

## Assessment of Pharmaceutical Warehouse Management Practice: The Case of Private Pharmaceutical Wholesalers in Ethiopia

Dawit Kumilachew Yimenu<sup>a,\*</sup>, Adugna Mengistu Nigussie<sup>a</sup> and Tirusew Yalew Workineh<sup>a</sup>

<sup>a</sup> *Department of Pharmaceutics and Social Pharmacy, School of Pharmacy, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia.*

### Abstract

Proper storage conditions for pharmaceutical products and paramedical supplies are crucial to maintaining their quality, safety, and efficacy. Poor warehouse management practice may lead to wastage or blockade of financial resources, irrational utilization of drugs, shortage, or overage of essential medicines among many others. The current study aimed to assess the warehouse management practice of private pharmaceutical wholesalers in Gondar, Ethiopia. The study utilized an institution-based cross-sectional study method. The data was collected using a checklist adapted from the Logistics Indicators Assessment Tool (LIAT) developed by the USAID | DELIVER PROJECT and was analyzed using SPSS version 22. Descriptive analysis was conducted and results were presented using tables and figures. A total of five pharmaceutical wholesalers were surveyed. All of the surveyed entities were managing both medicines as well as other medical supplies, and they were supplying their products to both public and private health facilities. The majority of the facilities 4(80%) reported that they were using the Professional Electronic Data System (PEDS) for the management of pharmaceutical products in the warehouse. The overall put away/ storage performance of the facilities was 68.75%, which can be regarded as poor (<80%). All of the facilities lack sufficient product handling equipment for unloading and moving the incoming goods. In conclusion, the overall warehouse management practice at the private pharmaceutical wholesalers was found to be poor. Shortage of product handling equipment and inadequate layout of the warehouses were the two most common problem areas identified that need major improvement.

**Keywords:** Pharmacy; Warehouse-management; Inventory-management; Wholesalers; Supply chain.

### 1. Introduction

The establishment of a consistent supply of commodities is the most expensive part of a humanitarian effort and is highly dependent on the supply chain management functions; procurement, warehousing, and transportation (Van Wassenhove, 2006). Medicines are the fundamental and indispensable resource elements of a healthcare system that drive people to seek health care services. To ensure their better accessibility and availability, medicines need to be stored in a warehouse. A warehouse is a storage facility, where health commodities are stocked until they are transferred to another facility or customer (Snow, 2017). It is a place used for receiving, storing, picking, packing, and shipping goods (Alemu, 2017).

Proper storage conditions for pharmaceutical products and paramedical supplies are crucial to maintaining their quality, safety, and efficacy. A successful storage practice should maintain the received products in the same quantity and quality until they are issued and minimize stock holding costs while maintaining an acceptable service level (Tabash & Mbuqamar 2018).

\* Corresponding author email address: dawit.kumilachew@uog.edu.et  
DOI: 10.22034/IJSOM.2021.3.5

Warehouse management is therefore the basic element of the pharmaceutical supply chain system, without which the entire supply chain structure is not viable. It includes the planning and management of all activities involved in sourcing, procurement, and other logistics management activities (Deliver, 2011). Every medical warehouse should maintain a standard list of all items in stock with their specifications, form, and quantity per package. The list should also be regularly updated and distributed to sub-stores and units. Besides, records of all stocks received with their sources, batch numbers, expiry dates, and quantities received should be documented (WHO, 2003).

Poor warehouse management practice may lead to wastage or blockade of financial resources, irrational utilization of drugs, shortage or overage of essential medicines resulting in expiration, increase in holding cost, reduction in enterprise's flexibility, and decline in quality of healthcare service (Kokilam et al., 2015).

Many factors were identified to affect the productivity level and overall warehousing operational activities including; infrastructure, warehouse layout design (architectural, location, and arrangement of stock), working environment, availability of material handling equipment, lack of documented warehouse operation management guidelines/ stock-keeping unit warehouse management system, lack of pharmaceutical warehouse operation performance metrics/ Key Performance Indicators (KPIs) (Yezid, 2019; Alene, 2018; Berhanu, 2017; Mahammed, 2018; Hailu, 2018; Teklay & Tewodros 2018; Ayele, 2019).

A study conducted on the Ethiopian Pharmaceuticals Supply Agency, Addis Ababa, Ethiopia revealed that from the total 70 program commodities managed by the agency, a 2.1% wastage rate was observed due to expiration and damage which resulted in a loss of over US \$2 million. The study also showed that insufficient storage space, outdated warehouse designs, shortage of warehouse equipment, lack of accurate data, and capacity building gaps were the main inventory management challenges faced by the facility. (Boche et al., 2020).

Human resource management is also a very critical component of a successful warehouse management function in which a lack of adequate knowledge and skill in warehouse management operations were the major determinant factors for many of the problems faced in the warehouse operations (Yezid, 2019; Bekele, 2018). A study done on private and local warehouses in the Gaza strip revealed that the majority of the warehouses did not have practical guidelines and written procedures for dealing with storage procedures. In addition, the study also showed that there were inadequate safety and security systems in the warehouses (Tabash & Mbuqamar 2018).

A study conducted in India revealed that hiring and training health facility staff with knowledge on modernized store and inventory management practices as well as regular training on medical and pharmacy education was vital to improve the various challenges faced in the warehouse management operations (Kokilam et al., 2015).

A similar study conducted in Cameroon also showed that proper human resources management plays a pivotal role in the supply chain management of medicines, in which improving their capacities would result in improved quality of services (Ayuk et al., 2014).

Therefore, a good warehouse management system takes a quantitative look at the productivity and service levels of warehouse operation and tells where the facilities are and what is needed to be done to meet their goals (Baruffaldi et al., 2019). The healthcare supply chain system and especially the pharmaceutical supply chain is much more complex than that of the other industrial supply chains due to its complexity, nature of the products, and regulation (Bhakoo et al., 2012; Yousefi & Alibabaei 2015; Rossetti et al., 2011). Therefore, assessing the current warehouse management practices and identifying the common challenges is crucial to improve the supply chain productivity and the overall health care service. Besides, only a few studies were conducted in Ethiopia that were also mainly focused on public health facilities that led to a paucity of researches in the private health care system. The current study aimed to assess the warehouse management practice of private pharmaceutical wholesalers in Gondar town, Ethiopia, with a due focus on the basic operations as well as human and material management related functions. The study will add to the current understanding of the situation in the country and could also be used as a baseline data to implement new strategies and evaluate program efficiency. Industries could also benefit from the findings of the study by understanding the current challenges and opportunities lower entities in the supply chain pipeline are facing based on which they can implement new service delivery strategies such as Just-In-Time (JIT) delivery systems.

**Table 1.** Contributions of previous authors

Author(s)	Number of facilities surveyed	Type of facilities surveyed	Availability of receiving SOP's*	Storage/ put-away practice	Availability of sufficient area for dispatching activities	Major uswarehouse management challenges identified
Alene H (2018)	14	Public	55.1%	32.9%	30.6%	Absence of designated receiving area, lack of enough space for warehousing operations, training gap, absence of warehouse SOP, very long vehicle unloading time, lack of enough material handling equipment
Mahammed T (2018)	9	Public	NA*	44.4%	NA	Poor record keeping, poor space allocation, poor organization of the storeroom
Hailu T (2018)	12	Public	68.8%	20.45%	4.5%	Training gaps, lack of enough warehouse space, no maintenance of equipment's and materials, security issue, shortage of goods handling equipment's,
Berhanu A (2017)	1	NGO*	NA	18.27%	No	Shortage of materials handling equipment, record keeping and application of information technology for warehouse services, skill gap
Bekele S (2018)	40	Public	NA	34.8%	20%	Knowledge/ skill gaps, shortage of human power, lack of maintenance of equipment's and materials, lack of warehouse monitoring and evaluation system, Lack of enough warehouse space
Kokilam MB et al. (2015)	20	Public	NA	57%	NA	Poor infrastructure, insufficient work force and training gaps, complex procedures, manual system of record maintenance, lack of co-ordination between the activities and players
The current study	5	Private	80%	68.75%	40%	Poor layout design of the warehouses, lack of enough space for warehousing operations, lack of enough material handling equipment, poor storage practice, training gap

SOP's\* stands for Standard Operating Procedures; NA\* stands for Not Applicable;  
NGO\* stands for Non-Governmental Organization

## 2. Study Methodology

### 2.1. Study period and Setting

The study was conducted in all private pharmaceutical wholesalers found in Gondar town. Gondar is located in the Amhara National Regional State, North West Ethiopia, at 727 km from Addis Ababa, the capital city of the country, and 185 kilometers from Bahir Dar, the capital city of the region. According to the 2015 population and housing census report, the total population size of Gondar town was estimated to be around 323,900 (22). During the study period, there were 8 governmental Health Centers, 1 Referral Hospital, 52 retail pharmacies, and 5 pharmaceutical wholesalers in the town. The study was conducted from April 1 to May 30, 2020.

### 2.2. Study design

An Institution-based cross-sectional study was conducted using a checklist adapted from the United States Agency for International Development (USAID), Deliver projects Logistics Assessment Indicators tool (LIAT).

### 2.3. Source population

The source population was all private pharmaceutical wholesalers in Gondar town.

### 2.4. Study population

Those private pharmaceutical wholesalers that fulfill the inclusion criteria for the study.

## **2.5. Inclusion and Exclusion Criteria's**

### **2.5.1. Inclusion Criteria**

All private pharmaceutical wholesalers in Gondar town that were giving service for at least the past 6 months at the time of data collection.

### **2.5.2. Exclusion Criteria**

Private pharmaceutical wholesalers who were not willing to participate in the study or those who were not willing to grant access to the warehouse for inspection.

## **2.6. Study Variables**

### **2.6.1. Dependent Variable**

Warehouse management practice

### **2.6.2. Independent Variables**

Year of service of the facility, professional background of the facility manager, professional background of the warehouse manager, year of experience of the facility manager, year of experience of the warehouse manager, utilization of warehouse management software, number of warehouse personnel.

## **2.7. Sample size and sampling procedure**

### **2.7.1. Sample size determination**

All private pharmaceutical wholesalers found in Gondar town that fulfilled the inclusion criteria to the study were included.

## **2.8. Data Collection Procedure**

Data was collected using a checklist adapted from the Logistics Indicators Assessment Tool (LIAT) developed by the USAID | DELIVER PROJECT (23). The data was collected by two data collectors using observational method and by interviewing the respective facility managers and warehouse managers at each of the wholesale facilities surveyed. The questionnaire consisted of open and closed-ended questions as well as checklists to verify the storage and other warehousing functions. The questionnaire was divided into three parts. The first part of the questionnaire consisted of a total of 35 questions that were used to interview the facility managers. The questions were composed of open-ended and close-ended questions by type that investigates the background characteristics of the managers and general supply chain related activities performed at the facilities. The second part of the questionnaire was composed of a total of 40 questions in a checklist that investigate warehouse management related to human and material resource management. The third part of the questionnaire was composed of 13 interview questions that were used to assess store personnel's background characteristics as well as training needs and challenges faced in the warehouse. (Annex)

## **2.9. Data Quality Assurance**

The data collection checklist was adapted from a standard tool thus making it reliable to measure the study in question. The data was collected by the investigators themselves who are pharmacists by profession and that were well aware of the technical aspects as well as the objectives of the study. The collected data were checked each day for completeness, accuracy, and consistency before entering into software for analysis.

## **2.10. Data Processing and Analysis**

The collected data was entered and analyzed using SPSS version 22. Descriptive statistics were conducted and results were presented using frequencies and percentages. Tables and figures were used to present the findings.

### 2.11. Operational Definition

**Receiving:** The process of carrier processing, item identification, un-packing, quantity, and quality inspection, sorting and recording the receipt of the goods.

**Put-away:** The process that moves materials from the receiving area to the storage, replenishment, or picking areas.

**Storage:** Putting the approved material in their respective locations.

**Order picking:** The process of obtaining the products requested by a customer order from the storage area.

### 2.12. Ethical Consideration

Ethical clearance of the study was obtained from the ethical review board of the School of Pharmacy, the University of Gondar on a Ref. No. SoP/784/2020 and was administered to the respective stockholders. Oral consent was obtained from each of the respective personnel at the facilities and confidentiality was assured by removing any personal identifiers from the questionnaire. The findings of the study were also used only for the study purpose.

## 3. Result

A total of five private pharmaceutical wholesalers were surveyed. Out of the five facilities, the majority 3(60%) were giving service for about 2-4 years while one of 1 (20%), was providing service for more than 4 years, and the remaining one was established less than 2 years ago. All of the five wholesalers 5 (100%), were managing both drugs (medicines) and other medical supplies and they were supplying their products to both public (government hospitals, health centers, and related facilities), and privately managed health care facilities (private clinics and pharmacies). All of the managers at the five facilities surveyed were pharmacists by profession 5 (100%). All of the surveyed wholesalers 5 (100%) use a lorry to collect their pharmaceuticals from their suppliers (manufacturers and distributors) and to transport them to their customers, 2 (40%) use a Bajaj (a three-wheel motorized vehicle) and 3 (60%) of them use a lorry. All of them responded that 80% of the time, a request for a supply of pharmaceuticals from their facility comes through a phone call and 20% by a direct personal request.

### 3.1. Warehouse Management Related Characteristics of the Facilities

The majority of the facilities 4(80%) reported that they were using the Professional Electronic Data System (PEDS) for the management of pharmaceutical products in the warehouse. The majority of the facilities 4(80%) also reported that they have Standard Operating Procedures (SOPs) for warehouse management operations. Only 2 (40%) of the facilities had maintenance support and replacement for the equipment's in the warehouses when they were not working. (Table 2)

**Table 2.** Warehouse management related characteristics of the wholesalers

No.	Characteristics	Response	Frequency (%)
1	What kind of system (software) does the facility use to manage pharmaceutical products	HCMIS*	0
		PEDS	4(80%)
		Manual	1(20%)
2	What kind of codification system does the facility use to store pharmaceuticals?	Alphabetical	1(20%)
		Pharmacological	4(80%)
		Other	0
3	Which method of material handling does the facility follow?	Manual	5(100%)
		Automatic	0
4	What type of stock verification system does the facility follow?	Spot check	4(80%)
		Perpetual	0
		Periodic	1(20%)
		Only annual	0
5	Does the facility dispose of obsolete or scrap products at the right time and place?	Yes	4(80%)
		No	1(20%)
6	Does the facility have enough staff to run the warehouse operations?	Yes	3(60%)
		No	2(40%)
7	Does the warehouse personnel have a job description for their respected duties?	Yes	5(100%)
		No	0
8	Does the facility provide sufficient personal protective materials like gowns, masks, gloves, etc. for the staff in the warehouse?	Yes	5(100%)
		No	0
9	Does the facility have an SOP for managing pharmaceuticals in the warehouse?	Yes	4(80%)
		No	1(20%)
10	Does the facility have safety materials like fire extinguishers and alarms for unexpected incidents?	Yes	3 (60%)
		No	2(40%)
11	Does the facility have maintenance support and replacement of the equipment's in the warehouses when they are not working?	Yes	2 (40%)
		No	3(60%)

HCMIS\*: Health Commodity Management Information System

**3.1.1. Receiving activities**

At all of the surveyed wholesalers 5(100%), there was a pre-notification of the incoming goods that will be received in the warehouses, there were procedures for the cross-checking of the documents and the goods during the time of receiving, there were procedures for the notification of discrepancies to the suppliers, and there was a procedure for the warehouse personnel to inspect the goods received in the receiving area before putting them away. However, all of the facilities didn't have sufficient product handling equipment for unloading and moving the incoming goods, and also at 4 (80%) of the facilities, the receiving area/ space wasn't convenient for the movement of the good handling Equipment's.

**3.1.2. Put-away/ storage activities**

The overall put away/ storage performance of the facilities was 68.75%, which can be regarded as poor (<80%). Major drawbacks were identified concerning the storage of products at least 30 cm away from the walls and other stacks, in which only one of the facilities 1 (20%) were following the recommendation. (Table 3).

**Table 3.** Storage practice of the wholesalers

No.	Put-away/ storage activities	Yes N (%)	No N (%)
1	Products that are ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.	5(100%)	0
2	Products are stored and organized in a manner accessible for first-to -expire, first-out (FEFO) counting, and general management.	5(100%)	0
3	Cartons and products are in good condition, not crushed due to mishandling.	5(100%)	0
4	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory	5(100%)	0
5	Products are protected from direct sunlight.	5(100%)	0
6	Cartons and products are protected from water and humidity.	5(100%)	0
7	The storage area is visually free from harmful insects and rodents.	5(100%)	0
8	The storage area is secured with a lock and key but is accessible during normal working hours; access is limited to authorized personnel	5(100%)	0
9	Products are stored at the appropriate temperature according to product temperature specifications.	5(100%)	0
10	The roof is maintained in good condition to avoid sunlight and water penetration	5(100%)	0
11	The storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).	5(100%)	0
12	The current space and organization are sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).	5(100%)	0
13	Fire safety equipment is available and accessible	3(60%)	2(40%)
14	Products are stored separately from insecticides and chemicals	3(60%)	2(40%)
15	Products are stacked at least 10 cm off the floor.	4(80%)	1(20%)
16	Products are stacked at least 30 cm away from the walls and other stacks	1(20%)	4(80%)

**3.1.3. Issuing Activities**

At most of the wholesalers surveyed, 4 (80%) received products were picked based on the printed order picking format while at all of the facilities 5 (100%), products were picked in the order of First Expire First Out (FEFO) principle. Updating of records by the warehouse workers at the time of picking products from their storage areas was practiced at 4 (80%) of the facilities only. The majority of the facilities 3 (60%) also reported that there was no sufficient area for packing, wrapping, and labeling of products for dispatching. (Table 4)

**Table 4.** Issuing practice of the wholesalers

No.	Issuing Activities	Yes N (%)	No N (%)
1	The products are picked based on the printed order picking format	4 (80%)	1 (20%)
2	The products are picked in the order of First Expire First Out (FEFO) (The early expiry retrieve first)	5(100%)	0
3	Warehouse workers update records when products are picked from their storage areas	4 (80%)	1 (20%)
4	There are sufficient areas for packing, wrapping, and labeling of products for dispatching	2 (40%)	3 (60%)
5	The picked goods are moved to the dispatching areas by handling equipment's and finally inspected for shipment	0	5(100%)
6	The warehouse workers pack and label the goods to the customers for shipment	5(100%)	0
7	Product handling equipment's like forklifts and pallet Jacks are used when loading Vehicles	0	5(100%)

**3.2. Human resource-related activities**

Interviews were conducted with each of the respective warehouse managers at each of the facilities. The majority of the respondents 3 (60%) were male by sex and 3 (60%) were between the age of 15-25 years followed by 1 (20%) 26-35 and one above 35 years old. The majority, 3 (60%) were diploma holders and the remaining 2 (40%) were degree holders. All of them were pharmacists by profession and the majority 3 (60%) had 2-4 years of experience while the remaining 2 had less than two years and more than 4 years of experience.

Regarding training background, only 2 (40%) of them reported that they have had at least one on the job training in which one of them received drug supply chain management training and the other one received training on online data registering. The respondents had also pointed out their desire to have regular training and the type of training they needed (Figure 1).

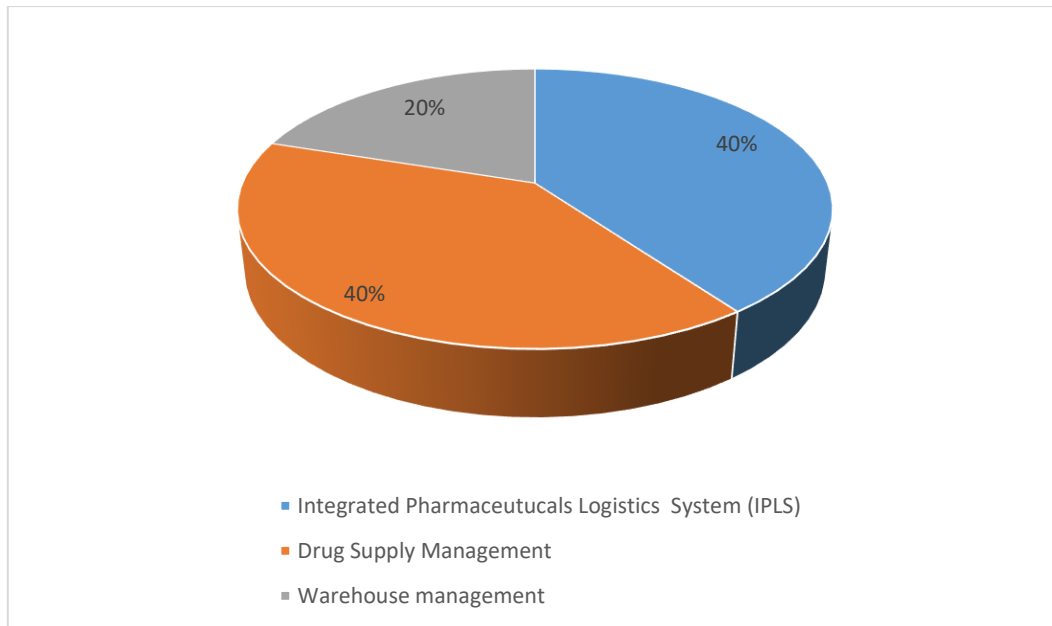


Figure 1. Type of training demanded by warehouse managers

#### 4. Discussion

In the current study, the majority of the facilities (80%) reported that they were using the Professional Electronic Data System (PEDS) for the management of pharmaceutical products in the warehouse. These kinds of Warehouse management systems (WMS) are crucial to track and manage warehouse activities and monitor all products arriving and shipped out of the warehouses. By installing a stock locator system this system can also provide the ability to manage an inventory of storage location which supports direct put-away, direct picking, and tracking real-time warehouse activities (Bartholdi & Hackman 2014).

In the present study, all of the surveyed facilities didn't have sufficient product handling equipment for unloading and moving the incoming goods. Similar findings were reported by other studies conducted in different health facilities in Ethiopia (Alene, 2018; Berhanu, 2017; Mahammed, 2018; Hailu, 2018; Teklay & Tewodros 2018; Ayele, 2019). Availability of an adequate number of products handling equipment such as material flow devices; conveyors, forklifts, automated guided vehicles (AGVs), shuttles, overhead cranes, and power-and-free conveyors which are very important in material handling activities that take place within the warehouse, receiving and shipping areas (receiving of goods, storage, order-picking, accumulation and sorting, and shipping) were one of the detrimental factors that affect the quality of warehouse operation and its productivity (Yezid, 2019; Van den Berg & Zijm 1999).

The current study revealed that, in the majority of the facilities surveyed (80%), the receiving area/ space wasn't convenient for the movement of goods and materials. This was consistent with studies conducted in different health sectors in Ethiopia, in which the lack of a designated receiving area was one of the principal factors hindering the productivity of warehouse operations (Alene, 2018; Berhanu, 2017; Mahammed, 2018; Hailu, 2018; Teklay & Tewodros 2018; Ayele, 2019). Literature suggests that designing a warehouse is a highly complex task, where, sometimes, trade-offs have to be made between conflicting objectives as it should be constructed in the way that the layout must be modular, adaptable, compact, accessible and flexible and must be capable to respond to the changing conditions, to improve the space utilization and reduce congestion and movement (Gerald et al., 2008).



In the current study, the overall put away/ storage performance of the facilities was 68.75%, which can be regarded as poor (<80%). Proper storage practice of medicinal drugs is very essential to ensure their effectiveness, safety, strength, and quality as well as to maintain their intended quality and prevent damages while handling until they reach their consumers. The shelf life of the drugs is also affected by their storage practice and it can't be guaranteed unless they are segregated from other non-pharmaceutical items and stored properly (Kokilam et al., 2015).

Regarding human resources management, only 60% of the facilities have enough personnel to run warehouse operations and among them, only 40% of the warehouse personnel have had at least one on the job training. Employing an adequate amount of warehouse personnel and providing necessary training is a crucial element to improve the productivity of warehouse operations. A study conducted in India showed that hiring and training health facility staff with knowledge on modernized store and inventory management practices as well as regular training on medical and pharmacy education was vital to improving the various challenges faced in the warehouse management operations (Kokilam et al., 2015). Other studies also reported that lack of adequate knowledge and skill in warehouse management operations were the major determinant factors for many of the problems faced in the warehouse operations (Yezid, 2019; Bekele, 2018). Human resource management (HRM) is a critical activity, as evidence suggests that frontline service employees (FLSES) actions will lead to significant results in successful service operation (Yezid, 2019).

### **5. Limitation of the study**

Due to the insufficient number of previous studies conducted in private pharmaceutical wholesalers; the study was unable to compare the results against studies conducted in similar settings. The study was also devoid of more advanced analytical methods including sensitivity analysis due to the nature of the study and the sample size. Even though the study has included all the available private pharmaceutical wholesalers in the study area (100%), sufficient conclusion and inferences may not be made due to the small sample size and thus further studies with a larger sample size are needed.

### **6. Conclusion**

The overall warehouse management practice at the private pharmaceutical wholesalers was found to be poor. Major improvements were needed especially in availing product handling equipment and the layout design of the warehouses in which space wasn't enough for adequate movement of products and future service expansion. A significant problem was also observed in the storage practices of pharmaceuticals in the warehouses as this will highly affect the quality and efficacy of the pharmaceutical products stored. There was also a huge need for warehouse management related training by the warehouse personnel.

### **7. Recommendation**

The facilities need to give priority to the layout design of the warehouses and thereby construct new facilities or expand the existing ones with the appropriate infrastructure needed for the proper management of pharmaceuticals in the store. Strategies should also be implemented to provide the necessary and timely capacity building training to the technical and professional workers in the warehouses. The facilities should also consider utilizing modern methods of supply chain operations such as Just in Time (JIT) delivery which can reduce storage costs thereby reduce overall inventory holding cost with the primary features of waste elimination and the organization of production/ delivery around a demand-pull flow (Ouma et al., 2013).

### **8. Acknowledgments**

The authors would like to acknowledge the University of Gondar for its support and facilitating the study and all the study participants for their collaboration and participation in the study.

### **References**

- Alemu A. (2017). Measuring supply chain performance in Ethiopian pharmaceutical industry using BSC model: the case of Addis pharmaceutical factory (Doctoral dissertation, Addis Ababa University).
- Alene H. (2018). Assessment Of Pharmaceuticals Warehousing Practice: The Case Of Pharamaceuticals Fund And Supply Agency, Central Level, Ethiopia..

- Ayele T. (2019). Assessing Performances Of Pharmaceutical Store Management: The Case Of General Public Hospitals Under The Addis Ababa City Administration Health Bureau, Ethiopia.
- Ayuk SO, Agbor ON, Tanyi F. (2014). Assessment of human resources capacity of pharmaceutical warehouses in Cameroon. *Journal of Pharmaceutical Policy and Practice*, Vol. 7(1), doi:10.1186/2052-3211-7-S1-P9.
- Baruffaldi G, Accorsi R, Manzini R. (2019). Warehouse management system customization and information availability in 3pl companies. *Industrial Management & Data Systems*. Vol. 119(2), pp. 251-273.
- Bartholdi JJ, Hackman ST. (2014). Warehouse and distribution science. Supply Chain and Logistics Institute.
- Bekele S. (2018). An Assessment on Pharmaceutical Storage System in The Case of Arsi Zone Governmental Health Centers..
- Berhanu A. (2017). Effectiveness of Warehouse Management in Save the Children Ethiopia A Case of Gambella Emergency office..
- Bhakoo V, Singh P, Sohal A. (2012). Collaborative management of inventory in Australian hospital supply chains: practices and issues. *Supply Chain Management: An International Journal*. Vol. 17(2), pp. 217-30.
- Boche B, Mulugeta T, Gudeta T. (2020). Assessment of Inventory Management Practices at the Ethiopian Pharmaceuticals Supply Agency, Addis Ababa, Ethiopia. *Integrated Pharmacy Research & Practice*, Vol. 9, pp. 175-183.
- Central Statistical Agency Ethiopia and ICF International. Ethiopian demographic and health survey. Addis Ababa: Central Statistical Agency Ethiopia and ICF International; 2016.
- Deliver U. (2011). The logistics handbook a practical guide for the supply chain management of health commodities. USAID| DELIVER PROJECT, Task Order.; Vol. 1, pp. 174.
- Geraldes CA, Carvalho MS, Pereira GA. (2008). A warehouse design decision model—Case study. In 2008 IEEE International Engineering Management Conference, (pp. 1-5). IEEE.
- Hailu T. (2018). Assessment Of Warehouse Management: The Case Of Pharmaceutical Fund And Supply Agency Head Office..
- John Snow I. (2017). The Supply Chain Manager's Handbook, A Practical Guide to the Management of Health Commodities. Arlington, Va.: John Snow, Inc.
- Kokilam MB, Joshi HG, Kamath VG. (2015). Assessment of Pharmaceutical Store and Inventory Management in Rural Public Health Facilities--A study with reference to Udupi District, Karnataka. *Pharmaceutical Methods*, Vol. 6(2), pp. 53-59.
- Ouma AM, Njeru AW, Dennis J. (2013) Assessment of the Influence of Just in Time (JIT) delivery of Materials in Managing Cost Levels in the Pharmaceutical Industry in Kenya. *International Journal of Academic Research in Business and Social Sciences*, Vol. 3(11), pp. 185-196.
- Mahammed T. (2018). Assessment Of Pharmaceutical Inventory Management Performance At Health Facilities.
- Rossetti CL, Handfield R, Dooley KJ. (2011). Forces, trends, and decisions in pharmaceutical supply chain management. *International Journal of Physical Distribution & Logistics Management*, Vol. 41(6), pp. 601-622.
- Tabash m, Abuqamar m. (2018). Assessment of the status of private and non-governmental pharmaceuticals supply warehouses in the Gaza Strip, Palestine. *Assessment*, Vol. 11(2), pp. 300-307.

- Teklay A, Tewodros M. (2018). Barriers in Implementing Green Supply Chain Management in Addis Pharmaceutical Factory, Ethiopia.
- USAID | DELIVER PROJECT, Task Order 1. Logistics Indicators Assessment Tool (LIAT). Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1. 2008.
- Van Wassenhove LN. (2006). Humanitarian aid logistics: supply chain management in high gear. *Journal of the Operational research Society*. Vol. 57(5), pp. 475-89.
- Van den Berg JP, Zijm WH. (1999). Models for warehouse management: Classification and examples. *International journal of production economics*. Vol. 59(1-3), pp. 519-28.
- World Health Organization. Guideline for Good Storage Practices in Medical Stores and Hospitals. Ministry of Health and Population, Faculty of Pharmacy. Cairo, Egypt: Cairo University, World Health Organization; 2004. Available from: [http://www.eda.mohp.gov.eg/Files/375\\_GDP.pdf](http://www.eda.mohp.gov.eg/Files/375_GDP.pdf). [Last accessed on 2017 Feb 17].
- Yezid H. (2019). Assessment of Pharmaceutical Warehouse Operation Management in The Case of Ethiopian Pharmaceutical Supply Agency. *Addis Ababa University Institutional Repository: logistics and supply chain management*. Available from: <http://10.6.20.92/xmlui/handle/123456789/20045>
- Yousefi N, Alibabaei A. (2015). Information flow in the pharmaceutical supply chain. *Iranian journal of pharmaceutical research: IJPR*, Vol. 14(4), pp. 1299-1303.

**Annex (Questionnaire)**

Name of facility: \_\_\_\_\_

Date of visit: \_\_\_\_\_

**Part –I Interview with facility manager (head office)**

(Questions that may not be answered by the manager should be inferred to the store manager)

1. Age: \_\_\_\_\_ in years
2. Sex: \_\_\_\_\_
3. Educational qualification: \_\_\_\_\_
4. Profession; \_\_\_\_\_
5. Number of years and months you have worked at this facility? Years: \_\_\_\_\_ Months: \_\_\_\_\_
6. When was your facility established? \_\_\_\_\_
7. How many employees does your facility have? \_\_\_\_\_
8. What kind of pharmaceutical products does your facility manage?  
A. Only drugs  
B. Only medical supplies  
C. Medical equipment's (MRI, X-ray...)  
D. All  
E. Other, state \_\_\_\_\_
9. For whom does your facility supply pharmaceuticals to?  
A. For public health facilities only  
B. For private health facilities (including private pharmacies)  
C. For both
10. How did requests for supplying products come to your facility? \_\_\_\_\_  
\_\_\_\_\_
11. How and from whom does your facility receive pharmaceuticals from? \_\_\_\_\_  
\_\_\_\_\_
12. Who is the principal person responsible for managing pharmaceutical products at this facility?  
\_\_\_\_\_  
\_\_\_\_\_
13. What type of transportation is most often used to supply pharmaceuticals?  
A. To your facility \_\_\_\_\_  
B. From your facility to customers \_\_\_\_\_
14. Did you receive any supervision visit from regulatory bodies?  
A. Yes  
B. No
15. If your answer to the above question is yes, when did you receive your most recent?  
Supervision visit? \_\_\_\_\_
16. Have you ever received on job training?  
A. Yes  
B. No
17. If your answer for the above question is yes, when your last training and what was it about?  
\_\_\_\_\_
18. What type of training do you need to receive \_\_\_\_\_?
19. Do you receive IPLS training \_\_\_\_\_
20. What kind of system (software) does your facility use to manage pharmaceutical products?  
(HCMIS)? \_\_\_\_\_
21. What challenges did you usually face in the supply chain process \_\_\_\_\_?
22. What challenges did you usually face in your facilities own operations \_\_\_\_\_
23. Does your facility have a specified warehousing procedure?  
A. Yes  
B. No
24. What kind of recording system does your facility use for pharmaceuticals you manage?  
A. Manual  
B. Computerized  
C. Both
23. Does your facility use a codification system for storing pharmaceuticals in the warehouse?  
A. Yes  
B. No
25. If your answer to the above question is yes, what kind of codification system does your facility use?  
A. Alphabetical  
B. Numerical  
C. pharmacological  
D. Other, state \_\_\_\_\_
26. What type of stock verification system does your facility follow?  
A. Spot checks  
B. Periodic

- C. Perpetually  
D. Annual only
26. Did your facility provide warehouse related training to your employees?  
A. Yes  
B. No
28. Does your facility disposed of obsolete or scrap material at the right time and place?  
A. Yes  
B. No
29. Do you think that the company has proper material handling methods??  
A. Yes  
B. No
30. If your answer to the above question is yes, which method of material handling does your facility follow?  
A. Manual  
B. Automatic  
C. Both
31. How do you evaluate the efficiency of your facility on material handling?  
A. Very high  
B. High  
C. Medium  
D. Low
32. How do you evaluate your facility on warehousing security practice?  
A. Good  
B. Satisfactory  
C. Low
33. How do you generally rate the warehouse management practice at your facility?  
A. Excellent  
B. Medium  
C. Poor
34. What challenges do you usually face in warehouse management operations at your facility?
- 
35. What do you think should be done to improve warehouse management operations at your facility?
- 

**Part-two- warehouse management related to human and material resource management**

(To be completed by interview and observation)

The purpose of this part is to gather information on how the warehouse management related human and material resource activities look like. Please indicate your level of agreement to the following statements using “Yes” or “No”

S.no	Description	Yes	No
1	There are a sufficient number of staffs to run the warehouse		
2	The staff members are not aware of warehouse management principles		
3	The warehouse personnel have a job description for their respected duties		
4	There are no standard operating procedures (SOP) for the warehouse management activities		
5	There are sufficient personal protective materials like gowns, masks, gloves, etc for the staff in the warehouse		
6	There are safety materials like fire extinguishers and alarms for unexpected incidents		
7	There are on job (on-site) training on warehouse management issues		
8	There are sufficient materials and equipment to facilitate the warehouse Activities		
9	There is maintenance support and replacement of the equipment in the warehouses when they are not working?		
	<b>Receiving activities</b>		
10	There is a pre-notification of the incoming goods that will be received in the warehouses?		
11	During the time of receiving goods, there are procedures for the cross-checking of the documents and the goods		
12	There are procedures for the notification of discrepancies to the suppliers for their turning and re-receiving of goods?		
13	The warehouse worker inspect the goods received in the receiving area before putting away		
14	There are no sufficient good handling equipment for unloading and moving the incoming goods		
15	The receiving space is not convenient for the movement of good handling Equipment		
	<b>Put-away/ storage activities</b>		
16	Products that are ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.		
17	. Products are stored and organized in a manner accessible for first-to-expire,first-out (FEFO) counting, and general management.		

