FACTORS AFFECTING THE EFFECTIVENESS OF PHARMACEUTICAL DELIVERY THE CASE OF ETHIOPIA PHARMACEUTICALS SUPPLY AGENCY JIMMA TOWN

BY: GALIB ZEBEN

A RESEARCH THESIS SUBMITTED TO SCHOOL OF POSTGRADUATE STUDIES OF JIMMA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF ARTS IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

JUNE, 2021

JIMMA, ETHIOPIA

JIMMA UNIVERSITY

COLLEGE OF BUSINESS & ECONOMICS

SCHOOL OF POSTGRADUATE STUDIES

FACTOR AFFECTING THE EFFECTIVENESS OF PHARMACEUTICAL DELIVERY THE CASE OF ETHIOPIA PHARMACEUTICALS SUPPLY AGENCY JIMMA TOWN

BY: GALIB ZEBEN

MAIN ADVISOR: EMNET NEGASH (ASSOCIATE PROFESSOR)

COADVISOR: MEGERSA WODEJOW (MSc)

JUNE, 2021

JIMMA, ETHIOPIA

Declaration

This is to certify that Galib Zeben has carried out his research paper work on the topic entitled ***"factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town".*** The work is original in nature and is suitable for the submission for the reward of MA Degree in logistics and supply chain management.

Certificate

This is to certify that the research paper entitles "***factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town,***" submitted to Jimma university for the award of the degree of masters of logistics and supply chain management and is a record of confide research paper work under our guidance and supervision.

Therefore, I hereby declare that no part of this research paper has been submitted to any other university or institutions for the award of masters.

Main Advisor's Name	Date	Signature
Emnet, (Assistance Professor)	_____	_____
Co-Advisor's Name	Date	Signature
Megersa, (MSc)	_____	_____

Acknowledgements

First I would like to thank my Advisor Emnet, (Associate Professor) and Megersa, (MSc) for his dedication, valuable advice, continuous, precious guidance and support throughout the study of this research paper. He was ready and available to give me guidance, support and contributions. My gratitude and heartfelt thank will goes to the Almighty God for everything he brought in my life.

I would also like to thank my family and friends, who encouraged and supported me at all times. Their love, support, encouragement, dedication, and many priceless sacrifices contributed to the successful completion of my ma studies. Without their assistance, this work would not have been possible.

Abstract

The main objective of the study was to investigate the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town. The study was designed to identify the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town. The researcher was used quantitative data in respect with research variables of Effectiveness of Pharmaceuticals delivery. The researcher was used both primary and secondary data. Primary data was collected from EPSA internal staff and from health facility who are pharmacy professionals who come to EPSA to collect pharmaceuticals. The study was adopted stratified random sampling technique. Stratified random sampling is a technique which attempts to restrict the possible samples to those which are ``less extreme'' by ensuring that all parts of the population are represented in the sample in order to increase the efficiency. Basing on the Krejcie & Morgan (1970) table for sample size determination, a sample of 103 respondents was selected from 140 employees of the respondents. The researcher was analyzed data by using descriptive statistics (mean and the standard deviation), correlation and multiple regression analysis. The regression analysis conducted indicated that the independent variables have a significant influence on effective distribution of pharmaceuticals. packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system have significant influence on effective distribution of pharmaceuticals. From the findings of this study, it can be concluded that: the effectiveness of pharmaceutical distribution in terms of packaging conditions and facilities, storage and inventory control practice, order fulfillment, communication, customer service management, transportation and distribution system with both the mean and correlation test indicating a great influence in a positive relationship and moderate levels. EPSA should coordinate the actions of various departments involved in the drug selection, quantification, procurement and distribution of pharmaceutical products and the health facilities.

Key Words: Packaging, Order fulfillment, Inventory control, Storage, Transportation, Distribution

Table of content

List of table

List of figure

CHAPTER ONE

1. Introduction

1.1. Background of the study

Supply chain management (SCM) is the means, by which firms engaged in creating, Distributing, and selling products, can join forces to establish a supply network With an unbeatable competitive advantage-has emerged as one of the most powerful business-improvement tools around (Deveshwar et al ,2010). Companies all over the world are pursuing supply chain as the latest methodology to reduce costs; increase customer satisfaction, better utilize assets, and builds new revenues (Deveshwar et al, 2010)

According to UNIDO (2010), providing adequate health care to their populations remains a major challenge for governments in Africa. Unsatisfactory and inadequate access to essential drugs and other healthcare commodities is a key limitation that impacts on people's health in most developing and Least Developed Countries (LDCs). Adequate access to drugs is dependent on both the affordability and quality of the products. UNIDO (2010), Unaffordable drugs are clearly not the solution but, equally, affordable low quality products are not the answer either. Therefore, an industry that produces high quality drugs at competitive prices must be the target when developing local manufacture of pharmaceuticals in Africa.

The global pharmaceuticals market is worth US$300 billion a year, a figure expected to rise to US$400 billion quickly (WHO, 2013). Controlling over one-third of this market, with sales over US$10 billion a year and profit margins of about 30%, are the 10 largest drug companies with six are based in the United States and four in Europe. With predictions of North and South America, Europe and Japan accounting for a full 85% of the global pharmaceuticals market in the 21st century. WHO (2013), Companies currently spend one-third of all sales revenue on marketing their products - roughly twice what they spend on research and development. Due to this pressure to maintain sales, there is an inherent conflict of interest between the public selection and rational use of drugs and the legitimate business goals of manufacturers and the social, medical and economic needs of providers (WHO 2013). This is particularly true where information as to which product are most effective is provided by drug companies. Even in the

United Kingdom, promotional spending by pharmaceuticals companies is 50 times greater than spending on public information on health and the medical profession receives publicly-funded information (WHO, 2013).

The logistics system ensures customer service by fulfilling the six rights. Each activity in the logistics cycle, therefore, contributes to providing excellent customer service. The situation where customers and service provider can choose, obtain, and use medicines and other health commodities when and where they need them for prevention, diagnosis, treatment, and care is the one that SCM can provide. The whole supply chain activities pharmaceutical industries are for saving lives and/or improving the health status of the people (Desalegn, 2015).

The system for warehousing and distribution of medicines is often a major constraint on efforts to meet the health-care needs of large sectors of the population, particularly in rural areas. An ineffective or poorly designed distribution system is likely to cause stock-outs at health facilities despite the availability of stock at the central warehouse On the other hand; an inefficient distribution system can result in an increase in the system's financing requirements, making it unsustainable over time. A balanced approach that acknowledges the current state of technical capacity, administrative structures and resource availability should guide the proper design and operation of a distribution system. (Prashant yadav, 2011)

Delivery is the delivery or giving out of an item or items to the intended recipient. Division system is a system of administrative procedures, transport facilities, storage facilities and user facilities through which supplies move from a central point to the user facilities.(MSH, Managing Drug Supply, 1997).Distributing vaccine from manufacturers to the final recipients is composed of a series of Procurement, storage, shipment and other related activities. One of the challenges is that vaccine demand and supply are variable. In many low and middle income countries, the demand for a vaccine is increasing exponentially because of the continued growth in the birth rate. Additionally, vaccines are also used for the purpose of immediate response to disease outbreak (Deveshwar et al, 2010)

The Ethiopian pharmaceutical market is estimated to be 190 million USD. Almost 85% of pharmaceuticals consumed are imported from other countries. The pharmaceuticals manufacturing companies of Ethiopia are not more than 13 and only cover 15% of the country's

pharmaceutical markets. More than 90% of the inputs used for producing pharmaceuticals are imported. A few inputs are locally procured. Raw materials account for 40% of total costs. Most packaging materials are imported, except for carton packaging and empty capsules, which is manufactured domestically. Most of the companies are engaged in formulation of products using raw materials and group as secondary manufacturing companies (Sutton and Kellow, 2010; UNCTAD, 2011b).Therefore the researcher was identify factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town.

1.2 Statement of the problem

The supply and distribution of pharmaceutical products is often highly centralized and marked by poor storage facilities, inaccurate demand planning processes, insufficient human resource management capabilities, high stock pilferage and inadequate financing all these resulting in frequent stock outs Some of these challenges can be reduced by adoption of relevant technology at the distribution channel level., Several studies with regard to the impact of technology on channel distribution have been done. (Scott & Scott 2011)

Different distributors and wholesalers of pharmaceuticals claimed that pharmaceutical manufacturing companies don't have an interest to have sole distributors. Also the selection of distributors and wholesalers seemed not based on selection criteria like capacity, geographic coverage or financial strength. In addition, it is stated that many small and medium-sized pharmaceutical producers in Ethiopia cannot cope with the severe competition of the low cost exports of large-scale Asian producers (Sutton and Kellow, 2010). Though the government gives preferential treatment to local manufacturers in its own procurement agency i.e. PFSA, and has put in place a system of paying a 30% advance payments, still the companies cannot compete in the market with such companies (EPA, 2011).

Pharmaceutical delivery in Ethiopia has numerous challenges including Undefined stock quantity as accessible, information disruption and hindrance, Some items reported as stock out during weekly report but not demanded/desirable when the service transport their demand, Use of rapid succeed plan to accomplish practice job that was achieved by DSM (EPSA 2018)

The Ethiopian pharmaceutical supply chain has several problems including non-availability, un-affordability, poor storage, lack of stock management and weak distribution system including weak fleet management. Health Facilities have problems to get right products; right quantity and right quality are not available at the right time, right place, for the right cost due to poor distribution system **(**PFSA, 2105).The distribution of pharmaceutical product is frequently handicapped by inadequate infrastructure (storage and transportation) and lack of effective management information systems. In addition to this PFSA is constrained by shortage of vehicles, portable cold chains, cold rooms, racks and pallets.

The main Challenges that affect EPSA performance are ; its dependency on international suppliers due to lack of local Competitive supplier, very long procurement process, limited vehicle Capacity for distribution, lack of skilled manpower and poor demand forecasting Capacity (Mereid, 2015). The situation seems higher at hub levels. Due to this the hubs are not sufficient to satisfy the need of clients. Besides to shortage of vehicles there is weak coordination among general internal and external stakeholder.

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), unsafe product packaging, delay in order fulfillment, 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.

It is thus critical to explore the existing supply chain pharmaceuticals delivery practice at Ethiopian pharmaceutical Supply Agency (EPSA). Thus this research assesses the factors affecting the effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town. Most of the studies reviewed to identify the determinants of effective pharmaceuticals distribution system. Gulilat, Z. in 2018 and Admasu, T in 2018 conducted a study on assessment of pharmaceutical distribution system PFSA at the head office level. These studies were a descriptive studies.

Therefore this study seeks to fill the existing research gap identifying the factors affecting the effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town.

1.3. Research questions

The study was guided by the following basic research questions:

1. To what extent EPSA Packaging condition and facilities affect the effectiveness of the pharmaceuticals distribution?
2. To what extent EPSA Storage and inventory control practice affect the effectiveness of the pharmaceuticals distribution?
3. How does EPSA Order fulfillment, communication of customer affect the effectiveness of the pharmaceuticals distribution?
4. How does EPSA Transport and Distribution affect the effectiveness of the pharmaceuticals distribution?

1.4. Objectives of the study

1.4.1. General Objectives

The main objective of the study was to investigate the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town.

1.4.2. Specific Objectives

The specific objective was:-

1. To identify the effect of Packaging condition and facilities on the effectiveness of distribution
2. To investigate the effect of Storage and inventory control practice on the effectiveness of distribution
3. To identify the effect of Order fulfillment, communication of customer on the effectiveness of distribution
4. To identify the effect of Transport and Distribution on the effectiveness of distribution

1.5 The Scope of the Study

The scope of this research was focuses in geographic and conceptual. The geographic scope of this research is therefore limited to the study of the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency in Jimma town. The study only focuses on health facilities in Jimma it does not address health facilities outside of the study area.

The conceptual scope of the study was going to focus on the pharmaceutical distribution effectiveness in pharmaceutical fund and supply agency in Jimma. The population of study consists of Ethiopia pharmaceuticals supply agency Jimma town and select public sector health facilities: hospitals, health centers, and health posts. While the factors that affecting effectiveness of pharmaceutical delivery presented in the literature are several, this study examines only some factors in pharmaceuticals supply agency. Moreover, the researcher was selected by using stratified random sampling whereby the subjects was categorizing into various strata with similar characteristics from the employees workers of Jimma town. These may limit the representative of the research results.

1.6 Significance of the Study

The finding of this research was contributed primarily to EPSA in brief the strengths and weakness of delivery of pharmaceuticals, providing recent information on the major factors affecting the effectiveness of delivery. These findings contribute to the government how to ensure proper pharmaceuticals to the public to achieve millennium health goal. Finally donors use this finding providing data and information for decision making. This study finding was add on to the body of knowledge already existing and was also be a basis for further research. Players in this industry were also able to understand the strategic competitive issues they need to address in order to position themselves more competitively.

1.7 Definition of Concepts and Terms

Distribution: is the process of ensuring movement of products and ensuring they are in the right place at the right time in affordable price in appropriate condition.

Lead time: is the length of time between placing an order and receiving the items

Effectiveness: is the extent to which health facility requirements are met.

Pharmaceutical manufacturing companies: Are those companies that produce drugs for humans, medical supplies, laboratory reagents from raw materials.

Health Facilities: are hospitals and health centers who receive pharmaceuticals from EPSA.

Performance: is the accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed (business dictionary.com, 2018).

1.8 Organization of the study

The research paper was organized according to the following chapters. The first chapter starts with presenting background of the study, statement of the problem, objective of the study, significance of the study, and scope of the study. Chapter two shows literature review was conducted on relevant studies. Chapter three describes the research methodology that was used for this study. The fourth chapter deal about data analysis, presentation and interpretation and fifth chapter all about summary of major finding, recommendation and conclusion.

CHAPTER TWO

2. Related Literature Review

The purpose of this chapter is to review literature and theoretical framework of pharmaceutical distribution which contains reviews and opinions of the different researches related to pharmaceutical distribution that assist in generating the hypothesis statement.

2.1. Theoretical Literature review

2.1 .1 Overview of Pharmaceuticals distribution

The distribution process has the end objective of delivering pharmaceuticals at the right time and in the right quantities to satisfy health facility demands; it entails various activities along the supply chain, from demand planning to the physical delivery of medicines to the health facility(Belson, 2005).

The World Health Organization (WHO) defines a drug or pharmaceutical preparation as: any substance or mixture of substances manufactured, sold, offered for sale or represented for use in the diagnosis, treatment, mitigation or prevention of disease, abnormal physical state or the symptoms thereof in man or animal; [and for use in] restoring, correcting or modifying organic functions in man or animal (WHO, 2010).

The distribution of pharmaceutical products is an important activity in the supply chain and involves several players. It consists of procuring, holding, supplying, importing and exporting of pharmaceutical products. Distribution activities are carried out by manufacturers, importers, wholesalers/distributors, retailers and other persons authorized to supply pharmaceutical products in the public and private sectors (NAFDAC, 2016).

According to WHO(2010),pharmaceutical distribution is procuring ,purchasing ,holding ,selling, supplying ,importing , exporting or movement of pharmaceutical products with the exception of the dispensing or providing pharmaceutical products directly to the patient or his or her agent.

The primary drug distribution management goal is to maintain a steady supply of pharmaceuticals and supplies to facilities where they are needed, while ensuring that resources are being utilized in the most effective manner. Adequate and dedicated transportation facilities laced

with cold chain maintenance are an important factor in maintaining the timely distribution of quality medicines round the clock at health facilities. (Javid Iqbal, 2017).

Pharmaceutical distribution has never been just about delivering. It is about getting the right medicines to the right patients at the right time, safely and efficiently. Every day, pharmaceutical distributors sustain a complex supply chain, serving as an important link in the healthcare system and delivering medicines safely, securely and efficiently. Distributors work around the clock to help pharmacies, hospitals, long-term care facilities, clinics and other health care providers keep their shelves stocked with the medications and products that patients need. Different information technologies such as product identification, bar coding, usage related information, and electronic identification have been applied to facilitate the rapid distribution of the pharmaceuticals in the supply chain (Belson, 2005).

2.1.2 Pharmaceutical distribution management

2.1.2.1. Pharmaceuticals storage system and inventory management

An important goal in storage of health products is the correct staging of health products to ensure that orders can be filled and distributed. Storage ensures the physical integrity and safety of products and their packaging, throughout the various storage facilities, until they are dispensed to clients (USAID | DELIVER PROJECT, 2015). Medicinal products should normally be stored apart from other goods and under the conditions specified by the manufacturer in order to avoid any deterioration by light, moisture or temperature.

The layout of a warehouse is key to its efficient operation. In developing warehouse or distribution center layouts, pharmaceutical corporations face unique challenges due to the nature of their products. Pharmaceuticals are sensitive not only to external contamination from bacteria or chemicals but also to temperature changes. In some cases, even lighting can damage pharmaceuticals. Pharmaceuticals must also be stored in a way that makes it easy to use a first - in, first-out system and that keeps this critical and expensive product safe from theft and deliberate contamination. These unique requirements mean that many factors need to be considered when setting up a warehouse for pharmaceutical storage. (IGPS, 2019)

Proper storage facility for drugs ensures the effectiveness, safety, strength, and quality of drugs. Unless the drugs are segregated from other non-pharmaceutical items and stored properly, long shelf

life of the drugs is not guaranteed. Medicines need to be stored to maintain the intended quality and prevent damage while handling until it reaches the consumer. (Harish Ganesh Joshi 2015)

Poor storage conditions, high temperature and high humidity conditions generally enhance chemical degradation and may alter the biopharmaceutical properties of the drugs, interactions may occur when products are exposed at high temperature and humidity, consequently reducing the dissolution rate. (Bonn, 2012)

Medicine needs to be stored in warehouses under appropriate conditions regarding security, temperature, conditions and storage area. Furthermore, a correct inventory management is necessary to ensure adequate stock levels. Therefore, strategies such as regular stocktaking, inventory reconciliation, first-expired-first-out practices and traceability of batches are beneficial. Research outlines that more centralized ware-house management model with guidelines and standard operating procedures im-proved performance. (anna schopperle, 2013)

Medicines should be stored under conditions which ensure that their quality is maintained. The temperature of storage is one of the most important factors that can affect the stability of a medicine. If medicines are not stored properly they may not work in the way they were intended, and so pose a potential risk to the health and wellbeing of the person receiving the medicine.(care inspector, 2016)

Inventory Management is the core of pharmaceutical supply management, without which the entire supply chain structure is not viable. The concept of inventory management sounds easy when it is just described as the process to order, receive, storage, issue and then reordering of a limited list of product. In reality, implementation of a robust inventory system for a pharmaceutical supply is a difficult task (Management Sciences for Health, 2012).

A “sick” inventory arises due to individual decision making on frequency of reordering and quantity to be ordered, ad hoc structuring, inaccurate stock recording, lack of transparency, increase in complexity, and the absence of systematic monitoring. These problems, mainly arise due to lack of awareness or knowledge about of scientific stock keeping and warehouse practices. In developing countries like India, where budget is tight, overstocking of certain pharmaceutical items may block a substantial portion of the drug budget, resulting in insufficient funds for procuring drugs that are more important. For this reason, it is important to implement or upgrade an inventory

control system in a public pharmaceutical supply to maintain a steady supply of drugs to the public. This ensures good health to all while minimizing the costs associated with inventory holding, lowering order processing, procurement or delivery costs, controlling stock levels and minimizing stock out conditions (Monica Balakrishnan,2015).

Temperature should be monitored and recorded periodically. Records of temperature should be reviewed regularly. Records should be maintained of these conditions if they are critical for the maintenance of the characteristics of the pharmaceutical product stored. (WHO, 2010)

Storing is the safe keeping of pharmaceuticals to avoid damage, expiry, and theft. Proper storage procedures help to ensure that storage facilities protect the shelf life of products, that only high-quality products are issued, and that there is little or no waste due to damaged or expired products. If proper storage procedures are followed, customers can be assured that they have received a high quality product (IPLS, 2015).

Medicinal products should be handled and stored in such a manner as to prevent spillage, breakage, contamination and mix-ups. Medicinal products should not be stored directly on the floor unless the package is designed to allow such storage. (PIC/S GDP, 2014).

An efficient inventory control system minimizes spoilage and expiry at all level maximum and minimum level are established at all levels for medicines and other health supplies. The commonly practiced periodic ordering or forced ordering, inventory control system at RMS and SDP ensures that at the end of each review period logistics personnel at those levels review all stock levels and order enough to bring stock levels up to the maximum.(Ghana MOH, 2009)

Inventory management as the branch of business management concerned with planning and controlling inventory 2015 (APICS).The role of inventory management is to maintain the desired stock level of specific products or items. The systems that plan and control inventory must be based on the product, the customer, and the process that makes the product available. A n effective and dedicated storage space provides the correct environment for the storage of medicines and commodities and assists the efficient flow of supplies (Javid Iqbal, 2017). IM systems or forms are necessary to gather information such as consumption data to identify successes and efficiency constraints (Transaid, 2013).

2.1.2.3. Transportation in pharmaceutical Distribution

Transportation refers to the movement of products from one location to another, as the products are rarely produced and consumed in the same location (Tsao & Lu, 2012). In order to understand the role of transportation in the distribution of pharmaceuticals, it is important to consider the perspectives of the parties involved, carriers and shippers. The carriers make investment decisions regarding transportation equipment in order to maximize the return on investment of the assets. They decide whether to use trucks, airplanes or other modes of transportation. On the other hand, shippers use transportation to minimize the total costs of operation (e.g., transportation, inventory, facility).

Transportation is an essential function in logistics for delivering the commodities to the health facility level. In many of the public sector logistics systems, not enough attention is given to the development of the transport system specifically for delivering products. However for HIV/AIDS program, more attention will need to pay to transport systems because of the nature of the supplies being high-volume, high-value and some with short shelf lives. As a result, transport systems need to be managed with better security and; efficiently in order to reduce lead-times, which can directly impact the amount of inventory the system needs to carry. In many countries, transportation is the weakest link which, if not addressed impacts the inventory, order management and customer service. Transportation systems can no longer be managed on an ad-hoc basis, but need to be managed as a scheduled delivery system. This means that programs need to either invest in transportation systems or seek for options to outsource this function to private companies that can ensure timely, regular delivery. (Sangeeta Raja, 2004).

Pharmaceutical transportation should be secured and include the appropriate documentation to facilitate identification and verification of compliance with regulatory requirements. Policies and procedures should be followed by all persons involved in the transportation, to secure pharmaceutical products. (WHO, 2010)

When transporting pharmaceuticals, the truck must remain at a certain temperature to maintain their safety and efficacy. The exact temperature will depend on the pharmaceuticals you are transporting. Without proper temperature controls, these pharmaceuticals could become dangerous to use. Cold chain transport is integral to safe transportation of these medications (PFSA, 2015, pharmaceuticals distribution manual).Distributing medical supplies to the healthcare facilities

also involves managing an effective transportation system and preventing misappropriation of fuel and vehicles for private or non-health related uses. The Responsibility of the supplying wholesale distributor to protect medicinal products against breakage, adulteration and theft, and to ensure that temperature conditions are maintained within acceptable limits during transport(EEA, 2013).

Road vehicles used to transport drug products should be suitable for their purpose. Monitoring devices should be placed in different areas of the trunk or cabin where the drug product will be positioned during seasonal extremes (e.g., summer and winter). The monitor should be secured so that it is immobile and there should be no ambiguity about its exact position within the payload so that the monitor is always placed in the same position. Monitoring devices used on or in packages or on containers may also be used (GSDP, 2017).

Transportation of medicine to health center needs to balance high initial investments, capacity of health workers, reliability and stock-out situations. Therefore there are using different approaches for distribution, such as collection, delivery, outsourcing or public-private partnerships. Transportation cost can account for 10-20% of the stock value and thus, distribution systems need to be optimized (Anna Schöpperle, 2013)

Delivery schedules should be established and routes planned, taking local needs and conditions into account. Such schedules and plans should be realistic and systematic. Security risks should also be taken into account when planning the schedules and routes of the delivery. Distributing pharmaceutical products to the healthcare facilities involves managing an effective transportation system and preventing misappropriation of fuel and vehicles for private or non-health related uses (EPSA, 2016, distribution manual).

2.1.2.4. Repackaging, Relabeling in pharmaceutical Distribution

A package would essentially protect and preserve a product. Along its development and extensive use in an industrialized society, other functions were attributed to packaging such as to store, to transport, and to promote product sales .To Ensures the product quality and to protect the contents from the rigors distribution, including environmental or physical damage the packaging of the pharmaceutical product should be selected and tested. (Lorenzini Giana, 2018)

As pharmaceutical products is likely to be distributed in a variety of ways, some going out through informal channels, the labeling of drugs and the package insert becomes important. (World Health Organization, 2004)

All drug products have storage requirements that may contain specific controls. The container used for transporting the drug product should be qualified on the basis of labeled conditions of the product as well as anticipated environmental conditions. Consideration should be made with seasonal temperature differences, transportation hemispheres, and the routes and modes of transportation. The type, size, location, and amount of the temperature• stabilizers required to protect the product should be on documented studies of specific distribution environment, including domestic and international lanes, mode(s) of transport, duration, temperature, and other potential environmental exposures or sensitivities that may impact product quality (PIC/S GDP,2014).

Report on PFSA (2015) Medicinal products should be transported in containers that have no adverse effect on the quality of the products, and that offer adequate protection from external influences, including contamination. Pharmaceutical packaging has the vital role of keeping medicines safe.

Repackaging and relabeling of pharmaceutical products should be limited, as these practices may represent a risk to the safety and security of the supply chain (WHO,2010). During transportation pharmaceuticals should be securely packaged, clearly labeled, and be accompanied by appropriate supporting documentation. Special care should be taken when using dry ice in shipment containers. In addition to safety issues it must be ensured that the pharmaceutical product does not come into contact with the dry ice, as it may have an adverse effect on the quality of the product. (WHO, 2010)

2.1.3 Effective pharmaceutical distribution

In the distribution of pharmaceuticals reducing the cycle time can add the efficiency of the supply chain. When a distributor reduces the time span for distribution cycle, making it short, the overall costs will be decreased. An effective supply chain is characterized by the timely, reliable movement of health commodities and data up and down the supply chain: from the service delivery point to hospital, health center, health posts, clinics.

Susarla and Karimi in (2012) describe A well-managed and well-designed distribution system will have Sustain a constant supply of medicines, Minimize loss due to expiration and damage,

Maintain correct inventory records, Utilize available transportation resources efficiently, provide information to determine forecasting medicine needs, and also Integrate a quality assurance program.

The distribution process begins when the manufacturer ships the medicine and ends when the medicine consumption report is back to the procurement entity (Susarla & Karimi, 2012).

A well-coordinated medicines supply system helps to ensure that funds available for the procurement of medicines are used effectively and efficiently. Failures in the supply system can lead to life threatening medicines shortages and waste of scarce resources. Problems frequently result when an inefficient public medicine supply system is intended to serve an entire country and/or more efficient private sector supply systems only serve urban populations (fact book on level 1 monitoring indicators 2007)

As mentioned WHO 2006, effective distribution management comes from m selecting appropriate strategies for delivering, maintaining accountability procedures and secure storage at each level of the system, making reliable transport arrangement, keeping reliable records of medicine stocks and consumption, designing an effective network for storage facility, allocating supplies based on actual workload and treatment needs.

Efficient distribution management includes the availability of an efficient network of storage facilities, keeping reliable records of drug stock balance and consumption, maintaining accountability procedures, ensuring adequate and secured storage, reliable transport systems and reinforcing, reporting and supervisory practices (Matse, 2005).

An efficient drug distribution system ensures the availability of the right medicines in sufficient quantities procured at the lowest prices to secure the maximum therapeutic value to the largest number of beneficiaries with the availability and additional resources (Javid Iqbal, 2017).

2.1.4 Evaluation of pharmaceutical Distribution Effectiveness

Organizational effectiveness is defined as an external standard “of how well an organization is meeting the demands of the various groups and organizations that are concerned with its activities” (Pfeffer and Salancik, 1978).

Assessing for ways of improving performance of pharmaceutical distribution is very essential for distributor of pharmaceuticals. By evaluating and measuring distribution, performance manufacturers and businesses can see what they achieve, quantify ad qualify their effectiveness, identify opportunities for improvement and compare their performance against competitors. (Lezama, 2015)

2.1.5 Distribution Challenges for pharmaceutical products

Inadequate availability of and access to essential health commodities are major barriers to the delivery of essential health care in developing countries.

Health is a basic human right and access to medicine is a basic tool to ensure health. This right and its tools are facing major issues in the world

The supply and distribution of medicines are a fundamental aspect of the success of any health system. Fundamentally, they ensure access to medicines to local populations. However, they also provide information on the supply and demand of products and transfer money to finance the system. Disruptions to this supply of medicines undermine health outcomes as supply chains have an impact on the availability, cost and quality of medicines available to patients. Developing countries face a number of challenges that limit access to medicines. These include: Regulating the quality and flow of medicines into and within the country, Geographic access to medicines, financial access to medicines, Supply chain forecasting and planning, Limited warehousing.(Ariane McCabe, 2014).

Improving access to affordable and high-quality essential medicines, and ensuring their rational use, is among the main objectives of national medicines policies. However, about 50% of the population in sub-Saharan Africa lacks regular access to essential medicines, while traditional medicine remains insufficiently integrated into conventional health services. Problems of insufficient access can be attributed to: inadequate human resources, insufficient financing, high medicine prices, inadequate management of public sector procurement and supply management systems and inadequately regulated pharmaceutical markets (who 2017).

The Federal Government of Ethiopia has made several efforts to improve the health of Ethiopian by setting up programs to deliver priority health interventions. Despite these efforts, shortage of foreign currency, displacement in most part of the country, unavailability of reliable

transport system, lack infrastructure are a major contributing factor to shortage of pharmaceuticals (EPSA 2019 annual report)

Many low-income countries are still facing acute shortages of essential medicines because of the limited supply of affordable medicines and inadequate logistical systems to deliver them, and a continuing shortage of new products to meet developing country's health needs. As such, efficient medicine logistic and supply management is viewed as the key strategy in reducing costs of drugs and ensuring their availability in the healthcare facilities (WHO June, 2004).

Distribution of pharmaceuticals to a health facility is facing too many problems, which impact effectiveness of distribution performance. One of the major challenges of the pharmaceutical sector and health care delivery system in Ethiopia is the uncoordinated drug distribution system, which is not in line with good drug supply management, which the National Drug Policy stipulates(PFSA, 2015).

As report of EPSA by 2015 pharmaceutical distribution in Ethiopia face a lot of problems. The major ones among them include:

- Storage and Processing Problems: Storage and processing are critical in ensuring that the pharmaceutical products for a particular period are available for consumption whenever and wherever they are required. Medicines and some other medical supplies risk losing their efficacy due to poor storage conditions. Most facilities do not have conducive and adequate storage space. Medicines are stored in areas that may lead to faster deterioration
- Transportation and Infrastructural Inadequacies: Most facilities visited do not have transport facilities and some that are in place are old. Lack of transport, high cost of it and poor conditions of vehicles are major setbacks at facility levels, when it comes to collecting medicines and medical supplies from PFSA. Inadequate infrastructure constitutes a major constraint to pharmaceutical distribution.
- Uncoordinated drug distribution system: The level of HIV pharmaceuticals in health facility is several challenges for delivery such as; logistics support has remained at the same level, even if the number of ART sites increasing is rapidly. inadequate storage facility, the PFSA centers are constrained by shortage of vehicles, portable cold chains, racks, palates in addition staff turnover is high, stock arrangement warehouse is poor(USAID, 2009).

In health facility there are several challenges for delivery of pharmaceuticals such as poor road and vehicle infrastructure, long travel distances and shortage of funding. Last mile delivery deals with transportation, data collection and order fulfillment. There are used several approaches such as mobile warehouses, collection, scheduled delivery or manufacturer-managed transportation. The challenge is to deliver small quantities to several customers and balance incentives, ability of HWs, medicine availability at HCs and collection of consumption data. (Arlington MSH)

The level of stock availability at a regional store is influenced by various factors that take place in the central store. Some of which are inadequate stock to distribute to regional stores, lack of transport, long tendering procedures, supplier performance, uneconomical order quantities, computer system hang-ups and at times lack of due diligence on the part of central store staff among other issues. The many factors mentioned invariably affect the availability of medicines and medical supplies at the health facilities as well (EPSA center KPI training in 2018)

A WORKSHOP BY WHO (2006) outlines problems in distribution of medicines in Africa were poor communication, information and consumption data. And also inadequate storage facilities and temperature control systems and a lack of quality assurance procedures. Lack of transparent procurement procedures is the main challenge in Africa to distribute pharmaceuticals in Africa. In addition Lack of appropriate planning, monitoring and evaluation and inadequate budget allocation.

2.1.6 Worldwide Strategy of Supply Chain Management

Some recent study regarding supply chain integration in European firms show that many firms have adopted enterprise resource planning systems and also established some electronic links with their supply chain partners. Enterprise resource planning systems generally support internal coordination across functional activities; however it is less supportive in decision-making across organizational boundaries. The results from the survey also confirm that supply chain integration is more a rhetoric than reality in most industries in Europe. Regarding transparency of inventory and sensitive data, most companies are quite cautious when it comes to sharing such data. Very few companies have established joint decision-making with their key suppliers or customers. However, a majority of the respondents confirmed that some consultation took place with their supply chain partners (Bagchi, 2005).

In the same year there are researches that compared the supply chain integration and performance of US and East Asian Companies. The variables used are information sharing, internal integration and external integration with suppliers. It was found that US companies tend to use various means in ensuring information sharing process is smooth and share the information to the extent production plans and systems. But East Asian firms are using internal integration via internal control primarily to reduce costs, but the US firms emphasized on operational integration of physical process flows between a company and its suppliers and customers. Regarding external integration both East Asian and US firms show long term partnership with suppliers and customers that lead to achieve competitive advantage (Zailani and Rajagopal, 2005).

Kannan and Tan (2005) studied the linkages between just in time, total quality management and SCM in business performance, According to the study, at strategic level, linkages exist between just in time, total quality management, and SCM. While some companies may understand the inherent relationships between the three and actively exploit their synergy, those that do not maybe inadvertently achieving the benefits of synergy. By explicitly and effectively integrating just in time, total quality management, and SCM practices into operations strategy, the potential exists to add value and to better position oneself to respond to competitive pressures. At an operational level, just in time, total quality management, and SCM practices can be deployed together to create value. The extent to which various practices correlate with each other and with performance is evidence that while the three may have distinct characteristics and goals, there are elements of each that are common and which can be successfully reinforced by each other. Lastly, in addition to having a focus on quality, understanding supply chain relationships is a key driver of performance. Whether it is by coordination and integration of activities throughout the supply chain or by recognizing the capabilities of immediate suppliers, understanding supply chain dynamics has a significant impact on performance. As the trend towards outsourcing and focusing on core competencies increases, organizations will be under greater pressure to effectively leverage supplier and customer relationships. The results demonstrate that doing so be a significant driver of a firm's success (Kannan and Tan, 2005).

According to the study on SCM practices of the Hong Kong manufacturing companies, it shows that there is little progress towards SCM implementation. SCM is immature and not fully recognized in

the city. The main reason may be due to the application of information and communication technologies and insufficient skills (Chin et al., 2004).

practice from four key areas namely; management issues, roles and responsibilities, competitive strategies and performance management. The result of the study show that; many firms will be required to change their organizational structures, relationships with supply chain members and performance measurement systems to achieve this. New information technology to enhance communication throughout the supply chain will be required as well in order to increase service levels and reduce operating costs. Supply chain management managers will have to decide which areas offer the greatest strategic value for the supply chain. Over time, these capabilities will become an entry requirement for those wishing to compete. However, first movers are likely to continue to benefit from their pioneering efforts, and continue pushing forward seeking further differentiation.

2.1.7 Developing Countries Experience

Asamoah et al., (2011) studied the pharmaceutical supply chain for anti-malarial drug in Ghana. It was found that there are two main supply channels i.e. private and public channels. But both chain lack information technology leading to disruption and delay in the Supply chain system. These lead huge implication in drug security and affordability. To achieve availability of drugs at the right time and place the availability of information infrastructure is mandatory for the supply chain.

Msimangira, (2003) studied the SCM practices of Botswana companies. The result of the study shows that supply chain management is not as such a strategic rather it is a clerical and operational activities only. Top managers don't recognize its importance and also there are very limited trainings and education are available for SCM as a profession.

Voordijk (1999) studied obstacles and precondition of logistics and manufacturing as case study of the East African country of Eritrea, The result showed that each element of the supply chain network causes problems. The basic condition for logistics and manufacturing are well developed infrastructure: such as transport system and telecommunication network, enabling environment: such as sound industrial policy and educational system for skill development, and at firm level: such as purchasing materials, manufacturing capabilities and export and distribution. Such factors impede the efficient logistics and manufacturing of the country. To solve such obstacles the government has to follow two types of policy. On the one hand, it has to reduce its own role by

giving public firms more autonomy and by eliminating the remaining regulatory and legal obstacles that constrain private (domestic and foreign) enterprises from investing. On the other hand, the government has to strengthen its role in the national economy by increasing investments in the transport and communication infrastructures. Also firms have to improve their local linkages in order to decrease their supply, production and distribution problems. The institutional infrastructure just mentioned can be important in getting to know local business partners. In addition, firms have to seek co-operation with foreign companies in order to solve their supply chain problems.

One study regarding logistics management of South Africa shows that there is still in the quarter of supply chain confusion. The position close to the center can possibly be explained by the fact that South Africa is still in the early phases of integration of logistics activities. Understanding for logistics has increased but the practice still lags behind. Logistics management is still fragmented. Logistics activities are still managed with a functionally fragmented approach. The major advantage of the integrated logistics concept is the higher efficiency that stems from integrated management. The other challenges are that there is lack of holistic management. The fact that management in South Africa is primarily functionally oriented resulted in a lack of holistic management. In addition, there is lack of integrative systems. Owing to the lack of a holistic approach, integrative systems will naturally lag behind (Cilliers and Nagel, 1994).

2.1.8 Ethiopian Experience

SCM practices and challenges in different industry of Ethiopia were studied in different dissertations. The results of different researches in the practices of SCM in different commercial sectors of Ethiopia are poor. Admaw (2010) studied the practice of SCM for Ethiopian textile firms. It was found that, SCM practices in Ethiopian textile firms are weak and not considering SCM as a strategic tool for competition. Business managers of the textile firms didn't give attention for SCM theories and practices. Also Dereje, (2012) studied the impact of SCM practices on the organizational performances in metal and engineering industries. The result of the study shows that the implementation of SCM in this industry is weak. Also the SCM practices don't have any relationship with organizational performances except internal lean practices. In addition, belay, (2011) studied the practices of SCM in cement industries. The result of the thesis shows similar to other industries in the country i.e. the practice of SCM in cement industry is almost poor. There

seems that since the demand outweighs the supply of the cement, which contributes for not using SCM as a competitive strategy.

Mesfin (2007) also studied the SCM and model development study as a case study of Mesfin Industrial Engineering plc. The result of this study shows that most of the employees of the company don't have awareness of SCM. The company also don't use supply chain cost analysis rather than using the traditional accounting system. Also there are problems in their warehouses. Besides to the above machine handling problem, ageing, poor preventive maintenance, lack of proper operation, and wear of spare parts are the main reasons for the breakage of machines in Mesfin Industrial Engineering.

Based on the assessment of FMOH for monitoring and evaluation of national drug policy, there was only one local pharmaceutical manufacturing plant in 1993 G.C that is owned by the government. Currently, drug production activity is being under taken by 13 local pharmaceutical manufacturing plants: One government owned, eleven private (unaffiliated with multinationals) and one private (affiliated with multinationals). Three of the factories are engaged in medical supplies production, one on empty gelatin capsule production and nine on finished product formulation using imported raw materials (FMOH, 2003).

According to Sutton and Kellow (2010), and different experts the pharmaceutical supply chain of Ethiopia have two wings. The first is addressing those of the public health facilities through PFSA. The second is addressing the private health facilities through different importers, wholesalers and also PFSA to some extent. PFSA was established in 2007 based on pharmaceutical logistics master plans implementations designed by FMOH. The mandate of PFSA is; it is a sole provider of forecasting, procurement, storage, inventory management and distribution of pharmaceuticals to the public health sector in Ethiopia. PFSA's current supply chain starts with the import of most drugs via the port of Djibouti. These products are then trucked into central PFSA based in Addis Ababa, before being distributed to the various distribution centers and on to the hospitals and health centers. Today, there are approximately 750 Health Centers operating in Ethiopia, with a planned expansion to 3,500 (1,500 are planned to be operational by July 2010). There are also 6,000 Health Posts operating, with a planned expansion to 15,000. The ultimate goal of this expansion is to have a Health Facility within a two hour walk of every Ethiopian citizen. The system is still largely push

system as demand profiles that are used for pull system are unknown with the exception of HIV and AIDS drugs and supplies (World Bank, 2009).

Recently PFSA has established pull system known as integrated pharmaceutical logistics system primarily using the essential data items reported from health facilities regularly every other month. Using its 11 distribution centers, PFSA will distribute drugs and supplies to public health facilities throughout the country (PFSA, 2012).

2.2 Empirical Literature Review

USAID (2011) in developing country with poor roads it is expensive to transport products over rough terrain In India, for example, nearly 70 percent of the population lives in rural areas, where the health posts may be few and lacking in staff, electricity, and supplies. The costs of drug distribution in India are two to three times greater than in the United States or the European Union, despite vastly lower labor costs Langer and Kelkar, 2008). Supply chain managers are always concerned with the last-mile problem: the disproportionately expensive and inefficient final leg on the distribution chain. In developing countries, the last mile is exceptionally long, extending to sparsely populated villages far from a paved road and farther from a supply center.

The research done by Adzimah (2014) A qualitative study on assessment of health commodities management practices in selected hospitals in Ghana revealed that, challenges in managing inventories in the hospitals was; inadequate availability of health commodities, poor procurement practices, undermined distribution, unavailability of storage facilities, unavailability of skilled labor, internal bureaucracy, lack of funding and logistical problems.

A study on inventory management practices at public and mission hospitals in Kenya by Shadrack (2015) explored that, the challenges experienced by the inventory management , team were; stock-outs, inadequate storage space, budget constraints, poor inventory record keeping, lack of teamwork, delayed supplies, delay in getting suppliers and inadequate staffing in the department. Ad-hoc decisions about order frequency and quantity, incomplete stock records, lack of Standardized Operating 10 Procedures (SOPs) to guide staff and lack of regular performance monitoring were other challenges faced in the studied hospitals.

In developed countries, the majority of medicinal products reach the patient through the traditional pharmaceutical full-line (pre-wholesaler) distribution pathway: manufacturer patient. In some cases,

a pre-wholesaler is part of the retail pharmacy wholesaler supply chain, linking the manufacturer and the pharmaceutical full-line wholesaler. Shadrack (2015)

According to Admasu (2016) study result shows that in PFSA head office most of the location of warehouses is less comfortable to pick, load and unload pharmaceutical products. This is because the agency uses rental warehouses which were not planned and built for warehousing and storage purpose. In addition, study shows that problems during unloading of pharmaceuticals at branch and health facility level. The problem is higher when the move to health facilities. Some of the problems are; Warehouse managers may not available in the workstation, less human power to unload products especially at health facility level.

Ethiopian government started moving to make the vaccine SCM more efficient and integrated. However, unlike other sectors such as discrete parts in manufacturing and fast-moving consumer goods where there has been a long history and experience with h management of inventory, the healthcare sector is behind other industry sectors in implementing effective supply chain management (SCM) practices (McKone et al.,2005;Baltacioglu et al., 2007).

The main reason for the sector's difficulties in implementing effective SCM practices is supply chains are much more complex compared to supply chains in other industries (Vikram, Prakash, & Amrik, 2012). However, several factors contribute to this complexity. There are also new vaccines continually adding to the SCM, demanding specific conditions like transportation, storage or cold chain and distribution that challenge the supply chain and inventory management.

The Ethiopia case is that Food, Medicine and Health Care Regulatory Authority (FMHACA) adapts and follows stringent registration and market authorization procedures. Food and health products need to undergo registration and licensing with detail product descriptions, manufacturer information Andover, there are regular import permit approval and licensing requirements. Third, pharmaceutical products are characterized by long developmental cycles that are distinctly different from medical devices. These long lead times have a significant impact on capacity planning and supply chain strategies, particularly inventory management.

As a result, in vaccine SCM, getting a child vaccinated, a mother an appropriate medicine and controlling any epidemic outbreak are all very critical while ensuring the proper management and use of medicines. That makes supply chain in vaccine more difficult while it requires the bulk of the

health resources even if funded by UNICEF. Although, vertical and integrated systems each have advantages and disadvantages there are valid technical reasons, often reflecting changes in the environment, make integrating a logistics system more advantageous or feasible. Some of the advantages include improved transportation infrastructure, improved data management, improved communications system coverage, new customer service requirements and increased storage and transportation efficiency (USAID | DELIVER PROJECT, 2009).

Adopting SCM initiatives primarily requires that companies take a long-term view and have an extensive focus, on all the conduits that are employed in the total transformation process from the earth to the end-user to create a productive and reliable supply chain network system. Specially vaccine supply chain needs to consider the various administrative levels and wide that requires specific storage conditions, cold chain, regulated levels of usage, and seasonal and campaign effects and bulkiness of the products and storage capacity at all levels.

Proper execution of SCM requires commitment and champion from senior management too. In old days and currently even in some organizations, internal supply chain and inventory management were over emphasized. However, organizations and partners have to re-think how their SCM linked to others within and outside the organization, locally and internationally, and upwards and downwards supply chain. Hence by evaluating and mapping a specific supply chain, a company is able to find and reduce system redundancies while improving reliability and flexibility of a system. SCM needs to begin by investigating each function a department handles and breaking it down if necessary.

Despite the challenges that are created developing an effective and efficient supply chain become a core competency or even a distinctive competency. A core competency is any function, which a firm does well at performing. On the other hand, a distinctive competency is a function that is performed well and is unique. Literature has shown that the basis of competition in many industries in the future will revolve around supply chain development (Das & Narasimhan, 2000). Supply chain analysis advocates reducing non- core processes (waste) and streamlining the supplier and logistics network. Thus the supply chain network includes upstream, downstream and lateral suppliers producing goods, services or other value adding activities.

2.3 Conceptual Framework

The conceptual framework adopted for this study shows that the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town. This practice includes: packaging condition and facilities, Storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system. The dependent variable is an effectiveness of pharmaceutical distribution. Therefore, the conceptual framework shows that pharmaceutical distribution to health facilities.

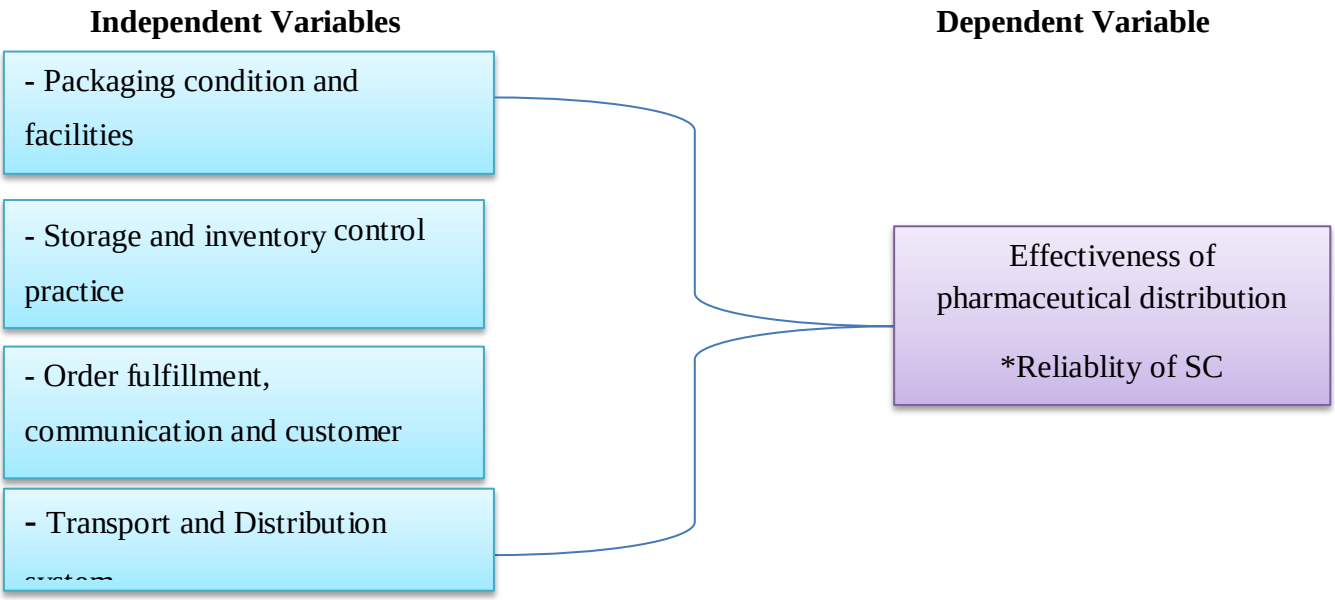

Figure 1: Concept Framework

Source: Own Survey Result Developed, 2021

Literature Gap

From the above literature review section, several studies have been carried out in relation to pharmaceutical distribution; however, there are little or no theories in relation to customer satisfaction and consistency of distribution of pharmaceutical products to health facility. Therefore, this research is intended to fill these gaps in the areas which are not researched by others.

CHAPTER THREE

3. Research Methodology

3.1 Description of Study Area

Jimma is the largest city in southwestern Oromia Region in Ethiopia. It is a special zone of the Oromia Region and is surrounded by Jimma Zone. It has a latitude and longitude of 7°40′N 36°50′E. The town was the capital of Kaffa Province until the province was dissolved. Prior to the 2007 census, Jimma was reorganizing administratively as a special Zone. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 120,960, of whom 60,824 are men and 60,136 women. With an area of 50.52 square kilometers, Jimma has a population density of 2,394.30 all are urban inhabitants. A total of 32,191 households were counted in this Zone, which results in an average of 3.76 persons to a household, and 30,016 housing units. The three largest ethnic groups reported in Jimma were the Oromo (36.71%), the Amhara (27.14%) and the Dawro (10.05%); all other ethnic groups made up 26.1% of the population. Amharic was speaking as a first language by 41.58% and 39.96% spoke Afan Oromo; the remaining 18.46% spoke all other primary languages reported. The majority of the inhabitants said they practiced Ethiopian Orthodox Christianity, with 46.84% of the population reporting they observed this belief, while 39.03% of the population was Muslim, and 13.06% was Protestant.

3.2 Research Design and Approach

Research design is a master plan specifying the methods and procedures for collecting and analyzing the required data. The choice of research design depends on predetermined objectives that the researchers want to achieve. According to Kotzar et al., (2005), research design is defined as the plan and structure of investigation and the way in which studies are put together. Cooper et al. (2003) also define research design as the process of focusing on the researcher's perspective for the purpose of a particular study.

The study was designed to identify the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town. The researcher was used quantitative data in respect with research variables of Effectiveness of Pharmaceuticals delivery. Since it tries to describe the problem and attempts to explain the phenomenon with quantitative research approach. Thus, due to quantitative nature of data, the researcher was used deductive reasoning to examine the

cause and effect relationships between evaluations in relation with Effectiveness of Pharmaceutical delivery because deductive reasoning starts from laws or principles and generalizes to particular mean that the researcher generalized the position of Effectiveness of Pharmaceutical delivery depend on independent variables. As noted by Kothari (2004), explanatory research design examines the cause and effect relationships between dependent and independent variables. It is an explanatory research design whereas quantitative explanations are quantitative research approach.

3.3 Source of Data

The researcher was used both primary and secondary data. Primary data was collected from EPSA internal staff and from health facility who are pharmacy professionals who come to EPSA to collect pharmaceuticals. Data was collected using a structure questionnaire administered to 200 respondents. Structured questionnaire was designed in a set of open and close ended questions in respect to all the objectives. Secondary data was collected from journal articles, magazines, books, Internet web sites, procurement reports, manuals, policies and procedures, published and unpublished documents about procurement practices in Ethiopia and abroad. A closed- ended questionnaire with five point Likert scale was used to measure the opinion of the respondents about the organization.

3.4 Sampling Design

3.4.1. Target Population

The target population for this study was employees from distribution, warehouse & inventory management, forecasting department, fund administration and general service departments which found under EPSA Jimma branch. Therefore, the target population for this study comprises 140 employees from EPSA Jimma hub. Totally, 140 employees were the sampling frame of the study. From this population, the researcher obtained the sample from the subgroup as presented in table 3.1.

3.4.2. Sample Size and Sampling Technique

The study was adopted stratified random sampling technique. Stratified random sampling is a technique which attempts to restrict the possible samples to those which are ``less extreme'' by ensuring that all parts of the population are represented in the sample in order to increase the efficiency. Stratification may often produce a gain in precision of the estimates of characteristics of

the whole population (Oshungade, & Oyeyemi, 2015). The cost of conducting the survey is expected to be less for stratified sampling when strata are formed keeping administrative convenience in mind.

Sample size refers to the number of cases, subjects or respondents that are considered enough for data collection (Kombo & Tromp, 2010). The total numbers of samples from the town are 140 employees was taking from by using proportionate for this study was stratified random sampling whereby the subjects was categorize into various strata with similar characteristics. However, a sample size was taking from the target population of 140 employees working with EPSA Jimma center, hospitals, health center, and private diagnostic center. The stratified random sampling applied ensured a more representative sample for the results to be inferred to a larger population (Ary*et al*., 1979). It is also important to ensure that the sample selected an unbiased opinion. Basing on the Krejcie & Morgan (1970) table for sample size determination, a sample of 103 respondents was selected from 140 employees of the respondents.

Table 3.1: sample size

Departments	**Target hub Staff**	**Percentage (%)**	**Number selected**	**Round up number Respondents**
Distribution	26	73.6	19.13	19
Warehouse & Inventory Management	39	73.6	28.704	29
Quantification & Market Shaping	12	73.6	8.832	9
General Service	32	73.6	23.552	24
Fund Administration	31	73.6	22.816	23
TOTAL	***140***	73.6	***103.04***	***103***

According to the working category of employees as a stratum, 103 employees were became a representative samples for the study. This study considers permanent employees of the company which were selected using simple random sampling.

3.5 Data Collection Tool

The researcher was used the questionnaire that comprise of different questions to be administered directly to respondents. The questionnaire was have different sections, ranging from the Bio data of the respondents to questions that help the researcher collect information/data about the subject at hand. There was face-to- face interview between the interviewer (researcher) and interviewee (respondent) for the employees of the respondents.

3.6 Validity and Reliability

The questionnaire was being subject to face validity and content validity by the assistance of experts in the research method. Thus the pre-test was doing before actual entrance of data collection. Indeed necessary modification was making on the items and unclear question was modified or remove from index. The content validity of the instrument for the present study was ensure as the service quality dimensions and items was identify from the literature and was review by professionals and academicians. Pilot tests were then conduct with the employees who was sees as similar to the population for the study. The purpose of the pre-testing was to refine the questionnaire and to assess the validity of measures in the study context.

The reliability was measured so as to find out the degree to which the measuring items gave similar results over a number of repeated trials. A test – retest method was used to estimate the degree to which the same results can be obtaining with a repeated measure of accuracy of the same concept in order to determine the reliability of the instrument. Bells (1993) cited in (Eriksson, 2002) states that reliability with regards to the consistency of the results is obtained from the instrument used in the research. The present study is reliable because it was used valid strategies and techniques appropriate to the research objectives. It was try also to present a detailed evidence of the research plan (i.e. details of the research site, method of sample selection, instruments was used) and its implementation in the methodology section to assure the study's reliability.

3.7 Model Specification

Based on the theoretical review and empirical considerations the following model was developing by using binomial logistic regression model. The mathematical (functional) expression of the model is given as follows:

$$Yij= \alpha+\beta1X1+ \beta2X2+ \beta3X3+ \ldots, + \beta6Xn. + \varepsilon i$$

The Binomial logistic regression model was to determine the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town among respondents. The important variables were investigated in the research are, dependent and independent variables. Dependent variable is a variable that is affected or explained by another variable. An independent variable is a variable that causes change in another (Sarantakos, 1998).

3.8 Method of data analysis and Presentation

Selecting appropriate data analysis method is central point in any research process. Hence, the researcher was used data collected through quantitative and qualitative instruments. According to the relationship they was in answering the propose research questions. Regarding the quantitative data, responses will categorize and tallied before presentation, analysis and interpretation of the data was made in chapter four. The researcher was analyzed data by using descriptive statistics (mean and the standard deviation), correlation and multiple regression analysis. Descriptive statistical procedure was utilized to summarize statistical variables in tables and calculate standardized values, which helping the score transformation places variables on common scale for easier visual comparisons. The researcher was used percentage to analyze and summarized the identification (demographic) information of the respondents, and to compare some part of the basic data. The different variables were calculated using SPSS version 20.00 to identify and show significant differences among the responses in the basic data with separate statistical summary tables for measuring the values within different indicator categories. The researcher was used for determining variances among respondents' views throughout the summative Likert response data, i.e., to analyze variability of each respondent's opinion in his/her response. In addition to this, a narrative analysis was used to examine the legal framework governing the relationship of the qualitative data, which was obtained through structure questionnaire. The qualitative data, obtained with the means of structure questionnaire was analyzed using certain preliminary procedures such as: data reduction, data display, and verification. Data reduction was made to scrutinize or examine about the relevant information from irrelevant amongst the crude nature of the data; data display, to make precision of research related information for the audience; and verification, to materialize the relationship of the qualitative data properly answering the research questions. Unlike the quantitative data, in which

data collection was generally compiled in figures, the qualitative data analysis was present in a descriptive manner.

3.9 Ethical Consideration

Permission to carry out the research was sought from the college of business and economics department of management before the study is initiated. The respondent was made aware of the objectives and the general overview of the study. The respondents were also making aware that participation in the study did not warrant the many gifts, monetary or otherwise. However, they were informing that to search findings was used by the stakeholders and policy makers for the betterment of the supply chain management system. Their informed consent was sought by appending a signature in the respondent consent.

CHAPTER FOUR

4. Data Analysis, Presentation and Interpretation

4.1 Introduction

The research objective was to investigate the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency Jimma town. This chapter presents the analysis, presentation and interpretation. The findings are presented in percentages and frequency distributions, mean, standard deviations and inferential analyses. A total of 103 questionnaires were distributed to EPSA Jimma center, hospitals, health center, and private diagnostic center of the employee, out of which 96 were returned. This represented a response rate of 93.20%. This is a very high response rate which is good for research as any response rate above 70 % is good and adequate for analysis and reporting, (Mugenda 2003).

4.2 Background Information

The demographic information considered in this study included the respondents' level of gender, age, work department of respondent's, job position of respondents,work experience and field of specialization of respondents in the study area. This information is necessary because the respondents' competence of answering the questions ably was dependent on their level of education and also the work experience of respondents in the study area.

Table 4.1 Demographic characteristics information of the respondents

Variable	Item	Frequency	Percent
Gender	Male	71	73.96
	Female	25	26.04
	Total	96	100
Age	19-25	4	4.17
	26-30	31	32.29
	31-35	35	36.46
	36-40	17	17.71
	41-45	2	2.08
	Above 45	7	7.29
	Total	96	100
Work department	Store manger	8	8.33
	Deliverer	5	5.21

	Storage and distribution	12	12.5
	Health center	28	29.17
	Government hospital customer	13	13.54
	Private medical	10	10.42
	Private hospital	14	14.58
	Other	6	6.25
	Total	96	100
Job position	Deliverer	6	6.25
	DSM	21	21.87
	Head pharmacy	42	43.75
	Officer	15	15.63
	Store manager	12	12.5
	Total	96	100
Field of specialization	Druggist	13	13.54
	Pharmacist	83	86.46
	Total	96	100
Education Level	Diploma	14	14.58
	Degree	68	70.84
	Master	13	13.54
	Other	1	1.04
	Total	96	100
Work experience	0-5 year	21	21.88
	6-10 year	43	44.79
	Greater than 10 years	32	33.33
	Total	96	100

Source: Own Survey data, 2021

The above table indicates that the majority respondents 73.96% were male while 26.04% were female. It was observed that in every department, although the males were many compared to females, this tells as the majority respondents are males. Results in table 4.1 indicate that of the employees 36.46%were on the age category of 31-35 years, followed by 32.29% with 26-30 years and 17.71% were in the age category of 36-40. The others 7.29%were above 45, 4.17% were 19-25 and 2.08% was 41-45 were respectively. From this the researcher concludes that the respondents are experienced and that can be able to perform missions of the minster of health. Results in table 4.1 show that 29.17 % respondent being from health center, 12.5% were in storage and distribution. 13.54% were governmental hospital, 14.58% were private hospital, and 10.42% were private medical center. 6.25% was other. Regarding their position the respondents were asked to indicate

their job position, 43.75% of the respondents were head of pharmacy, 21.87% were DSM, 15.63% were officers, 12.5% were store manager and 6.5 were deliverer. Head of pharmacy formed the largest group of 42 respondents. Since most of the time head of pharmacy have a general knowledge over distribution of pharmaceutical this research are good representative. On the table 4.1 above indicates that the contribution different health professionals for managing pharmaceutical activities and health service in health facility. 86.46% and 13.54% of respondents were pharmacist and druggist respectively those have more contact with pharmaceutical distribution management. The study requested the respondent to indicate their highest level of education. From the findings, 70.84% of the respondent indicated their highest education level as degree, 14.58% of the respondent indicated their highest education level as diploma, and 13.54% of the respondents indicated their highest education level as masters, whereas 1.04% of the respondents indicated their highest education level as others. This is an indication that the majority of the respondents were middle level professionals which are BSC/BA holders. There for the respondents provide relevant and reliable information on distribution of pharmaceuticals needed for the study and they are fitted in line with the response to the questionnaire. From the findings the study established that, 44.79 % had worked for a period of 6-10 year, 33.33 % of the respondents had worked for a period of greater than 10 years, 21.88% of the respondents had worked for a period 0-5 year this implies that majority of the respondents engaged in this study had worked for a considerable time and thus they had vast knowledge which could be relied upon in the study. The more experienced one is, is attributed to performance, hence directly having an impact on the consistency at which pharmaceutical distribution were availed. Therefore, the demographic analyses indicate that there is a higher male ratio, force, high work experience and very good educational level.

4.3 Descriptive analysis

This section consists of the descriptive statistics of the variables under study. The variables of the study whose descriptive statistics were computed included; packaging condition and facilities, Storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system and effective distribution of pharmaceuticals. The scores low level was represented by mean score, equivalent to 1 to 2.5 on the continuous Likert scale. The scores of moderate level were represented by a score equivalent to 2.6 to 3.5 on the Likert. The score of high level were represented by a mean score equivalent to 3.6 to 5.0 on the Likert Scale Durham Unversty, 2013).

1.3.1 Packaging Conditions and Facilities

Table 4.2: Descriptive statistics corresponding to Packaging Conditions and Facilities

Characteristics	Mean	SD
Available special storage area	3.67	1.14
Enough storage space available	3.42	1.09
Fully functional storage equipment	3.24	1.07
Different storage equipment for different kinds of vaccines	3.03	1.03
Storage equipment are regularly checked for compliance	3.11	1.06
Existing SOPs that are followed to ensure proper storage	2.74	1.01
Measures in place to ensure vaccines don't go bad while in distribution	2.93	1.02
Good storage practices are satisfactory	3.31	1.08
Average mean	3.18	1.062

Source: Own Survey data, 2021

From the table above it was agreed that packaging conditions and facilities was done in majority of the respondents has been shown by the agreement of the following statements; the available special storage area mean of 3.67; the enough storage space available mean of 3.42; the fully functional storage equipment mean of 3.24. It was found that different storage equipment for different kinds of vaccines as indicated with a mean of 3.03; storage equipment are regularly checked for compliance mean of 3.11; existing SOPs that are followed to ensure proper storage mean of 2.74; measures in place to ensure vaccines don't go bad while in distribution with a mean of 2.93 and good storage practices are satisfactory a mean of 3.31. This means that the storage conditions are not excellent to ensure safety of cold chain items. control of storage conditions and temperature is essential in maintaining the quality of cold chain items and in helping to protect patients from sub-standard or ineffective medicines that may result from inadequate storage control (Monicah,2015). The average mean values of packaging conditions and facilities are 3.18 and standard division of 1.062. In general the overall of packaging conditions and facilities in the agency was in moderate level in liker scale questioner.

1.3.2 Storage and inventory control practice

Table 4.3: Descriptive statistics corresponding to Storage and inventory control practice (n=96)

Characteristics	Mean	SD
Current storage space is sufficient for existing products & planned program expansion	2.92	1.22
In EPSA in the study area pharmaceuticals are put-Away Accuracy in the correct location so they can be quickly and easily located	2.83	1.124
In the agency there are tools (camera, security guard) to control all activity to monitor security of pharmaceutical products	3.59	1.289
In EPSA in the study area the time taken to receive pharmaceuticals from warehouse are appropriate	2.94	0.998
The time taken pharmaceuticals to unload from truck after arriving at warehouse and preparing to picking are appropriate	2.97	0.841
Proper dispatching procedures have been undertaken by EPSA	3.37	1.126
In dispatching area repacking of one drug in a container of another drug have discouraged, the name, dosage and batch number and expiry date is clearly indicated	3.28	1.14
Stockpiles renewed on EPSA in the study area are done on scheduled dates	3.03	1.16
Average mean	3.115	0.987

Source: Own Survey data, 2021

The findings shows that respondent's agreed that current storage space is sufficient for existing products & planned program expansion with a mean value of 2.92 and 1.22 standard deviation. However the result of responding is agreeing the mean value indicates storage spaces are in the moderate range. From the results majority responds that storage space is sufficient, but because of sometime pharmaceuticals delivered to center in push system, poor forecasting quantification system and damage and expired pharmaceuticals did not dispose on time leads the store space limited. They continued to agree that the organization has put-away accurately pharmaceuticals or not as shown by a mean value of 2.83 and standard division of 1.124. The results demonstrated the agency practice to put-away accurately pharmaceuticals. However respondents suggest pharmaceuticals were not arranged and are not put in rack system.

As majority of the respondents indicated that time taken to receive pharmaceuticals from the warehouse have with the mean value of 2.94. Even if the result show neutral when respondents asked in the questioners, there are delays in receiving pharmaceuticals from warehouse because of items on storage and on system does not much which causes voiding, most of the time store manager was receive and dispatching pharmaceuticals at the same time it makes the overall process to take time. According to the results the respondent say time take pharmaceuticals to preparing to picking after unloading from the truck with the mean value of the questioner is 2.97. From the result, there are some challenges in loading and unloading in the organization. In addition to that to present the facts from the questioners respondent suggest that it takes to unload from the trucks for the reason of warehouse manager was most of the time buzz because of work burden . Regarding dispatching procedures this result supported by the mean value of 3.37, respondents in the questioners describe in dispatching process order of customer does not follow its steps and suggest the agency need to work effectively to solve problems related to dispatching process. According to respondent are neutral on dosage, batch number and expiry date included during repacking of container. The result shows that neutral for the statement which can be interpreted. They may not have enough information to say other ways secondly limited knowledge about questioners. This result supported by mean value of 3.28. From the result in the agency repacking process is in a moderate way. The respondents were asked about renewed of stock on EPSA in study area are done on scheduled or not, majority of respondents neutrals with a mean value of 3.03. The average mean values of storage and inventory control practice are 3.116 and standard division of 0.987. In general the overall storage and inventory practice in the agency was in moderate level in linker scale questioner.

1.3.3 Order fulfillment, communication, customer service management

Table 4.4: Descriptive statistics corresponding to Order fulfillment, communication, customer service management (n=96)

Characteristics	Mean	SD
EPSA in the study area, health facility and other branch is communicate to distribute over- stocked and near expiry pharmaceuticals	3.23	1.03

There is strong information exchange among distribution officers, store managers and customers	3.32	1.06
EPSA in the study area has order substitute instruments other than letter and telephone cells	3.34	1.08
The demand and request of customers' orders are filled on time and up on their request and expectation	2.74	1.14
Health facility report RRF in accuracy and on time	3.2	0.997
In EPSA the response time to receive an order is short	3.11	1.03
Products which are slow and fast moving are reported timely	3.13	1.04
The quantity ordered by health facility sites for pharmaceutical product is based on real consumption analysis	3.01	1.07
In EPSA center the cost of pharmaceuticals are inexpensive with comparing other provider	3.99	1.17
In EPSA center there is well residential tool to ensure consumer satisfaction in sharing activities of the agency	2.63	1.08
Average mean	3.17	1.069

Source: Own Survey data, 2021

The above findings show that respondents were agreed concerning the communication to distribute over-stock and near expiry pharmaceuticals with in branch to branch, branch to health facilities with a mean 3.23 and standard deviation1.03.This result indicates EPSA in the study area is strong communication practice with other branch and health facility to minimize over stock and to decrease to expiration of pharmaceuticals. With regarding to the question raise to respondents for information exchange among distribution officer, store manager and customer respondents agreed with mean value of 3.32 from this result EPSA in the study area has strong information exchange practice to improve distribution effectiveness. In the next question, respondents asked whether the distribution of pharmaceutical information exchange have additional mechanism other than letter and telephone respondents agree as results supported with a mean value of 3.34. In order to inform that whether there are new pharmaceutical are arrived or not. The findings implies the agency has done well in communicating to other branch and health facility and use different mechanisms of communication to improve overall distribution system. From this anyone can understand information communication technology play a significant role in the distribution of pharmaceuticals effectively. From this table majority respondents agree whether health facility RRF report was accurate and on

time with a mean value of this are 3.22. According to the above table indicated that, the respondent's responses on time to receive an order, with a mean value of 3.13. From the result of the respondent in the agency the response time to receive an order in performed in good performance. However because of their problems in quantification either in EPSA and health facility, quality problem in refilling RRF, and long time stock out of chemical reagents which needs more effort. Concerning whether the organization has reported timely which are slow and fast moving pharmaceuticals. The respondent responds neutral, whether slow and fast moving are reported timely. With a mean value of 3.13.this result indicates the organization has in moderate performance in reporting slow and fast moving pharmaceuticals. This finding show in the time indicator of ordering, communication and customer service management EPSA and health facility has worked on awareness regarding response time, reporting fast and slow moving items on time, accurate RRF reporting and timely reporting. Regarding the quantity ordered by health facility sites for pharmaceutical product is based on real consumption analysis was response neutral a mean value of 3.01. Majority of respondent were responded, strongly agree that price of pharmaceuticals is affordable comparing of other suppliers the mean value of this questionnaires is 3.99 which indicate the respondent are strongly agree the agency price are affordable with comparing to other distributor even some drugs like cancer, cardiac are delivered in decreasing the original amount up to 30%. Finally respondents were asked if there is developed tool to check customer satisfaction in the distribution of pharmaceuticals in EPSA in the study, respondents were disagreeing of 2.63 mean values. This indicates that the majority of the respondents disagreement that there is no as such a well-developed tool to check the customer satisfaction level in distribution of pharmaceuticals. The average mean and standard deviation of the respondents were 3.17and 1.069 respectively. The results emphasized that regarding Order fulfillment, communication, customer service management indicators for effectiveness of pharmaceuticals most of indicator result are in moderate level.

1.3.4 Transportation and distribution system

Table 4.5: Descriptive statistics corresponding to transportation and distribution system (n=96)

Characteristics	Mean	SD
Pharmaceuticals which are warm insightful (chemicals, vaccines) are transported by refrigerated means of transportation	3.76	1.1

In EPSA center stock outs of necessary medicine is a regular circumstances	3.14	1.05
In distribution of pharmaceuticals bad road network affect delivery	3.51	1.14
Pharmaceuticals which are ordered by health facility are delivered on time	3.08	1.01
Pharmaceuticals which are delivered to health facility in the vehicle is received are correct items and quantities much with during receiving period	3.51	1.05
There are a sufficient number of functioning vehicles with available drivers to meet the desired distribution schedule	3.11	1.02
The quality of pharmaceuticals are ensured during transport with the use of data loggers from EPSA to HF warehouse	3.19	1.09
EPSA center have the capability to fulfill health facility require precisely and to deliver all the requested pharmaceuticals	2.57	1.03
There are established procedures for placing emergency orders	3.31	1.06
EPSA are willing to prompt corrective action for defectives pharmaceuticals	3.16	1.09
Vehicles are comfortable to load pharmaceuticals according to the distance of delivery sites(for short distance site pharmaceuticals will be load last)	3.51	1.03
The average amount of time from the moment an order is received at the storage facility until the time the order is actually transported to health facility is appropriate	3.14	0.96
Average mean	3.14	1.052

Source: Own Survey data, 2021

From the above table result that concerning to heat sensitive pharmaceuticals respondents asked whether or not transported with refrigerated truck the respondents with a mean value of 3.76. This result implies transportation of heat sensitive pharmaceuticals in the agency is transported in good condition. When respondent asked about stock out are regular situation in essential medicine they respond as follow replied that they are agreed that in the agency stock out were regular situation the mean value of 3.14. These findings indicate that there are interruptions in distribution of pharmaceuticals in health facility. With regard to the impact of the bad road network affect delivery of pharmaceuticals agree a mean value of 3.51 this result indicates the bad road network has a big impact and cause late delivery to health facilities. Concerning delivery of pharmaceuticals on time,

which are ordered by health facility or not, the respondents agree supported by mean value of 3.08. When respondents asked pharmaceuticals which are delivered in the vehicle much during receiving period incorrect items and quantities are agree with a mean value of 3.51. The respondents respond neutral and agree when they have asked whether the amount of vehicles and derivers are sufficient mean value of 3.11. Regarding to transporting of the quality of pharmaceuticals was transported or not respondents respond were agree a mean 3.19. The result shows that in the agency pharmaceuticals are transported in quality way. From the result of the above table about whether the study area were the capacity to fulfill HF demand accurately disagree that the agency does not the capacity to fulfill the demand of HF unless absolute reform with a mean of 2.57. From description part most of respondent because of quantification, forecasting, coordination, increasing of HF and high burden work it is difficult to fulfill HF demand. Regarding to whether there is a procedure for placing an emergency order in EPSA in the study area majority of respondent respond agree with a mean of 3.31. As can be seen in table above respondents were asked whether EPSA study area is willing to prompt corrective action for defective pharmaceuticals were agree a mean value of 3.16. Arranging loading according to the distance of delivery sites, respondents responds were neutral and agrees mean value of 3.51. Finally, respondents asked the time an order is received at storage until transported to health facility were appropriate majority of respondents responds neutral with a mean value of 3.14 but respondents also mentioned there are problems in wait a longer time to pick pharmaceuticals in storage, technical problems in the cars. Generally, the average mean and standard deviation of the respondents of the total item in inventory management activity represents 3.14 and 1.052 respectively thus it shows that most of the respondents neither agree nor disagree in the indicators of transportation and distribution system. This implies the agency needs to commit in order to improve this area. The results emphasized that regarding transportation and distribution system indicators for effectiveness of pharmaceuticals most of indicator result are in moderate level.

1.3.5 Effective pharmaceutical distribution

Table 4.6: Descriptive statistics corresponding to effective pharmaceutical distribution (n=96)

Characteristics	Mea	SD
Consistence pharmaceutical distribution are delivered to health facility	2.57	1.039

EPSA in the town center minimize expiration of drug	2.61	1.058
EPSA in the town is used accurate information for decision making	3.29	1.104
EPSA in the town is supplying medicine with its original quality throughout the sharing procedure	3.19	1.093
Average mean	2.95	1.073

Source: Own Survey data, 2021

From the table above it was agreed that effective pharmaceutical distribution was done in majority of the respondents asked whether EPSA in the town delivered consistence of pharmaceuticals or not disagree that EPSA in the town does not deliver pharmaceuticals to health facility with a mean value of 2.57 and standard division of 1.039 from this result the agency does not delivered pharmaceuticals in an uninterrupted way. Concerning to whether the agency minimizing expiration of pharmaceuticals or not, the respondent disagree that minimizing expiration of pharmaceuticals are done in EPSA, this result also supported by mean value of 2.61 and standard division of 1.058 which implies that the branch did not work well to minimize expiration of pharmaceuticals.

Regarding to use accurate information for decision making the respondents were agree with a mean value of 3.29 and standard division of 1.104 .This result implies that the agency has great job in using of accurate information for decision making. The respondent asked about whether the agency supply pharmaceuticals with its quality agree the agency distributing pharmaceuticals in the quality of the original with mean value of 3.19 and standard division of 0.1095. This result indicates that pharmaceutical products are reach to health facility with in good condition. Generally the average mean of effective pharmaceutical distribution is 2.95 and standard division of 1.073. From this every one can understand that EPSA centers needs to improvement in overall performance of effective distribution. The results emphasized that regarding effective pharmaceutical distribution indicators are in moderate level.

4.4. Correlation Analysis

Correlation analysis is a method of statistical evaluation used to study the strength of a relationship between the dependent and independent variables. The particular type of analysis is useful when researcher wants to establish if there is possible connection between variables. Its often

misunderstood that correlation analysis determines cause and effect., however ,this is not the case because other variable that are not present in the research may have impacted on the results., so the researcher uses correlation to analysis the direct and inverse relationship between the variables each others. The correlation coefficient can range between -1 and +1, the larger the absolute value of the coefficient; the stronger the relationship between the variables. Zero (0) indicates no relationship between two variables.

Table 4.7: Pearson correlation coefficient

		EDP	PCF	SICP	OFCCSM	TDS
EDP	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	96				
PCF	Pearson Correlation	.460**	1			
	Sig. (2-tailed)	.000				
	N	96	96			
SICP	Pearson Correlation	.426**	.083	1		
	Sig. (2-tailed)	.000	.200			
	N	96	96	96		
OFCCSM	Pearson Correlation	.344**	.124	.020	1	
	Sig. (2-tailed)	.000	.057	.756		
	N	96	96	96	96	
TDS	Pearson Correlation	.253**	.048	.063	.105	1
	Sig. (2-tailed)	.000	.462	.332	.105	
	N	96	96	96	96	96

Source: Own Survey data, 2021

According to the above correlation table 4.7, there is strong and statistically significant relationship between packaging condition and facilities and effective distribution of pharmaceuticals ($r = 0.460$, $p < 0.01$). It also showed there was statistically significant relationship between storage and inventory control practice and effective distribution of pharmaceuticals ($r = 0.426$, $p < 0.01$). The table also showed there was a moderate and, statistically significant positive relationship between order fulfillment, communication and customer service management and effective distribution of pharmaceuticals ($r = 0.344$, $p < 0.01$). There is relatively moderate and statistically positive

relationship between transport and distribution system and effective distribution of pharmaceuticals ($r=0.253$, $p < 0.01$).

4.5 Diagnosis Tests (Test for CLRM Assumptions)

4.5.1 Normality test

It is also crucial to check the distribution of the error term or the disturbance term before embarking into discussion of the regression result. To check the normality of the distribution of the error term or the disturbance term both the graphical approach and the statistical approach have been applied.

In the graphical approach the histogram is drawn for the error term and the command density is used to evaluate if the histogram resembles a normal distribution shape. As it can be seen clearly from the histogram drawn below one can deduce that the histogram roughly resembles a normal distribution shape. Despite individual subjectivity it is kind of first impression towards the nature of normality. From the graph one can conclude that the error term is roughly normal.

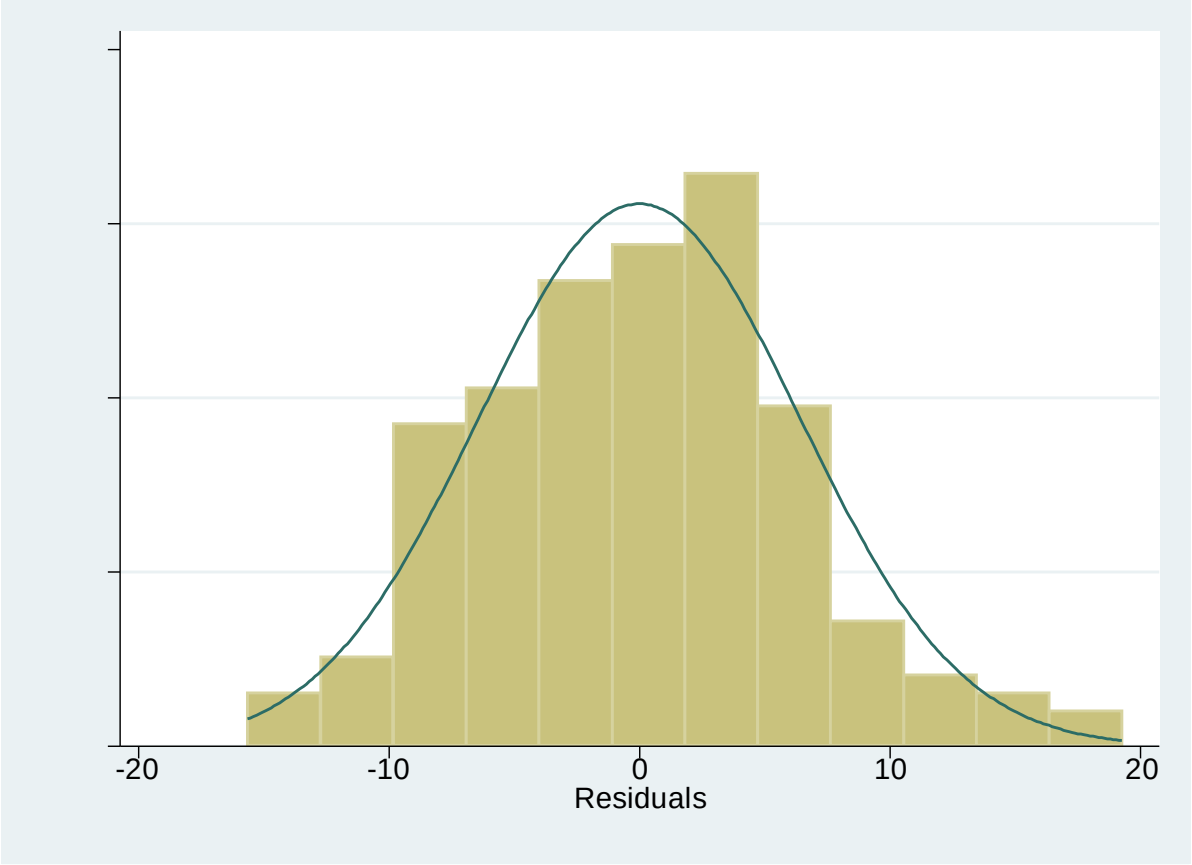

Figure 4.1 Normality test

Source: Own Survey data, 2021

4.5.2 Linearity test

Linearity test is among the diagnosis tests to be conducted before embarking the main regression analysis. One of the basic assumptions of a classical linear regression model is that the relationship between the dependent variable and the independent variables is linear. Thus, I have to assure that the relation between the variables is linear before making inference and conclusion based on a linear model.

The approach to use to check linearity in a multiple regression model is to draw the residual against the normal distribution using the two competing commands which are the “pnorm” and the “qnorm”. The relationship between the dependent and independent variables is expected to be linear when the two lines on the graph sheet or more or less the same. On the other hand, departure of the two lines on the graph sheet from each other proves non-linear nature of

relationship between the independent and dependent variables.

As it can be seen from the figure 4.2 presented below have shown proved that the two lines along both graphs found to exactly the same which is an evidence supporting linearity. This shows that the relationship between employee commitment and the four covariates is linear and as such non-linearity is shouldn't be a concern for this study.

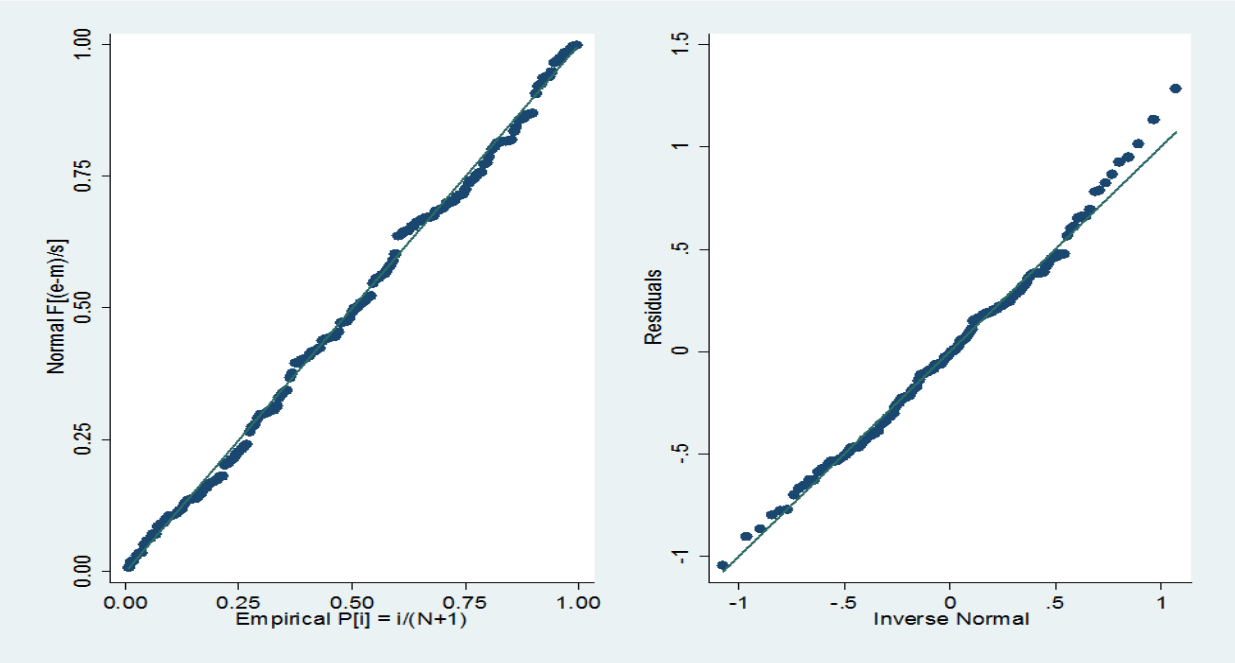

Figure 4.2 Linearity test

4.5.3 Heteroscedasticity test

Another assumption of the classical linear regression model is that the variance of the error term or the residual is assumed to be constant. This is because a heteroscedastic variance will result in a wrong inference and conclusion. Thus, it is very crucial to undertake a heteroscedasticity and check for the presence of the problem and so as to address the problem if any.

In this study both the graphical and the statistical approaches have been used to detect for the problem of homoscedasticity. In the graphical approach a two-way relationship is drawn between the residual and the fitted values of the dependent variables. In this approach, if the graph shows any systematic relationship between the two variables; the residual and the fitted value of the dependent variables it implies the presence of heteroscedasticity. On the other hand, if no systematic association is found in the relationship between the variables of interest it shows variance is homoscedastic and thus no heteroscedasticity problem.

As it can be clearly seen from figure 4.3 below the variables under consideration have no systematic relationship. That is no clear trend is found for the residual following the increase in the fitted value of the dependent variable. This justifies that the there is no heteroscedasticity problem in the model under consideration

.

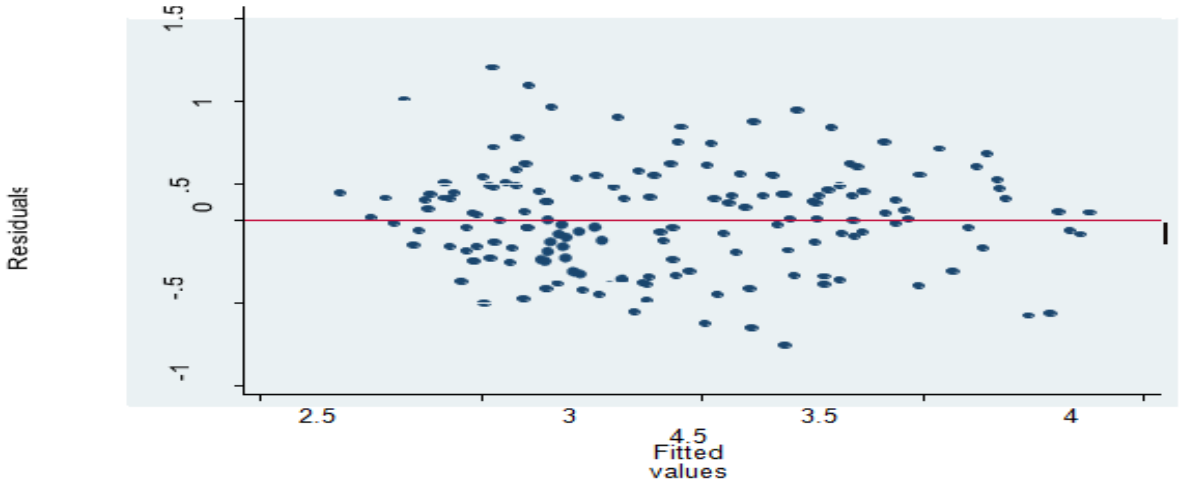

Figure 4.3 Heteroscedasticity test result

Source: Own survey data, 2021

4.5.4 Multicolliniarity

Multicollinearity occurs when you have two or more independent variables that are highly correlated with each other. This leads to problems with understanding which variable contributes to the explanation of the dependent variable and technical issues in calculating a multiple regression. From below table 4.8, there is no multi- collinearity effect among indicators of the independent variables. In addition to the Multi -collinearity is unlikely to be a problem if the tolerance more than 0.2 (Menard, 1995), and VIF should be less than 10 (Myers, 1990). Based on this parameter also Tolerance is more than 0.2, and VIF is also less than 10.

Table 4.8 Summary of co linearity test

Model	Co linearity Statistics	
	Tolerance	VIF
Packaging condition and facilities	.368	5.954
Storage and inventory control practice	.811	1.233
Order fulfillment, communication and customer service management	.223	4.487
Transport and distribution system	.254	6.484

Source: Own Survey data, 2021

4.6 Regression analysis

The regression analysis is concerned with the distribution of the average value of one random variable as the other variables which need not be random are allowed to take different values.

In this study, a multiple regression analysis was conducted to establish relationship between the variables and the dependent variable. Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (effective distribution of pharmaceuticals) that is explained by all the independent variables (packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system).

The regression model specifically connects the average values of y for various values of the x-variables. The regression model was as follows:

$$y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + ę$$

Where:

y = Effective distribution of pharmaceuticals

β0 = Constant Term

β1= Beta coefficients

X1= Packaging condition and facilities

X2= Storage and inventory control practice

X3= Order fulfillment, communication and customer service management

X4= Transport and distribution system

Table 4.9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.826[a]	.763	.754	0.00202

a. Predictors: (Constant), packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system.

The above table results show that R square equals 0.763 that is, packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system leaving only 23.7 percent unexplained. The standard error is low 0.002 (less than 0.05) implies that the model is reliable and effective.

Table 4.10: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.976	4	2.744	13.517	.000[a]
	Residual	18.466	91	.203		
	Total	28.442	95			

a. Predictors: (Constant), packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system.

b. Dependent Variable: Effective distribution of pharmaceuticals

ANOVA findings (P-value of 0.00) in table show that there is correlation between the predictor's variables (packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system) and dependent variable (effective distribution of pharmaceuticals), the P value is 0.000 which is less than 0.05 significance level.

Table 4.11: Regression coefficient determination of the regression model

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
	B	Std.Error	Beta		
(Constant)	8.165	.705		8.746	.000
PCF	.348	.081	.489	4.289	.000
SICP	.436	.084	.635	5.187	.000
OFCCSM	.711	.108	.754	6.593	.000
TDS	.286	.084	.396	3.420	.002

b. Dependent Variable: Effective distribution of pharmaceuticals

The researcher conducted a regression analysis so as to determine the relationship between independent variables and dependent variable

The established multiple linear regression equation becomes:

$$Y = 8.165 + 0.348X1 + 0.436X2 + 0.711X3 + 0.286X4$$

The study found that packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system have significant influence on effective distribution of pharmaceuticals since packaging condition and facilities $\beta = .348$, $t = 0.489$, $p = <.000$: storage and inventory control practice $\beta = .436$, $t = 5.187$, $p = <.000$: order fulfillment, communication and customer service management $\beta = .711$ $t = 6.593$ $p = <.000$: transport and distribution system $\beta = .286$, $t = 5.445$, $p = <.002$.

CHAPTER FIVE

5 Summary, Conclusions and Recommendations

The previous chapter presented the analysis of the findings, while this chapter deals with the summary of the finding, conclusions and recommendations provided based on the findings of the study. The following sections discussed about the final conclusion remarks of the study and applicable recommendations.

5.1 Summary of the Finding

Based on the analysis and interpretation of the data, the following findings were made: The study found that the descriptive statistics related to packaging conditions and facilities on effectiveness of the distribution in organization. First, the average mean values of packaging conditions and facilities are 3.18 and standard division of 1.062. In general the overall of packaging conditions and facilities in the agency was in moderate level in linker scale questioner. Second, the average mean values of storage and inventory control practice are 3.116 and standard division of 0.987. In general the overall storage and inventory practice in the agency was in moderate level in linker scale questioner. Third, the average mean and standard deviation of the respondents were 3.17and 1.069 respectively. The results emphasized that regarding order fulfillment, communication, customer service management indicators for effectiveness of pharmaceuticals most of indicator result are in moderate level. Fourth, the average mean and standard deviation of the respondents of the average mean item in inventory management activity represents 3.14 and 1.052 respectively thus it shows that most of the respondents neither agree nor disagree in the indicators of transportation and distribution system. This implies the agency needs to commit in order to improve this area. Finally, In effectiveness of pharmaceuticals a mean value of 2.57 and standard division of 1.039 were disagreed in consistency of pharmaceuticals were delivered, concerning to minimization of expiry pharmaceuticals the result shows mean value of 2.61 and standard division of 1.058 disagree that there is poor practice to minimize expiry of pharmaceuticals. The average mean of effective pharmaceutical distribution is 2.95 and standard division of 1.073.this finding shows they are moderate level of scale. The correlation analysis explained that there was a strong and statistically positive significant relationship between packaging condition and facilities($r = 0.460$, $p < 0.01$) and storage and inventory control practice($r = 0.426$, $p < 0.01$) with effective distribution of

pharmaceuticals. It also showed that order fulfillment, communication and customer service management ($r = 0.344$, $p < 0.01$).and transport and distribution system($r=0.253$, $p < 0.01$) have a moderate positive relationship with effective distribution of pharmaceuticals. It means that if there was an increase in predictor factors, effective distribution of pharmaceuticals also increases. The results show that R square equals 0.763 that is, packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system leaving only 23.7 percent unexplained. The standard error is low 0.002 (less than 0.05) implies that the model is reliable and effective. The regression analysis conducted indicated that the independent variables have a significant influence on effective distribution of pharmaceuticals. packaging condition and facilities, storage and inventory control practice, order fulfillment, communication and customer service management and transport and distribution system have significant influence on effective distribution of pharmaceuticals since packaging condition and facilities $\beta= .348$, $t= 0.489$, $p=<.000$: storage and inventory control practice $\beta=.436$, $t=5.187$, $p=<.000$: order fulfillment, communication and customer service management $\beta=.711$ $t=6.593$ $p=<.000$: transport and distribution system $\beta=.286$, $t=5.445$, $p=<.002$.

5.2 Conclusions

Based on the findings of this research, the following major conclusions were drawn based on the results obtained. This study aimed to provide up to date information on the distribution of pharmaceutical to health facility in Jimma town and the achievement of expected outcomes. From the findings of this study, it can be concluded that: the effectiveness of pharmaceutical distribution in terms of packaging conditions and facilities, storage and inventory control practice, order fulfillment, communication, customer service management, transportation and distribution system with both the mean and correlation test indicating a great influence in a positive relationship and moderate levels. The study establishes available special storage area, enough storage space available and fully functional storage equipment. And also very positive finding is that there were good practice, pharmaceuticals store in appropriate temperature, pharmaceuticals are secured from theft, short time to prepare picking, good dispatching process, expiry and batch number are labeled in repacking, renewal of pharmaceuticals are done on time, good communication, on time receiving, the agency are willing to correct for defective pharmaceuticals, pharmaceuticals are loading according to delivery sites, the overall time starting to movement of un order until transported are appropriate. On the other hand, based on the result, it can be concluded that, pharmaceuticals are not put- away accuracy, time to receive pharmaceuticals in warehouse are not appropriate, poor quality and late arrival of RRF from health facility, fast moving and slow moving items are not identified and reported periodically, In the agency there is not developed tool to check customer satisfaction, in the agency stock out are regular, the rate of consumption was not closely monitored which lead to stock outs due to delays in placing an order, due to high burden of work and increasing need of pharmaceuticals from health facility unless the agency develop a strategy does not the capacity to fulfill need of health facility. The majority responds that storage space is sufficient, but because of sometime pharmaceuticals delivered to center in push system, poor forecasting quantification system and damage and expired pharmaceuticals did not dispose on time leads the store space limited. They continued to agree that the organization has put-away accurately pharmaceuticals or not and also weak at all. Any stock out of key medicines is a serious occurrence, since patients would fail to obtain the medicine when needed. The more severe stock outs in public health facilities represent inadequacies in the current system for medicines distribution and replenishment. The study concludes that effectiveness of pharmaceutical distribution is positively affected by packaging conditions and facilities, storage and inventory control practice,

order fulfillment, communication, customer service management, transport and distribution system. And in the agency there are low level of maintenance vehicles, when vehicles enter to maintenance they took more than one month minimum, the longer time require for maintenance, costs the organization more in terms of effectiveness of pharmaceuticals distribution providing insufficient service for health facility which leads stock out.

5.3. Recommendation

Based on the study findings the following recommendations are forwarded:

- To increase the distribution of pharmaceuticals in consistency and customer satisfaction regarding quality of safety and stock should be checked and balanced from HMIS regularly to prevent unnecessary voiding of invoice which leads most of time customer dissatisfaction and also expiry and damaged pharmaceuticals should dispose on time with appropriate procedure the center better to use any standard tool to check level of customer satisfaction to take corrective action based on the results from the tool.
- Utilization of an efficient, customized electronic drug inventory management system instead of burdensome annual paper-based system. EPSA better to apply Computerization of all processes with guaranteed services will ensure inventory control and tracking and tracing of drug movements from the EPSA and to health facility warehouses until it reaches the health facilities and ultimately to the patients.
- The stock inventory better to check regularly by EPSA, at least for quantity, overall condition and retesting or expiration dates. Any discrepancies should be investigated. In order to avoid stock out and depletion of drugs enforces heath center to establish drug committee to initiate quantification and selection of drug requirement based on real time necessities and continuous monitoring on the drug usage.
- EPSA better to coordinate the actions of various departments involved in the drug selection, quantification, procurement and distribution of pharmaceutical products and the health facilities in order to provide better visibility and control in the system which will help in tracking the products and tracing the real evidence based requirements of the of the public.
- Better to improve the transport systems for EPSA in order to reduce risks of damage and to minimize over all time. And Schedule vehicles during delivery of pharmaceuticals to health facility and apply clear transportation system, preparing right truck, with enough quantity. To address efficiency and on time delivery of transportation
- EPSA better to improve on IT and HCMIS advancement in new technology in order to distribute pharmaceuticals effectively, to be effective, LIMS should be equipped with adequate trained staff, forms, equipment, and facilities.

Bibliography

Aarti, Deveshwar. Rupa, Rathee (2010). Challenges for supply chain management in today's global competitive environment. Volume, 6 numbers, 2: pp194-203.

Admasu, T. 2017, Assessment of Pharmaceuticals Distribution System: The Case of Pharmaceuticals Fund and Supply Agency (PFSA).

Anna,Schopperle, 2013, Analysis of Challenges of Medical Supply Chains in Sub-Saharan Africa Regarding Inventory Management and Transport and Distribution.

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.

Ariane, McCabe, 2014, Private Sector Pharmaceutical Supply and Distribution Chains Ghana, Mali and Malawi.

CSCMP (Council of Supply Chain Management Professionals). (2012). CSCMP Supply Chain Management Definitions. To access the definitions, go to http://cscmp.org/aboutcscmp/definitions.asp (accessed 10-08-2012).

EEA, 2013, on Good Distribution Practice of Medicinal Products for Human Use.

EPA (Ethiopian Pharmaceutical Association), (2011). Ethiopian Pharmaceutical Association Annual Conference Proceeding Report, Addis Ababa, Ethiopia

Federal Negarit Gazetta, 2007, Federal Negarit.Gazeta Of The Federal Democratic Republic Of Ethiopia 13th Year No. 36 Addis Ababa-18th May 2007.

Factbook on level 1 monitoring indicators pharmaceutical situation n the Americas, 2010/11 2014/15, Health Sector Development Programme IV 2010/11 – 2014/15 HSDP 2014/15 PIC/S GDP, 2014, PIC/S GMP Guide Annex 1 – Good Distribution Practice.

Javid, Iqbal., 2017, Development of an Indicator Based tool for the Assessment of Medicines Selection Practices in Various Public Sector Hospitals.

Heizer J. and Render B. (2011). Operation Management, Global Edition, 10th ed. New Jersey, USA, Prentice Hall Inc.

Lorenzini, Giana, 2018, Toward Inclusive Pharmaceutical Packaging LUND UNIVERSITY. Ministry of Medical Services and Ministry of Public Health & Sanitation, 2009, Access to Essential Medicines in Kenya.

Lezama ,2015, Distribution Modeling for Pharmaceutical Supply Chains in Urban Ethiopia.

PFSA (Pharmaceutical Fund and Supply Agency), (2012). Standard Operating Procedures Manual for the Pharmaceuticals Logistics Systems in Health Facilities of Ethiopia, PFSA, Ethiopia.

PFSA, 2015, Pharmaceuticals Fund and Supply Agency. Pharmaceutical Warehouse Operations Management Manual, Addis Ababa, Ethiopia.

PFSA,2016, Pharmaceuticals Fund and Supply Agency. Pharmaceuticals distribution Manual, Addis Ababa, Ethiopia.

PFSA, 2015, Pharmaceuticals Fund and Supply Agency. Pharmaceutical Warehouse Operations Management Manual, Addis Ababa, Ethiopia.

Sutton J. and Kellow N. (2010). An Enterprise Map of Ethiopia. London UK, International growth center.

Scott & Scott., 2011, The Effect of Search Channel Elimination on Purchase Incidence, Order Size and Channel Choice.

United States Agency for International Development | DELIVER PROJECT, 2011 Task Order 1.. The Logistics Handbook: A ... A Practical Guide for the Supply Chain Management of Health Commodities.

UNCTAD (United Nations Conference on Trade and Development). (2011b). Local Production of Pharmaceuticals and Related Technology Transfer in Developing Countries: A Series of Case Studies by the UNCTAD Secretariat. UN, Geneva and New York.

WHO. Global Immunization Vision and Strategy. 2013 [cited 2013 February 21]; Available from: http://www.who.int/immunization/givs/en/.

APPENDIX

JIMMA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

COLLAGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF MANAGEMENT

Dear respondents

The research paper title is conducting on the factor affecting effectiveness of pharmaceutical delivery the case of Ethiopia pharmaceuticals supply agency in Jimma town. The objective of this study is to improve the body of knowledge in the field of logistics with emphasis on distribution effectiveness. It is purely an academic exercise for the partial fulfillment of master's degree in logistics and supply chain management. I would like to extend my deep appreciation to your organization and you for r the willingness and cooperation in undertaking this valuable research paper. Taking part in this study you were contributed towards alleviating the problem of distribution system. I request your cooperation to fill and respond truthfully for the asked Questions.

For this section, I kindly request you to indicate your response by putting a (√) mark in the corresponding boxes or in writing on the lines that follow the items.

Section One: Demographic Characteristics of the Respondents

1. Sex: A. Male □ B. Female □

2. Age Group:

A. 19-25□ B. 26 – 30 □ C. 31-35 □

D. 36-40□ E. 41-45 □ F. above 45 □

3. In which department you are working currently?

A. Store manager □ B. dispatch officer □ C. deliverer □ D. Storage and distribution □ E. Forecasting and capacity building□ F. health center customer hospital customer □ G. Private Medical center □ H. private hospital customer□

I. Other specify ……

4. What is your current position in your organization?.....

5. What is your field of study /Specialization?.....

6. Please indicate your highest level of qualification.

A. Diploma □ B. BSC/BA □ C. MSC/MA □

D. Others specify ……

7. Your work experience in years including your experience in other company.

A. Less than 1 year's □ B. 1-5 Years □

C. 6-10 year's □ D. Greater than 10 year's □

Section Two. Packaging Conditions and Facilities

The responses was generated on a five point Likert scale; whereby the respondents were required to state their level of agreement where: *SD=strongly disagree D=Disagree S=Satisfactory A=Agree SA=Strongly Agree

Characteristics	**1**	**2**	**3**	**4**	**5**
Available special storage area					
Enough storage space available					
Fully functional storage equipment					
Different storage equipment for different kinds of vaccines					
Storage equipment are regularly checked for compliance					
Existing SOPs that are followed to ensure proper storage					
Measures in place to ensure vaccines don't go bad while in					

distribution					
Good Storage practices are satisfactory					

Section Three: Storage and Inventory Control Practice

Characteristics	1	2	3	4	5
Current storage space is sufficient for existing products & planned program expansion					
In EPSA in the study area pharmaceuticals are put-Away Accuracy in the correct location so they can be quickly and easily located					
In the agency there are tools (camera, security guard) to control all activity to monitor security of pharmaceutical products					
In EPSA in the study area the time taken to receive pharmaceuticals from warehouse are appropriate					
The time taken pharmaceuticals to unload from truck after arriving at warehouse and preparing to picking are appropriate					
Proper dispatching procedures have been undertaken by EPSA					
In dispatching area repacking of one drug in a container of another drug have discouraged, the name, dosage and batch number and expiry date is clearly indicated					
Stockpiles renewed on EPSA in the study area are done on scheduled dates					

Section Three: Order Fulfillment, Communication and Customer Service Management

Characteristics	1	2	3	4	5
EPSA in the study area, health facility and other branch is communicate to distribute over- stocked and near expiry pharmaceuticals					

There is strong information exchange among distribution officers, store managers and customers					
EPSA in the study area has in order substitute instruments other than letter and telephone cells					
The demand and request of customers' orders are filled on time and up on their request and expectation					
Health facility report RRF in accuracy and on time					
IN EPSA the response time to receive an order is short					
Products which are slow and fast moving are reported timely					
The quantity ordered by health facility sites for pharmaceutical product is based on real consumption analysis					
In EPSA center the cost of pharmaceuticals are inexpensive with comparing other provider					
In EPSA center there is well residential tool to ensure consumer satisfaction in sharing activities of the agency					

Section Four: Transport and Distribution System

Characteristics	**1**	**2**	**3**	**4**	**5**
Pharmaceuticals which are warm insightful (chemicals, vaccines) are transported by refrigerated means of transportation					
In EPSA center stock outs of necessary medicine is a regular circumstances					
In distribution of pharmaceuticals bad road network affect delivery					
Pharmaceuticals which are ordered by health facility are delivered on time					
Pharmaceuticals which are delivered to health facility in the vehicle is received are correct items and quantities much with during receiving period					
There are a sufficient number of functioning vehicles with available drivers to meet the desired distribution schedule					

The quality of pharmaceuticals are ensured during transport with the use of data loggers from EPSA to HF warehouse					
EPSA center have the capability to fulfill health facility require precisely and to deliver all the requested pharmaceuticals					
There are established procedures for placing emergency orders					
EPSA are willing to prompt corrective action for defectives pharmaceuticals					
Vehicles are comfortable to load pharmaceuticals according to the distance of delivery sites(for short distance site pharmaceuticals will be load last)					
The average amount of time from the moment an order is received at the storage facility until the time the order is actually transported to health facility is appropriate					

Section Five: Effectiveness of Pharmaceutical Distribution

Characteristics	1	2	3	4	5
Consistence pharmaceutical distribution are delivered to health facility					
EPSA in the town center minimize expiration of drug					
EPSA in the town is used accurate information for decision making					
EPSA in the town is supplying medicine with its original quality throughout the sharing procedure					

Thank You for Your Cooperation

Table for Determining Sample Size for a Finite Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970