Perspective of 'Good Distribution Practices' in Indian Pharmaceutical Industry.*IOSR Journal of Business and Management (IOSR- JBM)*.Vol.17, No .11.

MOH Tanzania (2009) in depth assessment of Medicines Supply System in Tanzania. Ministry of Health and Social Welfare.Jamana Printers Limited, Dar es Salaam, Tanzania.

Pharmaceutical Fund and Supply Agency (2016) Pharmaceuticals distribution Manual, Addis Ababa, Ethiopia.

Pharmaceutical Fund and Supply Agency (2016) Pharmaceutical Warehouse Operations Management Training Manual, Addis Ababa, Ethiopia.

Pharmaceutical Fund and Supply Agency (2015) Standard Operating Procedures (SOP) Manual for the Integrated Pharmaceuticals Logistics System in Health Facilities of Ethiopia.

Pharmaceutical Fund supply and Agency (2017) Pharmaceutical supply Business process Reengineering.

Shewarega A., DowlingP., Welelaw N., Tewfik S., and Yiegezu Y. (2015) Ethiopia: National Survey of the Integrated Pharmaceutical Logistics System. Arlington, Va.:USAID | DELIVER PROJECT, Task Order 4, and Pharmaceuticals Fund and Supply Agency (PFSA).

USAID | DELIVER PROJECT,Task Order 1 (2011) The Logistics Handbook: A Practical Guide for the Supply Chain Management of Health Commodities. Arlington, Va.USAID | DELIVER PROJECT, Task Order 1.

WHO Technical Report Series, No. 957 (2010) Annex 5.WHO good distribution practices for pharmaceutical products.

Yadav, P.,Tata, H.L, and Babaley, M. (2011) The world medicines situation storage and supply chain management.World health organization Geneva.

Yeboah,A.,Owusu,A.,Boakye,S.,Owusu-Mensah,S.(2013**)** Effective distribution management, a pre-requisite for retail operations: a case of poku trading. *European Journal of Business and Innovation Research.* Vol.1, No. 3, p.28.

Annexes I: Questionnaire

Addis Ababa University

School of Graduate Studies

College of Business and Economics School of Commerce

Questionnaire was filled by Pharmaceutical and medical supplies Storage & distribution directorate Director, Team coordinators, officers and warehouse managers.

Dear Sir,

My name is Gulilat Zebene conducting a study on Pharmaceuticals Supply Chain distribution effectiveness at central PFSA for the partial fulfillment of master's degree in logistics and supply chain management in Addis Ababa University, School of commerce. I am here to collect data about the pharmaceutical distribution practice of the agency that is needed for the Master's thesis entitled "Assessment of Pharmaceutical distribution effectiveness: The case of central Pharmaceutical Fund and Supply Agency".

I would like to extend my deep appreciation to your company and you for the willingness and cooperation in undertaking this valuable research. Taking part in this study you will contribute towards alleviating the problem of distribution system. I request your cooperation to fill and respond truthfully for the asked Questions. Your participation is completely voluntary. You can refuse to answer any questions and/or withdraw from the study at any time. All of the information collected is strictly confidential. No one other than the research team will have access to your responses. Your personal identifiers such as your name and title shall not be used. The principal investigator will not refer to individual respondents in the report. If you have any question doesn't hesitate to contact me through **+251912484477 or gulepfsa@gmail.com**.

Thank you in advance for your willingness to take part in this study.

Note:

1. No need of writing your name.
2. Indicate your answer with a check mark (✓) on the appropriate block/cell both for multiple choice and Likert scale questions.

Part I: General Information and Demographic background of respondents

Please tick (✓) or provide your own answers where applicable.

1. Gender Male ☐ Female ☐

2. Age ☐ ☐ ☐

Less than 25 26-34 35- 54 Above 55

3. Educational background

Certificate ☐ Diploma ☐ Degree ☐ Masters ☐ Others (specify)

4. Position in the Agency

Director ☐ Team coordinator ☐ Officer ☐ Clerk ☐

Warehouse manager ☐ Driver ☐ Support staff ☐ others (specify)

5. Years of Experience in the Agency

Below 5 years ☐ 5- 8 years ☐ 9-12 years ☐ above 13 years ☐

6. In which directorate are you working?

- Storage and distribution ☐
- General service and property administrative ☐
- Others (specify) _____

Part II: Main Questionnaire

7. Please rate to what degree you agree on the following statements regarding PFSA's position pertaining to distribution practice.

The scale below will be applicable: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

A	Pharmaceuticals storage practice	1	2	3	4	5
1	Products are arranged on shelves with arrows pointing up, and with identification labels, expiry dates, and manufacturing dates clearly visible					
2	Products are not stored at the appropriate temperature according to product temperature specifications (8°–30°C) and including cold chain storage (2°–8°C), as required for certain products.					
3	There are no backup source of power like generator and solar energy for cold chain storage.					
4	The floor is convenient for movement of goods during receiving, put away, and dispatching activities like forklift.					
5	Storage area is visually free from harmful insects and rodents.					
6	Fire safety equipment is available and accessible.					
7	There is security controlling system in the warehouse with camera and alarms.					
B	**Pharmaceuticals transportation practice**					
1	The people responsible for the transportation of pharmaceutical products have enough knowledge about all relevant conditions for storage and transportation.					
2	The interiors of vehicles and containers remain clean and dry while pharmaceutical products are in transportation.					
3	Heat sensitive products such as vaccines, biological products and reagents are not transported by vehicle fitted with refrigerator.					
4	Pharmaceutical products are protected from direct sun light, humidity and contaminants during transportation.					
5	GPS is placed on vehicles that are transporting pharmaceuticals products					
C	**Pharmaceuticals inventory control practice**					
1	Over-stocked products are distributed by communicating with private health sector before the products are expired.					
2	Pharmaceutical products are not issued according to first expiry/first					

	out inventory control procedures.					
3	Damaged/expired products are not removed from usable stock records					
4	Fast moving and slow moving items are followed and reported periodically.					
5	Products which have near expiry are reported and distributed timely to health facilities.					
6	There are no logistic records in the warehouse to track the pharmaceutical products.					
7	There are inventory visibility among Central PFSA, Hubs and health facilities.					
D	**Order fulfillment**					
1	The full quantity of the requested health commodities are distributed to health facilities & branches.					
2	Products are distributed to health facilities and branches timely upon requested.					
3	All the requested kind of items is not supplied to health facilities and branches.					
4	Medical equipments are distributed to health facilities with full package of their accessories.					

8. Please indicate the degree to which you agree with the following statements regarding the feature of effective distribution practice at PFSA. The scale below will be applicable: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Effective pharmaceutical distribution	1	2	3	4	5
PFSA is successful in uninterrupted supply of medicines					
PFSA is successful in reduce wastage of medicine					
PFSA is used accurate information for decision making.					
PFSA is supplying medicine with its original quality throughout the distribution process					