

**ADDIS ABABA UNIVERSITY SCHOOL OF
COMMERCE DEPARTMENT OF LOGISTICS AND
SUPPLY CHAIN MANAGEMENT**



*ASSESSMENT OF FACTORS AFFECTING AVAILABILITY OF
ESSENTIAL LABORATORY COMMODITIES IN ADDIS ABABA:
PUBLIC HOSPITALS UNDER ADDIS ABABA CITY ADMINISTRATION
HEALTH BUREAU.*

BY: Samuel Temesgen

ADVISER: TEKLEGIORGIS ASSEFA, Asst. Prof.

Thesis Submitted to Addis Ababa University School of Commerce in partial fulfillment of the requirements for the Award of Master of Art Degree in Logistics and Supply Chain Management.

Addis Ababa, Ethiopia

June 2017

***ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE
DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT***

***ASSESSMENT OF FACTORS AFFECTING AVAILABILITY OF
ESSENTIAL LABORATORY COMMODITIES IN ADDIS ABABA:
PUBLIC HOSPITALS UNDER ADDIS ABABA CITY ADMINISTRATION
HEALTH BUREAU.***

Thesis Submitted to Addis Ababa University School of Commerce in partial fulfillment of the requirements for the Award of Master of Art Degree in Logistics and Supply Chain Management.

By: Samuel Temesgen

Approved by Board of Adviser and Examiners

Teklegiorgis Assefa, Asst. Prof.

Advisor

Signature

Date

Tariku Jebena (PhD)

Internal Examiner

Signature

Date

Nakachew Bashu(PhD)

External Examiner

Signature

Date

Declaration

I, Samuel Temesgen declared that this paper is a result of my independent research work on the topic entitled “*Assessment of Factors Affecting Availability of Essential Laboratory Commodities in Addis Ababa: Case from Public Hospitals under Addis Ababa City Administration Health Bureau*” in partial fulfillment of the requirements for the Degree of Masters of Art in Logistics and Supply Chain Management in Addis Ababa University. This work has not been submitted for a degree to any other university.

All the references are also duly acknowledged.

Certification

This is to certify that Samuel Temesgen has carried out this research work on the topic entitled *“Assessment of Factors Affecting Availability of Essential Laboratory Commodities in Addis Ababa: Public Hospitals under Addis Ababa City Administration Health Bureau”* under my supervision.

This work is original in nature and has not been presented for a degree in any University and it can be submitted for the partial fulfillment of the requirements for the award of the degree of Masters of Art in Logistics and Supply Chain Management.

Teklegiorgis Assefa, Asst. Prof.

Signature _____

Date _____

Acknowledgement

First of all, I would like to thank the Almighty GOD for giving me all that I am asking for to complete this study. Secondly, I am deeply extending my sincere appreciation to my advisor, **Teklegiorgis Assefa, Asst. Prof.** for his valuable advice, constant support, commitment, encouragement, dedication, guidance and comments, and for his being everlasting enthusiastic from the beginning to the end of the project. Without his urge, no doubt, this work would not have been possible at all. Thirdly, a word of thanks must also go to **Chemonics** – Contractor for USAID Global Health Supply Chain Program-Procurement and Supply Management (GHSP-PSM) for its financial support to materialize my final thesis work. Appreciation also to Laboratory, Pharmacy and Logistics staff of Hospitals under AACAHB and staff of Pharmaceutical Fund and Supply Agency, for their cooperation in filling out questionnaire, availed themselves for an interview and providing very valuable information about Supply Chain Information of Laboratory Commodities. Furthermore, I would like to forward a word of appreciation to Dr. Adiel (AUC) who shared his experience on Research. I would also like to appreciate my classmate Dawit Teshome for his valuable comments, suggestions and also my friends & Colleagues for supporting me by moral throughout my study. Furthermore, I would like to acknowledge my family; Late Dad, w/o Etagegn Habte and Siblings for their endless love and encouragement. Last, but not least, I would like to thank my Darling Etaferahu Sileshi & Son Yeabtsega Samuel for their love, encouragement, patience, care and support specially throughout this post graduate study.

Samuel Temesgen

May 2017

Abstract

Laboratory service is one of the key elements for comprehensive health care delivery. In order to be efficient and effective in its capacity, it is mainly depends on availability of required laboratory Commodities with reliable quality and quantity. The country has experienced inconsistent availability of laboratory Commodities at a number of health facilities. The purpose of the study was to assess factors that were negatively affecting optimal availability of essential laboratory Commodities in all public hospitals under AACAHB. Combinations of both quantitative and qualitative research approach through a descriptive and case study design respectively were conducted. A non-probability purposive sampling was used to involve 50 health workers comprising; Head of Laboratory, Head of pharmacy, Focal person of each laboratory units and logisticians. For the purpose of triangulation, six purposively selected employees were also contacted at PFSA H.Q. Both primary and secondary data were used for this study. Questionnaires, semi-structured interviews and checklist as a data collection instrument were used. The analysis was carried out using SPSS Version 20 simple descriptive and thematic approach. The major findings of the study revealed that Inappropriate quantification & forecasting, inadequate storage facility, lengthy procurement process, inadequate involvement of lab personnel in procurement, capacity limitation of local suppliers, high dependency on foreign source of laboratory Commodities and chemicals, frequent stock-out at PFSA and inadequate fund are the major barriers to optimal availability of laboratory Commodities at all public hospitals under studied. The researcher recommended that all stake holders need to integrate to addresses those challenges that are contributing to sub optimal availability of laboratory Commodities for the sustainable health benefits of the society at large.

Key Words: *Essential Laboratory Commodities, Public Hospital, Availability*

List of Acronyms

| | |
|----------------|--|
| AACAHB | Addis Ababa City Administration Health Bureau |
| AAHBERB | Addis Ababa Health Bureau Ethical Review Board |
| AAUCC | Addis Ababa University College of Commerce |
| AIDS | Acquired Immune Deficiency Syndrome |
| CSA | Central Statistics Agency |
| FEFO | First Expired First Out |
| HCMIS | Health Care Management Information System |
| HIV | Human Immunodeficiency Virus |
| IFRR | Internal Facility Report and Resupply |
| IPLS | Integrated Pharmaceutical Logistics System |
| LIAT | Logistics Indicator Assessment Tool |
| LMIS | Logistics Management Information System |
| MOH | Ministry of Health |
| PFSA | Pharmaceutical Fund and Supply Agency |
| RDF | Revolving Drug Fund |
| RHB | Regional Health Bureau |
| SCM | Supply Chain Management |
| SPSS | Statistical Package for Social Science |
| TB | Tuberculosis |
| USAID | United States Agency for International Development |
| WHO | World Health Organization |

Table of Contents

| | |
|---|-----|
| Declaration | I |
| Certification | II |
| Acknowledgement | III |
| Abstract | IV |
| List of Acronyms | V |
| Table of Contents | VI |
| List of Tables | IX |
| List of Figures | X |
| CHAPTER ONE | 1 |
| INTRODUCTION | 1 |
| 1.1 Background of the Study | 1 |
| 1.2 Statement of the problem | 2 |
| 1.3 Research Question | 4 |
| 1.4 Objective of the Study | 5 |
| 1.4.1 General Objective..... | 5 |
| 1.4.2 Specific Objectives..... | 5 |
| 1.5 Significance of the study | 5 |
| 1.6 Scope of the study | 6 |
| 1.7. Limitation of the Study | 6 |
| 1.8 Definition of Terms and Concepts | 7 |
| 1.9 Organization of the study | 8 |
| CHAPTER TWO | 9 |
| RELATED LITERATURE REVIEW | 9 |
| 2.1 Supply Chain for Health Commodities | 9 |
| 2.2 Availability of health Commodities | 11 |
| 2.3. Factors constraining availability of essential Laboratory Commodities | 14 |
| 2.4 Laboratory Commodity Supply in Ethiopia | 20 |
| 2.5 Conceptual Framework | 24 |
| 2.6. Summary of the Related Literature Review | 25 |
| CHAPTER THREE | 26 |

| | |
|--|----|
| RESEARCH METHODOLOGY | 26 |
| 3.1 Description of the Study Area | 26 |
| 3.2 Research Approach | 27 |
| 3.3 Study Design | 27 |
| 3.4 Population and Sampling | 27 |
| 3.4.1 Population..... | 27 |
| 3.4.2 Sampling and Sample Size determination | 28 |
| 3.5 Data Source | 29 |
| 3.6 Data Collection Tools | 29 |
| 3.7 Study Variables | 30 |
| 3.7.1 Dependent Variable..... | 30 |
| 3.7.2 Independent Variables..... | 30 |
| 3.8 Data Analysis | 30 |
| 3.9 Reliability Test | 31 |
| 3.10 Response Rate | 31 |
| 3.11 Ethical Consideration | 32 |
| CHAPTER FOUR | 33 |
| Data Presentation, Analysis and Interpretation | 33 |
| 4.1 Introduction | 33 |
| 4.2 Quantitative Data Presentation, Analysis and Interpretation | 33 |
| 4.3 Qualitative Data Presentation, Analysis and Discussion | 49 |
| 4.3.1 The Interview data presentation, analysis and discussion at the hospital level | 49 |
| 4.3.2 The Interview data presentation, analysis and discussion at the PFSA level | 54 |
| CHAPTER FIVE | 56 |
| Findings and Discussion of the Study | 56 |
| 5.1 Major findings of the study | 56 |
| 5.2 Discussion of the study | 58 |
| CHAPTER SIX | 61 |
| Conclusions and Recommendations | 62 |
| 6.1 Conclusions | 62 |
| 6.2 Recommendations | 63 |
| 6.3 Areas of Future Research | 64 |

| | |
|---|----|
| Reference | 65 |
| Appendix: Data collection Instrument | 69 |
| Annex 1. Quantitative Data Collection Tool for respondents at public hospitals under study in Addis Ababa. | 70 |
| Annex 2. Quantitative Data Collection Tool for respondents at PFSA in Addis Ababa. | 78 |
| Annex 3. Interview Guide for Respondents at Public Hospital in A.A | 86 |
| Annex 4. Interview Guide for Respondents at PFSA in A.A | 89 |
| Annex 5. Assessment Check List On Availability Of Selected Essential Lab Commodities and Infection Prevention Supplies | 92 |

List of Tables

| | |
|--|----|
| Table 3.1 The study population & number of respondents in each hospital and PFSA..... | 28 |
| Table 3.2 Reliability statistics result..... | 31 |
| Table 4. 1 Availability status of essential laboratory Commodities..... | 34 |
| Table 4. 2 Reasons for idleness of laboratory equipment, hospitals under AACAHB | 36 |
| Table 4.3 Most frequent stock-out laboratory Commodities in hospitals under AACAHB | 36 |
| Table 4. 4 Quantification & forecasting practice in related to availability of lab commodity | 37 |
| Table 4.5 Inadequate storage facilities in the hospitals under AACAHB | 38 |
| Table 4. 6 Inappropriate storage practices in related to unavailability..... | 38 |
| Table 4. 7 Insufficient cold storage in related to unavailability of laboratory Commodities | 39 |
| Table 4. 8 Lack of Vehicles with cold chain | 40 |
| Table 4. 9 Inappropriate usage of Commodities in the laboratory | 40 |
| Table 4. 10 Lack of staff commitment in the laboratory | 42 |
| Table 4. 11 Reliance on foreign source of lab supply | 45 |
| Table 4. 12 Inefficient data management for request and report..... | 47 |
| Table 4. 13 Lack of adequate fund for lab commodity | 48 |

List of Figures

| | | |
|-------------|---|----|
| Figure 2.1 | Flows of health commodities and information in Ethiopia health system... | 23 |
| Figure 2. 2 | Relationships between dependent and independent variables..... | 24 |
| Figure 4. 1 | Educational qualification of sample population chart..... | 33 |
| Figure 4. 2 | Presence of idle lab equipment in the hospitals under AACAHB..... | 35 |
| Figure 4. 3 | Inadequate human resources in related to unavailability of laboratory.... | 41 |
| Figure 4. 4 | Bureaucracy of procurement process in related to laboratory Commodities..... | 43 |
| Figure 4.5 | Inadequate involvements of lab personnel in the procurement process... | 44 |
| Figure 4.6 | Capacity limitation of private supplier in related to supply of lab reagen.. | 45 |
| Figure 4.7 | Frequent stock-outs of supplies at point of supplier (PFSA)..... | 46 |

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The Efficient logistics process is fundamental to the effective supply for various products including the laboratory Commodities (Kumurya 2015). However, supply for laboratory Commodities remains challenging especially in developing countries where resources are limited (Peter et al. 2009). This inefficient is critical in Sub Saharan Africa where the health systems need reliable availability of the essential laboratory Commodities for appropriate diagnosis, management and prevention of the major communicable diseases especially HIV/AIDS, TB and Malaria(Ibegbunam & McGill 2012). The increasing burdens of the non-communicable diseases such as hypertension, diabetes, Heart Disease etc. are also threatening the laboratory services.

Expanding health program for HIV, TB and Malaria has increased the demand for affordable and reliable laboratory services. Laboratory tests are increasingly being used in these programs and are recognized as essential for surveillance, patient management and programmatic decision making (Peter et al. 2009). The Laboratory to be efficient and effective in its capacity, it is mainly depends on the availability of the required Commodities with reliable quality and quantity to perform diagnosis. Most tests require multiple Commodities to be available simultaneously (USAID Project 2011). Not only customers feel more confident about the health program that motivates them to seek and use services from the consistent availability of Commodities but also health workers can use their training and expertise fully, directly improving the quality of care for clients (Kumurya 2015).

In 2007 the government of Ethiopia introduced logistics management information system (LMIS) aiming to harmonize distribution of public health Commodities to the public health facilities all over the country. It was especially critical for HIV/AIDS Commodities that require special handling procedures for quality assurance (A. Desale, B. Taye & G. Belay, A. Nigatu.2013). It has been revealed that he LMIS was weak and consistently crashed by several systemic challenges that caused frequent absence of critical laboratory Commodities, thus impeding reliable diagnostic service for patients (Desale et al. 2013). Again in 2011 the country introduced a new approach called integrated pharmaceutical logistics systems (IPLS) to enhance efficiency in delivery of all public health Commodities including for laboratory Commodities (Desale et al. 2013). Despite the efforts taken to improve accessibility for health Commodities in Ethiopia, there is an evidence of its sub-optimal performance that contributes to unreliable availability of laboratory Commodities at health facilities countrywide (Sinishaw et al. 2015). This has contributed to inconsistent delivery of health services and client dissatisfaction (Desale et al. 2013).

The study was to assess factors negatively affecting availability of essential laboratory Commodities in selected public hospitals in Addis Ababa, Ethiopia. It was expected that, the evidence from this study would contribute to the knowledge required for improving service delivery in the country as far as availability in supply of laboratory Commodities was concerned.

1.2 Statement of the problem

Effective and efficient laboratory services are critically important to provide quality health care services to the public. It helps to diagnose various diseases ,monitor therapeutic response, detect cases and control for epidemics (Sinishaw et al. 2015).

However, not all public health facilities are providing these services mainly due to unavailability of laboratory supplies (USAID 2009). As a result, health care delivery was hampered (Boadu et al. 2016).

In Ethiopia, government has taken a number of measures to enhance laboratory Commodities supply to all public health facilities. For instance, The introduction of Logistics Management Information System in 2007 aiming to harmonize distribution of public health Commodities to the public health facilities and the implementation of Integrated Pharmaceutical Logistics System in 2011 to enhance efficiency in delivery of all public health Commodities including for laboratory Commodities (Desale et al. 2013).

Yet, the country is facing inconsistent availability of laboratory Commodities at a number of health facilities. For instance, 60.5% health facilities in Addis Ababa were stocked out for at least one ART monitoring and TB laboratory Commodities. The highest stock out rate was for chemistry Commodities. Expired ART monitoring laboratory Commodities were also found in 25 (73.5%) of facilities (Desale et al. 2013). If TB and ART programs with huge financial support and close monitoring experienced stock-out at such a high scale; it could be realized that how lab Commodities that are being managed through comparatively limited fund would suffer by greatest extent from high stock out. Consequently, the public would be exposed to extra and unnecessary cost which through time erodes patients' confidence on laboratory service in particular and health care system in general (Sinishaw et al. 2015)

Lack of scientifically generated evidences for decision making that could mitigate factors constraining availability of essential laboratory Commodities such as logistical and cross functional aspects of laboratory Commodities could be the main reason for such high stock out in Ethiopia (Desale et al. 2013; Sinishaw et al. 2015). Hence, it was needed to obtain such information for consideration in improving the availability of essential laboratory Commodities. The study was conducted to assess factors that are barriers for ensuring optimal availability of essential laboratory Commodities in public hospitals Addis Ababa. Opinions for improving the availability of essential laboratory Commodities to be optimal are documented.

1.3 Research Question

The main question this research tried to answer was:

1. What factors were constraining availability of essential laboratory Commodities in public hospitals Addis Ababa, Ethiopia?

This research tried to answer the following specific questions:

1. What was the availability status of essential laboratory Commodities on day of visit and in the past six months in the public hospitals Addis Ababa?
2. What factors were negatively affecting availability of essential laboratory Commodities in the public hospitals Addis Ababa?
3. What could be done to improve availability of essential laboratory Commodities?

1.4 Objective of the Study

1.4.1 General Objective

To assess factors constraining availability of essential Laboratory Commodities in public hospitals Addis Ababa, Ethiopia.

1.4.2 Specific Objectives

This research has the following specific objectives:

1. To assess availability of essential laboratory Commodities on day of visit and in the past six months in the public hospitals Addis Ababa
2. To identify factors negatively affecting availability of essential laboratory Commodities at Public hospitals in Addis Ababa.
3. To explore opinions for improving availability of essential laboratory Commodities.

1.5 Significance of the study

Scientifically identifying the possible factors that could contribute for hindering availability of essential laboratory Commodities at public health facility is very crucial for the provision of continuous and reliable laboratory service. It will help concerned bodies to formulate a better intervention policy on availability of the most needed health Commodities which could facilitate quality and comprehensive health service delivery while reducing extra cost, time and dissatisfaction by the patients in the country.

Besides, Laboratory professionals will have adequate resources to dispense quality and uninterrupted service and patients would get affordable and timely lab result. So, the study assessed factors that could affect the optimal availability of essential laboratory Commodities which resulted to inconsistent health service delivery in public hospitals under Addis Ababa city administration health bureau as well as in the country.

1.6 Scope of the study

This study focused on factors constraining availability of essential laboratory Commodities at Public Hospitals under Addis Ababa city administration health bureau such as: Zewditu Memorial, Gandhi Memorial, Yekatit 12, Ras Desta Memorial, Minilik II Memorial and Tirunesh Beijing Hospital. It also assessed availability of selected laboratory Commodities on the day of visit and in the past six months in each hospital under study. In addition PFSA HQ was included as it's the main supplier and to identify the source of the challenge for the optimum availability of laboratory Commodities. The study employed both quantitative and qualitative approach which used questionnaire, check list and semi-structured interview respectively for data collection techniques from April to May 2017 by the principal investigator (Researcher).

1.7. Limitation of the Study

Conducting a study in the area of medical specially in related with laboratory commodity has a lot of challenges and limitation due to a number of reasons associated with higher and quality service expectation by the customer and a number of stakeholders with varied capacity are involving in the sector that could contributing

for inconsistent, not-expected level of service and dissatisfaction by clients may occurred. Apart from time limitation, the study had some limitation which includes accessing sufficient literature material. Accordingly, the main limitations faced during this study were lack of secondary data both for the literature and in the hospitals secondary data management, conducting interview with coordinators and heads of studied department was challenging due to frequent meeting and busy schedule for long time and few employees resistance to fill questioners.

1.8 Definition of Terms and Concepts

Laboratory commodities are products used to collect, prepare, test, analyze, store, and dispose of biological/clinical specimens (USAID 2008). For logistical purpose they are categorized in to three as: Commodities, consumables, and durables.

Essential Laboratory Commodities is evolved from the pertinent test required for selected diseases of public health significance. The diseases are significant because of high rate of morbidity and mortality. In order to carry out the required test identified (USAID 2009, WHO 2003) for these disease, we need to ensure availability of essential lab Commodities. For the case of this study the researcher used selected laboratory Commodities and supplies as per the attached list on Appendix- Annex 5.

Public health laboratories are specific laboratories solely managed by the federal government for public health and support the public health system, complementing other services provided(USAID|DELIVER Project 2008).

Clinical laboratories usually comprise private and public laboratories that focus exclusively on the provision of clinical services to the individual, generally without regard to the community or the greater public good(USAID|DELIVER Project 2008).

1.9 Organization of the study

The study is organized into five chapters, as the first chapter presents information about the introductory part including background of the study, statement of the problem, research questions, objective of research, significance of the study, scope of the study, limitation of the study and definition of terms.

The second chapter covers literature review regarding to Supply chain for health Commodities, availability of health Commodities, factors affecting availability of essential lab Commodities, laboratory Commodities supply in Ethiopia and conceptual framework on availability.

The third chapter explains research methodology on how the study was conducted.

The fourth chapter focuses on the data presentation, analysis, interpretation and discussion of the result.

The fifth chapter focuses on the findings and discussion of the research.

The sixth chapter addresses conclusion, recommendation as well as direction for future research.

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1 Supply Chain for Health Commodities

The main purpose of the healthcare supply chain is to deliver products in a timely manner in order to fulfill the needs of healthcare providers to save life. Based on their functions, stakeholders in the healthcare supply chain can be divided into four major groups: producers (manufacturers of those medical Commodities), purchasers (government and non-governmental organizations), providers (those health facilities which carried out the treatment activities for patients), and Patients (which are end users of the service and those health Commodities).

Related to health service providers, supply chain management often refers to the information, supplies and finances involved with the acquisition and movement of goods and services from the supplier to the end user in order to enhance clinical outcomes while controlling costs. In doing so supply chain management puts a strong emphasis on the integration of processes. Within the healthcare sector these processes might refer to physical products like pharmaceuticals, medical devices and health aids but also to processes associated with the flow of patients(Vries & Huijsman 2014).

According to a research conducted by McGill, D (2012) on health commodity management systems showed that the need for coordinated and integrated health commodity management system, sustainable human resource and infrastructure development and an effective information management system to address health commodities supply chain challenges including laboratory Commodities and supplies.

According to a study conducted in Uganda showed that supply chain complexity is a reason for poor availability of health commodities in providing expected services. Hence, less supply-chain complexity can produce higher customer service in terms of less stock shortages, while keeping costs down. By reducing lead times and uncertainty, increasing order frequencies, and moving order points and safety stocks, there may be better integration between information and commodity flows(M. Jahre 2012).

A study conducted by UNICEF (2008) in selected West African countries supported the view highlighting fragmentation of supply chain and poor coordination as a result of the number of key players as challenges. In response to the expansion of the HIV/AIDS, Malaria and TB have emphasized some national health laboratories in Africa. Positive health outcomes are highly dependent on how well the health delivery system which is mainly contributed by health information, financing, personnel and supply chain (including laboratory Commodities) is performing (Mcgill 2012).

The importance and availability of laboratory Commodities at the health facility cannot be overstated, and has implication on how the supply chain is performing(USAID |Project 2010). Among the service provided by the healthcare provider, laboratory service is the one and important for the community in provision of healthcare. In most countries although the value of laboratory supplies and equipment may have equal substantial proportion of what governments spend on pharmaceuticals, such items are rarely given enough attention(USAID 2009). Different studies have shown that efficient supply has a positive impact on the performance of companies in different industries (Ibegbunam & McGill 2012).

Hence, national and international partners and various governments have worked collaboratively over the last several years to build sustainable laboratory capacities within the continent and dramatic changes have exhibited (Alemnji et al. 2014). Key successful partnership and platforms that include the establishment of the African-based World Health Organization Regional Office for Africa (WHO-AFRO); Stepwise Laboratory Quality Improvement Process towards Accreditation (SLIPTA); development of the Strengthening Laboratory Management toward Accreditation (SLMTA) training program; and launching of the African Society for Laboratory Medicine (ASLM) established.

These platforms continue to serve as the foundations for national health laboratory infrastructure enhancement, capacity development and overall quality system improvement expecting efficient and effective laboratory service. However, a study conducted in Zambia regarding to rapid diagnostic test supply, a number of challenges are still hindering the performance of a laboratory among other availability of laboratory Commodities (Hasselback et al. 2014).

Similarly, in the health care service, having efficient supply of medical and non-medical Commodities will bring dramatic change on disease prevention, treatment and control. Hence effective supply not only help ensure commodity security, they also help determine the success or failure of any public health program (Kumurya 2015).

2.2 Availability of health Commodities

Availability of health commodity have critical role in saving lives. Availability is one of the fundamental attributes of basic customer service. It means, the capacity to have

inventory when desired by a customer. However, many central medical stores of developing countries do not have a national list of essential laboratory supplies and staff members do not know which items or how much of a particular item is required to carry out essential laboratory tests(Project 2010b). Hence, many products may not be stocked or even available in the country.

It is common for an organization to expend considerable time, money, and effort to generate customer service and then fail to have product available to meet customer requirements (Cooper 2002). Traditionally organizations have a practice to stock inventory in anticipation of customer orders. Typically an inventory stocking plan is based on forecasted demand for products and may include differential stocking policies for specific items as a result of sales popularity, profitability, and importance of an item to the overall product line and the value of the Commodities. Hence the logistical activities need to have strong forecasting and planning roll to ensure those inventories whenever required in greater efficiency (Williams et al. 2016).

(Cooper 2002) Inventory can be classified into two groups:

- Base stock which determined by forecasted and planned requirements
- Safety stock to cover unexpected variations in demand or operations.

Achieving high levels of inventory availability requires a great deal of planning. Especially for essential Commodities or core customers while minimizing overall investment in inventory and facilities. Availability is based on three performance measures namely as stock-out frequency, fill rate, and orders shipped complete (Cooper2002).

Stock-out frequency refers to the probability that a facility will not have inventory available to meet a customer order/ laboratory diagnosis.

A stock-out occurs when a facility has no product/ inventory available to fulfill customer demand. With stock out of essential lab Commodities, patient diagnosis couldn't be possible in the case of laboratory service (USAID| DELIVER 2009).

In business, stock-out does not actually occur until a customer desires a product but not for health service delivery whereby the absence of an item has greater impact on the lives (Wales et al. 2014). So, some items are critically expected to be available irrespective of demand because of unexpected need. The aggregation of all stock-outs across all products is an indicator of how well a firm is positioned to provide basic service commitments in product availability.

Fill Rate measures the magnitude or impact of stock-outs over time. Being out of stock does not affect service performance until a customer demands a product. However, it's important to determine the impact of that product not available when it's needed (Cooper 2002). Fill rate performance can be evaluated for a specific customer, product, or for any combination of customers, products, or business segments.

Fill rate can be used to differentiate the level of service to be offered on specific products for instance, inventories that can be used not frequently (rarely) but the impact on the service could be critically high during its absence. Whenever fill rate is acceptable, then the customer may accept a backorder or be willing to reorder the short times at a later time.

Order Shipped Complete is the most exacting measure of performance in product availability. Having everything that a customer orders as the standard of acceptable

performance. Failure to provide even one item on a customer's order results in that order being recorded as zero in terms of complete shipment.

Availability of laboratory commodities are mainly depend on the accurate forecasting technique that is based on proper quantification of each lab commodities needed for all testing purpose(USAID| Deliver, 2011). Besides, availability of lab commodities are also affected by a number of factors like; inadequate fund, inappropriate usage, lack of infrastructure, etc. (USAID| Deliver, 2009).The essence of the study was to identify factors constraining availability of essential laboratory Commodities and looking for possible recommendations on its improvements.

2.3. Factors constraining availability of essential Laboratory

Commodities

Challenges associated with optimal availability of laboratory Commodities includes lack of policies, political commitment, absence of dedicated government budgets and lack of standardization exhibited in many developing countries(Anon 2013). The challenges coupled with a lack of human and financial resources and poor infrastructure, prevent the efficient operation and delivery of accessible and quality-assured laboratory services to support national public health programs, including malaria and TB control and treatment and the delivery of ART(Williams et al. 2016).

Therefore, it is necessary to strengthen supply chain for lab Commodities by improving the performance of supply chain to ensure uninterrupted diagnostic service (Sinishaw et al. 2015). Supply chain managers need to have a solid understanding on the possible barriers that have direct impacts on availability of essential Commodities

namely as: quantification, procurement, storage, transportation, information sharing and funding that leads to impact on overall health service delivery (Williams et al. 2016).

Quantification and Forecasting it is an activity where by laboratory items should be quantified based on the purpose of the item not by the type of test (USAID| Deliver 2011). It depends on the consumption data that could be available after conducting a test and recording the data. Inappropriate forecasting of lab commodity will result to shortage or absence of necessary lab Commodities. Hence, the laboratory services will be interrupted and resulting inadequate health care and poor customer satisfaction ultimately threatening the health care system in the country.

Forecasting for laboratory commodities is an intensive process because of the large number of commodities involved and the multiple purposes for which these products are used in the laboratory. To avoid leaving out any of the uses for particular commodities and; therefore, possibly underestimating need, we recommend that your forecast covers all the needs of the laboratory, rather than a subset of services or tests(Project 2011). According to a research conducted by MoH (2005) in Lesotho to scale up ART service, the main challenge of the laboratory was unavailability of required Commodities resulted from poor quantification and forecasting.

The quantities of laboratory products needed for the diagnostic purposes of testing are determined by the in country testing algorithm. For certain laboratory products that are used specifically for HIV testing—such as CD4 (cluster of differentiation), viral load Commodities, and HIV test kits—you would need to apply a number of factors, including the HIV prevalence, attrition rates, and testing protocol to determine the quantity of laboratory Commodities required. For HIV tests, you must include other

considerations, including the discordance rate between the screening and the confirmatory tests because that would determine the quantity of tie-breaker tests needed. For other non-HIV specific testing areas, such as chemistry and hematology, the quantities of laboratory Commodities required will not be determined solely by the afore mentioned factors. You will also need to think about additional considerations, such as the percentage of the general population that uses them routinely for non-HIV testing(Pettersson 2008).

Another study was conducted in Ghana (Adzimah et al. 2014) on health care delivery, the most hindering factor to provide the intended health care service was absence and inconsistent supply of health commodities because of improper quantification and forecasting so resulted in countless loss of life.

Supplier is choosing of who will perform a particular supply chain activities such as production, Procurement, distribution, storage, transportation or management of information. Generally, function to be performed by own and to outsource. In this regard, careful decision must be taken as it affects the responsiveness and efficiency (Cooper 2002). Combinations of factors, at the facility level and at the national level need to be considered when selecting sourcing for the procurement of laboratory commodities. In addition to national policies and guidelines, financial and regulatory factors may impact national capacity to select and manage particular types of laboratory Commodities and chemicals (WHO manual 2013).

Similar to selected laboratory Commodities and supplies; pharmaceutical products are also supplied to the public health facility via same channel especially for program budget which includes HIV, TB and Malaria. Hence, challenges affecting availability

of medicine also shared by the laboratory Commodities. According to a research conducted in selected public health facilities in Addis Ababa, decreasing the ordered quantity of ARV medicines and Laboratory Commodities by the supplier were mentioned as a main reason for the stock outs of these pharmaceuticals(Berhanemeskel et al. 2016).

Procurement unlike any activities, health service delivery needs special attention to save life. Hence, the procurement procedures need to be flexible for more effectiveness in ensuring commodity availability. Quantification and procurement for all items should be in the way that it will be needed to complete a testing protocol. We need to ensure that shipping schedules are coordinated to make all items available at any time, as needed(USAID 2008). In many countries, procurement is performed on an annual basis. Estimating the required quantities must be accurate in order to avoid wastage and stock-outs. Determining the quantity of laboratory Commodities and supplies required and forecasting future needs can be extremely challenging. Multiple sources of data can be used to calculate the demand for particular items. Often, Technical experts with specific knowledge in the selection and use of diagnostics, including end-users, should be involved in procurement processes for diagnostics and laboratory items (WHO manual 2013). Facility infrastructure including stability of utilities, cold chain and appropriate storage, human resources capacity, staff competencies, training, local service and technical support, test through-put, and quality assurance measures will all contribute to product selection and therefore procurement of laboratory commodities (Commodities, supplies and equipment)(Project 2011). The procurement process should not happen in isolation. Rather, a number of stakeholders should be engaged, all of whom have important expertise to bring to the decision- making process, irrespective of whether

procurement is coordinated at a national or international level. These stakeholders should constitute a procurement and laboratory technical working group.

Storage and distribution are actual physical locations in the supply chain network where by products are stored. Decisions regarding the role, location, capacity, requiring technology and flexibility of facilities have a significant impact on the supply chain's performance(Cooper 2002). The purpose of a storage and distribution system is to ensure the physical integrity and safety of commodities and their packaging as they move from the central storage facility to peripheral laboratories or point of service. A sound storage and distribution system will help ensure that commodities reach the laboratory in usable condition. Proper storage procedures help ensure that storage facilities issue only high-quality commodities and that little or no loss is caused by damaged or expired products. Acceptable storage facilities (warehouses, storage rooms) must be clean and secure, and adequate distribution systems must have dependable and secure delivery vehicles. Ideally, the pipeline should be as short as possible. In the context of storage and distribution, a shorter pipeline can positively influence the security and quality of the commodities being distributed(Project 2011).

Acceptable Distribution is all about how Commodities shall be delivered to and mode of transportation required delivering Commodities from storage facility to the hand of customer.

They involve moving inventory from point of origin to point of destination in the supply chain. Decisions on the selection of transportation will result in large impact on availability of essential health Commodities(Peter et al. 2009). A study conducted in Cabo Delgado, Mozambique on Rapid diagnostic test supply chain and consumption reflects the substantial high levels of RDT stock-outs were found at a

number of health center resulted from inadequate attention to the design and implementation of the distribution system (Hasselback et al. 2014). Storage and distribution are important to consider because some laboratory commodities will need to remain cold in storage and transit, and because reverse transportation may be needed when specimens must travel up the system to a higher-level laboratory for testing.

Information Management consists of data and analysis concerning facilities, inventory, transportation, cost, prices and customers throughout the supply chain. Information is the main enablers of supply chain performance as it directly affects each of the other drivers. Information will help the supply chain to have the opportunity to make more responsive and efficient on the availability of products and services(Cooper 2002). Information Technology is very important especially in the demand forecasting given the large amount of data involved, the frequency with which forecasting is performed and the high quality result. It has several important advantages to utilizing the capability of Information Technology in forecasting. It will provide us a more accurate forecast than what can be produced via the use of Excel. The government of Ethiopia implemented information technology at the Pharmaceuticals Fund and Supply Agency(PFSA) named as integrated pharmaceuticals logistics system(IPLS) hoping that will helps the agency in busting its mandate(Desale et al. 2013).

Fund is a process by which a firm decides how much to charge customers for its goods and services. It affects customer segments that choose to buy the product, as well as the customer's expectation. This directly affects the supply chain in terms of the level of responsiveness. Pricing is one of the most significant factors that affect

the level and types of demand that the supply chain will face(Cooper 2002). In many countries, the budget for laboratory services is usually included in the budget for essential health services. In some countries, national public health laboratory services have separate budgets for performance improvement, supervision, and supplies(USAID 2009). It is one of the major factors affecting availability of product and services for the society in need especially health related commodities in saving lives. Fiscal and budget policies are often some of the most influential policies affecting a logistics system, whether related to securing funding for product procurement; or to pay for critical infrastructure, such as storerooms and transportation(Kumurya 2015).

2.4 Laboratory Commodity Supply in Ethiopia

Laboratory service is one of the most critical components in the delivery of an effective and quality health care provision. It provides the basis for good clinical diagnosis, objective means to manage patients' response to treatment and monitor disease trends and controlling disease epidemic. More than 70% of clinical decision-making is predicated upon, confirmed by, or documented by medical laboratory test results (Dighe et al. 2007).

If laboratory services are to support health care effectively, they need to provide reliable, valid, and timely results. Functioning, good-quality equipment and uninterrupted supplies of test kits, Commodities, and other consumables are mandatory(Anon n.d.).

Also, the laboratory has been identified as one of six key public health functions that would contribute the most towards health systems strengthening efforts and has the

greatest impact on improving the public's health (Bloland al. 2012). But there were still gaps like lack of laboratory networks, equipment or their maintenance and weak supply chain management systems among other challenges in the strengthening of laboratory services and systems in many developing countries (Olmsted et al. 2010; Abimiku 2010; Fonjungo 2012).

Uninterrupted availability of laboratory Commodities (functioning equipment, test kits, Commodities, and consumables) is mandatory to carry out laboratory diagnosis (Anon 2009). The supply chain management of laboratory Commodities shares many similarities with the management of pharmaceuticals and is just as important in providing effective health care services.

In 2011 the government of Ethiopia introduced a system called integrated pharmaceuticals logistics system (IPLS) that governing the logistics management of pharmaceuticals and laboratory supply (Desale et al. 2013). Pharmaceuticals Fund and Supply Agency (PFSA) is mandated for the functionality of the system for affordable and quality pharmaceuticals and laboratory Commodities sustainably to all public health facilities in an efficient and cost effective manner and ensure their rational use.

The objective of IPLS is to ensure that patients always get the health services they need. Health facilities must have the Commodities to provide health services (FMHACA, 2011). IPLS is an application of the single pharmaceuticals reporting and distribution system based on the overall mandate and scope of the PFSA. It aims to ensure that customers always get pharmaceuticals and non-pharmaceuticals product they need.

The system addresses the six rights of supply chain management by ensuring the right products, in the right quantity, of the right quality, with the right cost, to the right place and at the right time. The IPLS integrates the management of essential pharmaceuticals including the following pharmaceuticals that were used to be managed vertically: HIV/AIDS, Malaria, TB and Leprosy, EPI, FP, MCH and purchased essential drugs.

It is the primary mechanism through which all public health facilities obtain essential and vital pharmaceuticals and non-pharmaceuticals. However, studies revealed that, there are many public health facilities that had no or only low stocks of key laboratory Commodities and consumables as a result of ineffective distribution system (Desale et al. 2013).

The following figure will tries to show how the flow of health commodities including laboratory items from international or local supplier to the end users(Health facility) and the forward and backward flow of information regarding to the Commodities in Ethiopia health system.

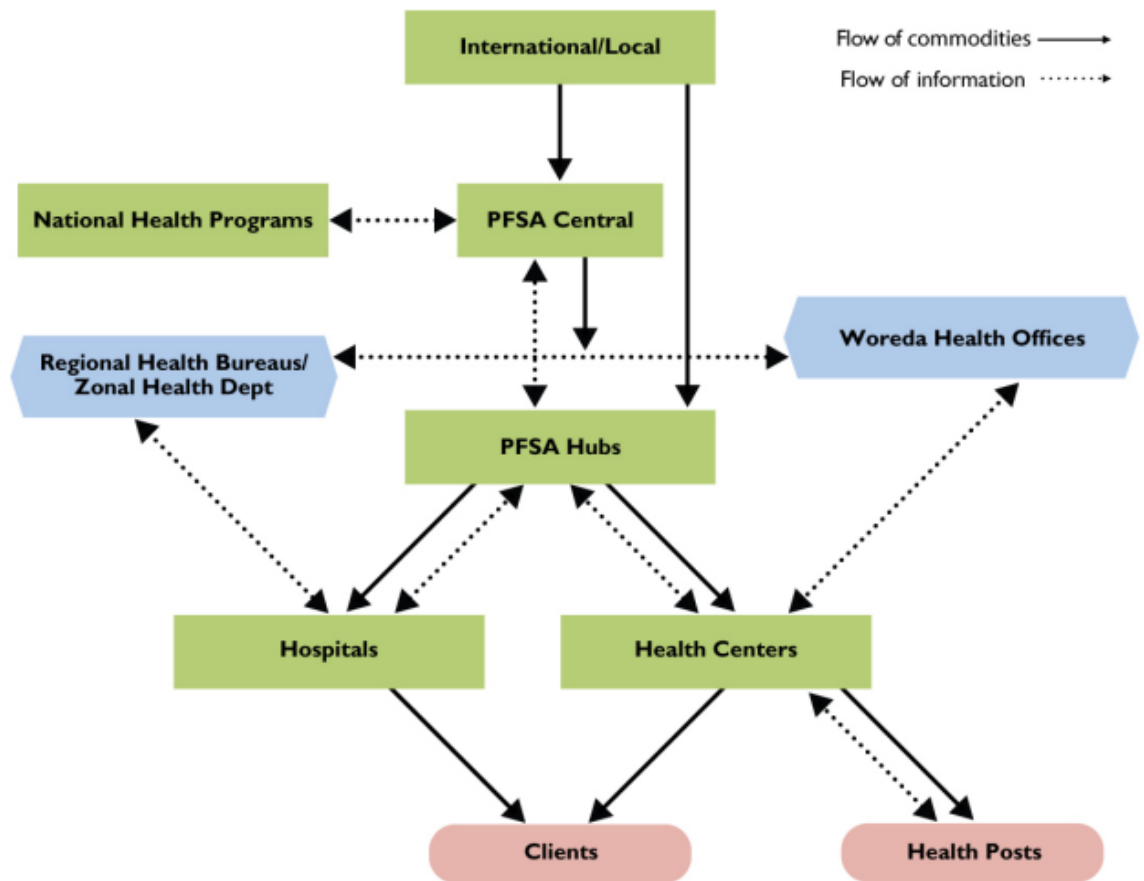


Figure 2. 1 Flows of health commodities and information in Ethiopia health system

Source: USAID / DELIVERY PROJECT, 2011

2.5 Conceptual Framework

Based on the above discussion, the following conceptual framework is developed.

The dependent variable is availability and independent variables which are aspects of logistical and cross functional determinant that are affecting availability of essential lab Commodities.

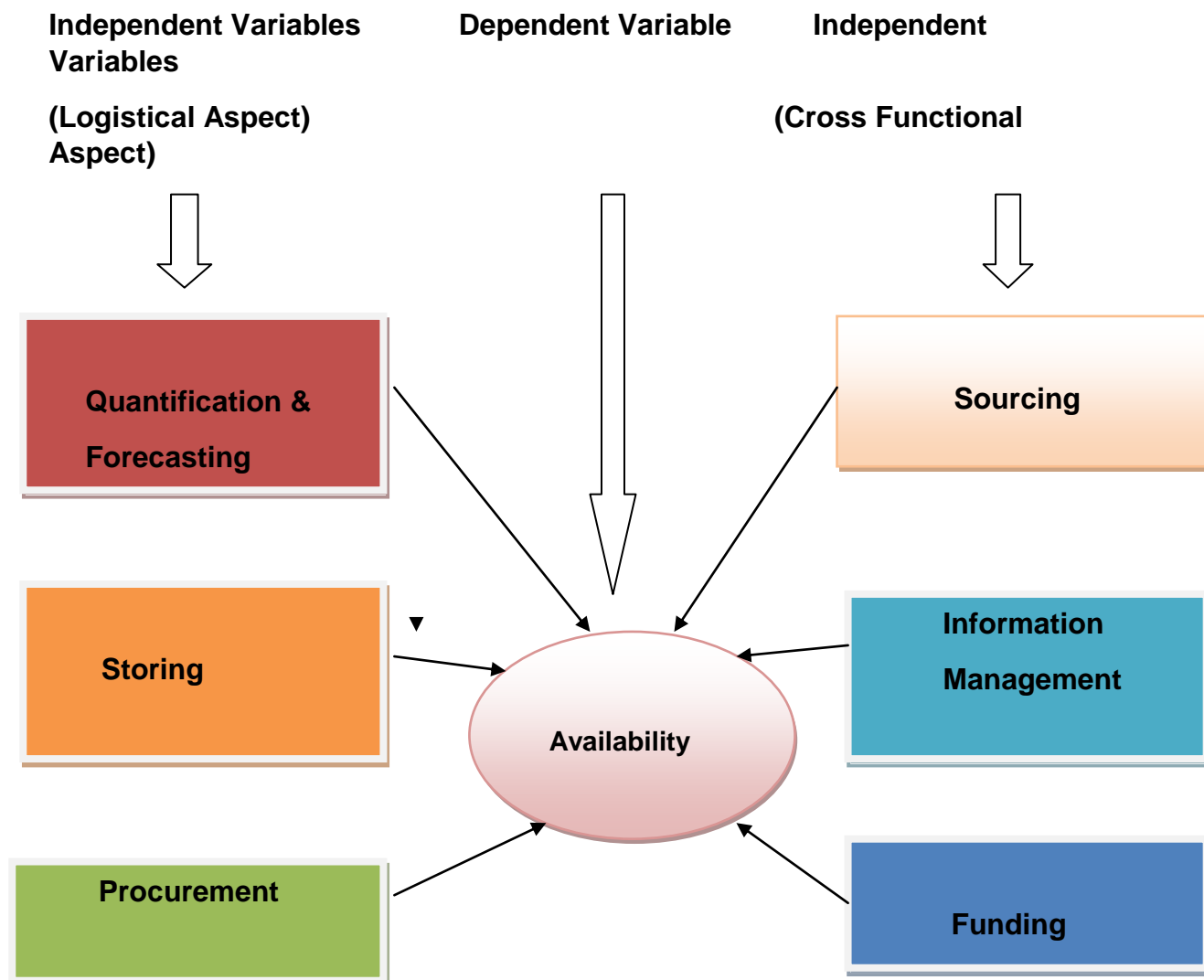


Figure 2. 2 Relationships between dependent and independent variables

(Source: Cooper2003)

2.6. Summary of the Related Literature Review

This summary of related literature review was to show how important is health commodities supply chain in saving life and the challenges that inhibiting the effectiveness of its operation in related to availability of health commodities including laboratory Commodities and supplies. It also tried to assess what looked like the laboratory commodities supply chain in Ethiopia, challenges and effort that had been made to improve the laboratory services by implementing different approaches to secure optimal availability of laboratory Commodities and supplies. And yet, the challenges of sub-optimality of these Commodities and supplies were still inevitable as a result of a number of challenges. From the review we could realize that there are a number of challenges that are hindering optimal availability of laboratory Commodities and supplies irrespective of the level of laboratory and identified as forecasting, procurement, supplier, storage, information management and funding.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted at Public Hospitals and Pharmaceutical Fund and Supply Agency in Addis Ababa, the capital city of Ethiopia. Geographically, Addis Ababa is located at (8.9° N, 38.76° E) with an estimated population of 4 million. Its economy is mainly based on trade, manufacturing and services.

Particularly, data was collected at Public Hospitals under Addis Ababa City Administration Health Bureau and PFSA head office in Addis Ababa. The public hospitals under Addis Ababa city administration Health Bureau include Zewditu Memorial, Gandhi Memorial, Yekatit 12, Ras Desta Memorial, Minilik II Memorial and Tirunesh Beijing hospital. They are located at different sub cities in Addis Ababa. The main objective of these hospitals is to provide outpatient, inpatient and emergency health care services to the clients referred from different health centers under their catchment areas and different regional hospitals depending on level of specialty.

The hospitals have also been serving as teaching and research centers for a number of public and private university and college students. These hospitals will be ideal for this study due to the fact that they provide comprehensive laboratory services compared to the health centers. Moreover, they all are managed by same chain of command unlike hospitals under federal and university level which have special authority and privileges.

Besides the public hospitals, the study was conducted at the headquarters of PFSA located at Gulele sub city in Addis Ababa. PFSA has a central warehouse in its HQ

with five warehouses at different sub cities and closely working with eleven regional hubs in Ethiopia. The PFSA was used as a data collection site due to its main mandate in the country to guarantee public access to quality pharmaceuticals and laboratory supplies.

3.2 Research Approach

A Combination of both qualitative and quantitative approach was employed in data collection and analysis for this study. The core assumption of this approach was to provide a complete understanding of research problem i.e. factors constraining for availability of essential laboratory Commodities in public health facilities, than either approach alone (John Creswell, University of Nebraska-Lincoln, 2013).

3.3 Study Design

A descriptive cross-sectional and a case studies design of inquiry were conducted from April to May 2017 in all Public Hospitals under Addis Ababa City Administration health bureau and PFSA H.Q. The study used hand delivered survey questionnaire for self-completed and semi-structured interview. It had both open and closed ended questions in English version which was easy to understand and free from biasness.

3.4 Population and Sampling

3.4.1 Population

The sources of study population for this research were all public hospitals under Addis Ababa city administration health bureau and PFSA HQ.

Each hospital's laboratory have five to six functional units (work station) namely as hematology, clinical chemistry, serology, bacteriology, parasitology and microbiology.

3.4.2 Sampling and Sample Size determination

The respondents for this study were selected purposively based on a non-probability sampling technique which includes employees who have better understanding about the study problem and a direct link with laboratory Commodities. It was designed to cover a total of 56 respondents (As illustrated in the table 3.1 below) for quantitative (43 respondents) and qualitative (13 respondents) approach in the following manner:

The table below depicts the number of respondents in different functional unit and study population i.e. public hospitals under AACAHB and PFSA in Addis Ababa for this research purpose.

Table 3.1 The study population & number of respondents in each hospital and PFSA HQ.

| S/N | Name of Study Population | # of Respondents in different functional level / units in the hospital relating with laboratory Commodities | | | | Total # of Respondent |
|-----------------------------|------------------------------|---|------------------|--------------------------------------|---------------|-----------------------|
| | | Head of Lab. | Head of Pharmacy | Focal person of each laboratory unit | Lab Store man | |
| 1 | Zewditu Memorial Hospital | 1 | 1 | 5 | 1 | 8 |
| 2 | Gandhi Memorial Hospital | 1 | 1 | 5 | 1 | 8 |
| 3 | Yekatit 12 Hospital | 1 | 1 | 6 | 1 | 9 |
| 4 | Ras Desta Memorial Hospital | 1 | 1 | 5 | 1 | 8 |
| 5 | Minilik II Memorial Hospital | 1 | 1 | 5 | 1 | 8 |
| 6 | Tirunesh Beijing Hospital | 1 | 1 | 6 | 1 | 9 |
| 7 | PFSA H.Q | 1 Lab Coordinator | | 5 Lab Supply chain staff | | 6 |
| Total Number of Respondents | | | | | | 56 |

Source: Own Survey May, 2017

3.5 Data Source

The study used both primary and secondary data in order to answer study questions. While primary data were collected from Head of Laboratory, Head of Pharmacy, Focal person (Senior Laboratory Technologist / Technician) of each lab unit, logistician of the lab and coordinator and concerned employees of lab commodity supply chain at PFSA. Secondary data were collected from Bin card to check stock status and capture period of unavailability of laboratory Commodities.

3.6 Data Collection Tools

For the Qualitative data semi-structured interview was employed. The data collection involved a direct interaction with selected respondents from public hospitals under study and PFSA H.Q on a one to one basis. The interview had few questions with English that could address the research questions. It applied inquiry based conversation and recorded using Samsung Android Phone model GT-N7100 after securing permission of their conveniences.

Quantitative data was collected using open and closed ended semi-structured questionnaire administered to respondents from public hospitals under study and PFSA H.Q. The questionnaire was partly adopted from USAID|DELIVER for Logistics Indicators Assessment Tool and customized to this study in English version only. The questionnaire was pretested and valid to be free from biasness. It was found to be easily understandable by the participant and administered after securing ethical clearance from AAHBERB.

Additional quantitative data was collected using a checklist customized from the Logistics Indicators Assessment Tool (LIAT), which is a quantitative data collection instrument developed by USAID / DELIVER, to assess availability of laboratory

Commodities at health facilities (USAID | DELIVER PROJECT 2008). The check list was applied only for hospitals under study. Finally, organization's documents and their facilities were observed.

3.7 Study Variables

3.7.1 Dependent Variable

- ❖ **Availability** of Essential Laboratory Commodities.

3.7.2 Independent Variables

- ❖ Quantification & Forecasting
- ❖ Storing
- ❖ Procurement
- ❖ Sourcing
- ❖ Information Management (IPLS)
- ❖ Fund

3.8 Data Analysis

For the quantitative analysis data was checked for completeness and logical consistency on daily basis, cleaned and assigned values to insure data quality and finally entered into SPSS version 20 for analysis only for data collected from the hospitals. Descriptive statistics—including frequencies, averages and percentages were performed.

For the qualitative analysis data collected from the hospitals and PFSA were transcribed, coded and analyzed thematically. Findings were triangulated. The conclusion on the research was based on the findings which could be converging, diverging or complimenting.

3.9 Reliability Test

Before presentation of the analysis, it was crucial to communicate the result of the pilot survey conducted prior to the actual data collection. Hence, a total of 15 questionnaires were distributed for the pilot survey which has helped the researcher to ensure that the questionnaire were in fact clear to respondents and can be completed in the way the researcher wish (Adams, et al., 2007). Accordingly, the pilot survey has proved that the questioners designed to collect the desired data was in fact clear and free from biasness to respondents. Hence, for the reliability test of the data Cronbach's alpha was calculated using SPSS and the result has presented as below, which prove that the correlation among variables was 78.3 and found reliable and acceptable.

| Reliability Statistics | |
|------------------------|------------|
| Cronbach's Alpha | N of Items |
| .783 | 15 |

Table 3. 2 Reliability statistics result (source SPSS Analysis from Own Pilot Survey 2017)

3.10 Response Rate

After the pilot test, the questionnaire was administered to a total of 38 respondents who are working in all hospitals under study. The respondents were laboratory technologist (technician) and logistician by profession and who were also working in their respected hospital during the study period. Of the entire 38 questionnaire administered to the hospital respondent, 36 were collected, checked for completeness and were valid for analysis while two were not collected due to refusal to give response for questionnaire as a result of work load by the technician during the data collection time. The valid questionnaires which formed the analysis yielded 95%

response rate. According to Mugenda the statistically significant response rate for analysis should be at least 50% (Mugenda, 2003).

Statistical Package for Social Science (SPSS) version 20 was used to perform the analysis for quantitative data and thematic (categorical) analysis was used for qualitative data.

3.11 Ethical Consideration

Prior to launching the survey, Ethical clearance was secured from School of Commerce, Addis Ababa University and Addis Ababa Health Bureau Ethical Review Board. Permission was secured from PFSA and respective hospitals. During data collection, each respondent was told the purpose, scope, expected outcome and provide their verbal consent. Any respondent not interested in participating in the survey could also decline. The participant was told for absence of payment, psychological and physical risk being participating in the study. The concerning body was updated periodically on the progress of the study. All data was anonymous; no individual or facility would be identified in any reports or any publication based on this study rather aggregate data was used.

CHAPTER FOUR

Data Presentation, Analysis and Interpretation

4.1 Introduction

This chapter presented a summary of data presentation, analysis and Interpretation of key findings of the study according to the intended objectives. The result is mainly from the questionnaire administered to the respondents from hospitals only in all study sites for quantitative study and the responses of the interview made by the participants for qualitative study from the hospitals and PFSA including the observation of all hospitals under Addis Ababa City Administration Health Bureau.

4.2 Quantitative Data Presentation, Analysis and Interpretation

The questionnaire data gathered was valid and reliable.

I. Qualification of the Respondents

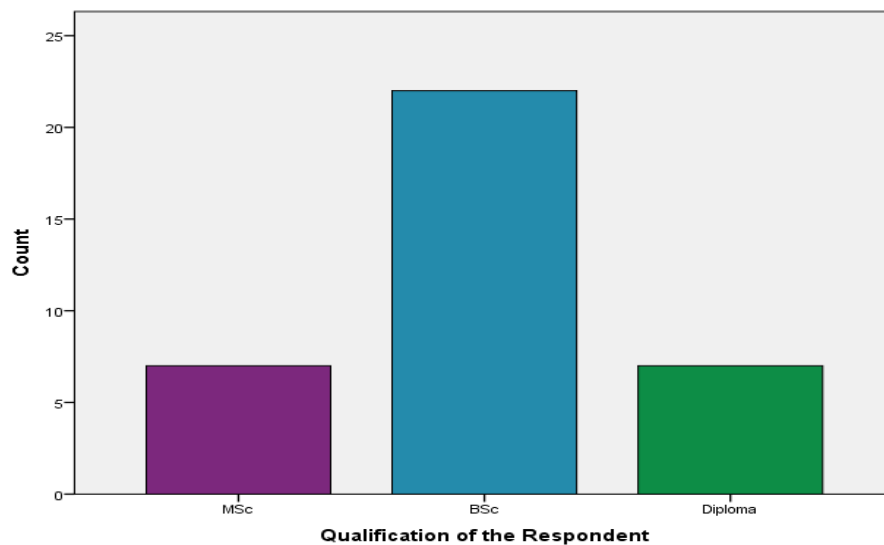


Figure 4. 1 Educational qualification of sample population chart

Source: Own Survey May, 2017

According to the data obtained from SPSS software; 7 (19.4%) were Master Degree holder, 22 (61.1%) were Bachelor Degree holders and 7 (19.4%) were Diploma holders. This implies that the respondents participated in this study are better educated in order to provide reliable information regarding to the study objective.

II. How would you describe the availability of essential laboratory Commodities in your hospital?

| availability of lab commodity | | | | |
|--|-----------|---------|---------------|--------------------|
| Availability of essential lab Commodities in all studied hospitals | Frequency | Percent | Valid Percent | Cumulative Percent |
| Always above minimum stock | 1 | 2.8 | 2.8 | 2.8 |
| Always within minimum stock | 3 | 8.3 | 8.3 | 11.1 |
| Rarely below minimum stock | 20 | 55.6 | 55.6 | 66.7 |
| Always below minimum stock | 12 | 33.3 | 33.3 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4.1 Availability status of essential laboratory Commodities

Source: Own Survey May, 2017

The minimum and maximum stock level for the hospitals was 2 and 4 months respectively for the items received from PFSA. However, based on the data obtained from SPSS software: the respondent described the availability of essential laboratory Commodities in their respected hospitals during the study period as 1(2.8%) always above minimum stock, 3(8.3%) always within minimum stock, 20(55.6%) rarely below minimum stock and 12(33.3%) always below minimum stock. This implies that, almost all hospitals experienced sub-optimal availability of essential laboratory Commodities during the study period.

III. Do you have idle lab equipment in your laboratory?

According to the data obtained from SPSS software, except 1(2.8%) respondent, 35(97.2%) respondents replied that, the hospitals where they are working for have idle lab equipment and also as per the visit made by the researcher in all hospitals under studied, it was true that all of them have idle lab equipment for considerable period of time. This implies that all hospitals under AACAHB are being challenged by having laboratory equipment which are not functional as a result of a number of reasons; so, it leads to wastage of resources and incomplete laboratory services. Therefore the concerning body need to find solutions for optimal availability of reagent and develop a system for maintenance of in-functional equipment.

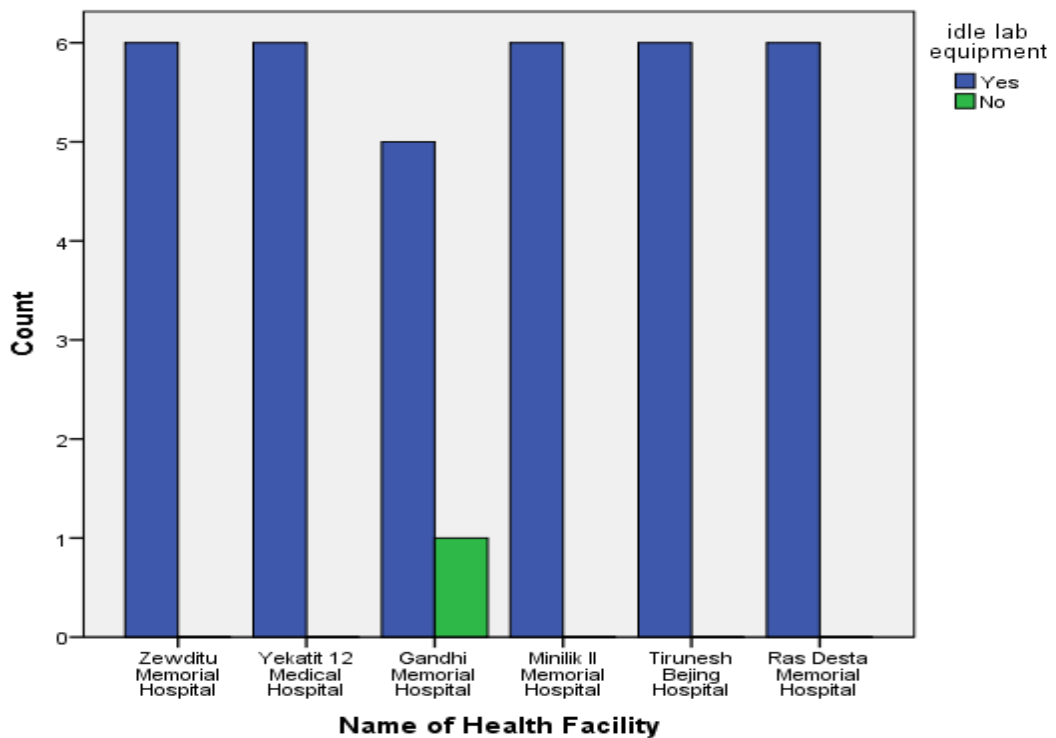


Figure 4. 2 Presence of idle lab equipment in the hospitals under AACAHB
Source: Own Survey May, 2017

IV. What is the reason for idleness of the equipment?

| reasons for idleness of equipment | | | | |
|--|-----------|---------|---------------|--------------------|
| | Frequency | Percent | Valid Percent | Cumulative Percent |
| Reagent stock-out | 13 | 36.1 | 36.1 | 36.1 |
| Maintenance issue | 2 | 5.6 | 5.6 | 41.7 |
| Valid Commodities and Maintenance challenges | 21 | 58.3 | 58.3 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4.2 Reasons for idleness of laboratory equipment, hospitals under ACAHB

Source: Own Survey May, 2017

Based on the data obtained from SPSS software: the respondent described the reason for idleness of laboratory equipment in their respected hospitals 13(36.1%) reagent stock-out, 2 (5.6%) maintenance issues, 21(58.3%) both reagent and maintenance challenges. This implies that, laboratory equipment which was found in all hospital under ACAHB but not working were mainly as a result of a combination of both reagent stock-out and maintenance challenges. Therefore, the concerning body shall find solutions to fix the maintenance issue and for continuous reagent supply to avoid unnecessary idleness and wastage of resource.

V. What laboratory Commodities have been most frequently stock-out in your hospital?

most frequent stock-out Commodities (*Source: Own Survey May, 2017*)

| most frequent stock-out laboratory Commodities under studied hospitals | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Hematology Commodities | 3 | 8.3 | 8.3 | 8.3 |
| Chemistry Commodities | 4 | 11.1 | 11.1 | 19.4 |
| Serology Commodities | 3 | 8.3 | 8.3 | 27.8 |
| Valid Hematology and Chemistry Reagent | 10 | 27.8 | 27.8 | 55.6 |
| Hematology, Chemistry and Serology | 16 | 44.4 | 44.4 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4.3 Most frequent stock-out laboratory Commodities in hospitals under ACAHB

According to the data obtained from SPSS software, the respondent replied for most frequently stock-out laboratory Commodities in their respected hospital as 3(8.3%) hematology reagent, 4(11.4%) chemistry reagent, 3(8.3%) serology reagent, 10(27.8%) both hematology & chemistry reagent, 16(44.4%) all (hematology, chemistry and serology) Commodities. This implies that, all the hospitals under ACAHB are suffering from multiple reagent stock-outs for considerable time. This leads to inconsistent and unreliable laboratory service to the patients. Therefore, the concerning body need to find systematic and inclusive solutions in order to secure laboratory Commodities at the point of service provision.

VI. How could you describe quantification and forecasting practice in related to availability of laboratory Commodities in your hospital?

| Quantification & Forecasting Practice | | | | |
|---------------------------------------|-----------|---------|---------------|--------------------|
| | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Excellent | 1 | 2.8 | 2.8 |
| | Very Good | 4 | 11.1 | 13.9 |
| | Good | 2 | 5.6 | 19.4 |
| | Fair | 22 | 61.1 | 80.6 |
| | Poor | 7 | 19.4 | 100.0 |
| | Total | 36 | 100.0 | 100.0 |

Table 4. 4 Quantification & forecasting practice in related to availability of lab commodity
Source: Own Survey May, 2017

Based on the data obtained from SPSS software: the respondent described the quantification & forecasting practice in related to availability of lab commodity in their respected hospitals as 1(2.8%) excellent, 4(11.1%) very good, 2(5.6%) good, 22(61.1%) fair and 7(19.4%) poor. This implies that the quantification and forecasting practice in the hospitals under ACAHB found to be fair. However, improvement has to be made in order to secure optimal commodity availability.

VII. How could you describe In-adequate storage facility in related to unavailability of laboratory Commodities in your hospital?

Inadequate Storage Facility

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Strongly Disagree | 4 | 11.1 | 11.1 | 11.1 |
| Disagree | 10 | 27.8 | 27.8 | 38.9 |
| Not Sure | 1 | 2.8 | 2.8 | 41.7 |
| Agree | 13 | 36.1 | 36.1 | 77.8 |
| Strongly Agree | 8 | 22.2 | 22.2 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4.5 Inadequate storage facilities in the hospitals under ACAHB

Source: Own survey may, 2017

According to the data obtained from SPSS software, the respondent described for In-adequate storage facility in related to unavailability of laboratory Commodities in their respected hospital as 4(11.1%) strongly disagree, 10(27.8%) disagree, 1(2.8%) not sure, 13(36.1%) agree and 8(22.2%) strongly agree. This implies that, the storage facility in majority of the hospitals is not adequate. Therefore, storage facility has to be increased by the concerned body.

VIII. How could you describe inappropriate storage practice in related to unavailability of laboratory Commodities in your hospital?

Inappropriate storage practice(handling)

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Strongly disagree | 5 | 13.9 | 13.9 | 13.9 |
| Disagree | 16 | 44.4 | 44.4 | 58.3 |
| not sure | 2 | 5.6 | 5.6 | 63.9 |
| Agree | 12 | 33.3 | 33.3 | 97.2 |
| strongly agree | 1 | 2.8 | 2.8 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4. 6 Inappropriate storage practices in related to unavailability Source: Own Survey May, 2017

Based on the data obtained from SPSS software, the respondent described for Inappropriate storage practice in related to unavailability of laboratory Commodities

in their respected hospital as 5(13.9%) strongly disagree, 16(44.4%) disagree, 2(5.6%) not sure, 12(33.3%) agree and 1(2.8%) strongly agree. This implies that, the storage practice in majority of the hospitals is acceptable. However, a lot has to be made to improve the storage practice.

IX. How would you describe insufficient cold storage in related to unavailability of laboratory Commodities in your hospital?

| Insufficient cold storage | | | | | |
|---------------------------|-------------------|---------|---------------|--------------------|-------|
| | Frequency | Percent | Valid Percent | Cumulative Percent | |
| Valid | strongly disagree | 8 | 22.2 | 22.2 | 22.2 |
| | Disagree | 14 | 38.9 | 38.9 | 61.1 |
| | not sure | 3 | 8.3 | 8.3 | 69.4 |
| | Agree | 8 | 22.2 | 22.2 | 91.7 |
| | strongly agree | 3 | 8.3 | 8.3 | 100.0 |
| | Total | 36 | 100.0 | 100.0 | |

Table 4. 7 Insufficient cold storage in related to unavailability of laboratory Commodities

Source: Own Survey May, 2017

According to the data obtained from SPSS software, the respondent described for Insufficient cold storage in related to unavailability of laboratory Commodities as 8(22.2%) strongly disagree, 14(38.9%) disagree, 3(8.3%) not sure, 8(22.2%) agree and 3(8.3%) strongly agree. This implies that, majority of the hospitals have adequate cold storage that could help them to keep refrigerated items. Nevertheless, in some hospitals cold storage should be increased.

X. How could you describe the lack of vehicle with cold chain in related to unavailability of laboratory Commodities in your hospital?

Lack of vehicle with cold chain

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| strongly disagree | 5 | 13.9 | 13.9 | 13.9 |
| Disagree | 11 | 30.6 | 30.6 | 44.4 |
| not sure | 3 | 8.3 | 8.3 | 52.8 |
| Agree | 12 | 33.3 | 33.3 | 86.1 |
| strongly agree | 5 | 13.9 | 13.9 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4. 8 Lack of Vehicles with cold chain (Source: Own Survey May, 2017)

Based on the data obtained from SPSS software, the respondent described for lack of vehicles with cold chain in related to unavailability of laboratory Commodities in their respected hospital as 5(13.9%) strongly disagree, 11(30.6%) disagree, 3(8.3%) not sure, 12(33.3%) agree and 5(13.9%) strongly agree. This implies that not all hospitals have vehicle with cold chain. Hence, concerning body need to consider hospitals to have vehicle with cold chain that would help to maintain the Commodities' chemical and physical composition while in transport from the point of distribution to the point of destination.

XI. How could you describe the inappropriate usage of laboratory Commodities in your hospital?

Inappropriate Usage of Commodities in the laboratory

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| strongly disagree | 10 | 27.8 | 27.8 | 27.8 |
| Disagree | 17 | 47.2 | 47.2 | 75.0 |
| not sure | 2 | 5.6 | 5.6 | 80.6 |
| Agree | 5 | 13.9 | 13.9 | 94.4 |
| strongly agree | 2 | 5.6 | 5.6 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4. 9 Inappropriate usage of Commodities in the laboratory Source: Own Survey May, 2017

According to the data obtained from SPSS software, respondent described for Inappropriate usage of laboratory Commodities in related to unavailability in their laboratory 10(27.8%) strongly disagree, 17(47.2%) disagree, 2(5.6%) not sure, 5(13.9%) agree and 2(5.6%) strongly agree. This implies that, commodity usage in the majority of the hospital laboratory is acceptable. However, in some laboratory reagent usage need improvement.

XII. How could you describe inadequate human resources that could contribute to unavailability of laboratory Commodities in your hospital?

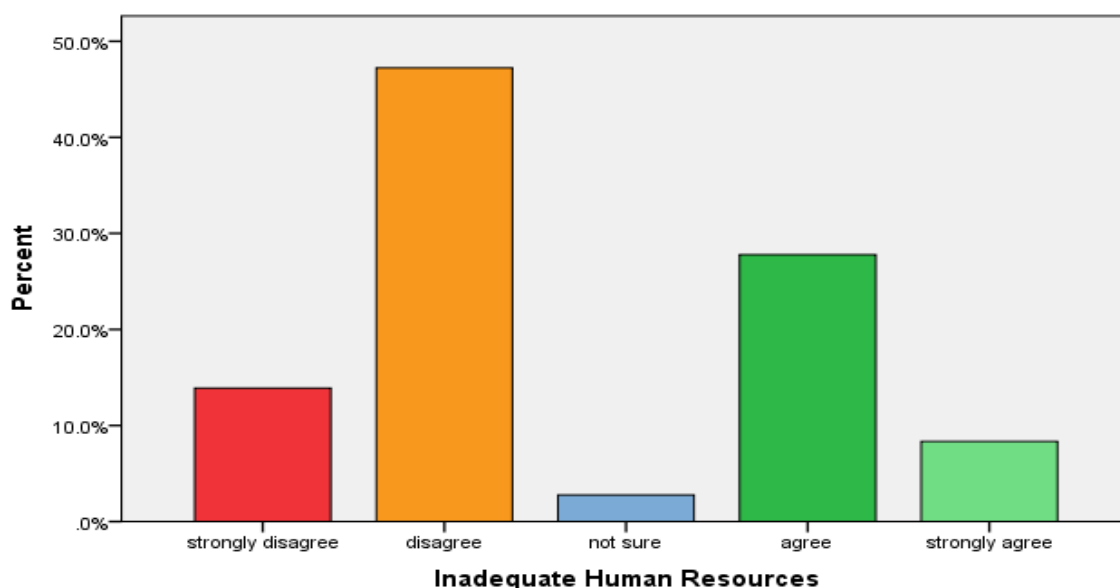


Figure 4. 3 Inadequate human resources in related to unavailability of laboratory Commodities Source: Own Survey May, 2017

Based on the data obtained from SPSS software, the respondent described for inadequate human resource which could contribute to unavailability of laboratory Commodities in their respected hospital as 5(13.9%) strongly disagree, 17(47.2%) disagree, 1(2.8%) not sure, 10(27.8%) agree and 3(8.3%) strongly agree. This implies that majority of hospitals have adequate human resource. However, there are hospitals

that need to have additional human resources in order to streamline the work flow which could help the laboratory service reliable.

XIII. How could you describe lack of staff commitment that could contribute to unavailability of laboratory Commodities in your hospital?

| lack of staff commitment | | | | | |
|---------------------------------|-------------------|---------|---------------|--------------------|-------|
| | Frequency | Percent | Valid Percent | Cumulative Percent | |
| Valid | strongly disagree | 5 | 13.9 | 13.9 | 13.9 |
| | Disagree | 13 | 36.1 | 36.1 | 50.0 |
| | not sure | 2 | 5.6 | 5.6 | 55.6 |
| | Agree | 13 | 36.1 | 36.1 | 91.7 |
| | strongly agree | 3 | 8.3 | 8.3 | 100.0 |
| | Total | 36 | 100.0 | 100.0 | |

Table 4. 10 Lack of staff commitment in the laboratory

Source: Own Survey May, 2017

According to the data obtained from SPSS software, the respondent described for Lack of staff commitment which could contribute to unavailability of laboratory Commodities in their respected hospital as 5(13.9%) strongly disagree, 13(36.1%) disagree, 2(5.6%) not sure, 13(36.1%) agree and 3(8.3%) strongly agree. This implies that, the commitment of the staff who are working in the laboratory of the hospital is acceptable in related to the availability of lab commodity. However, in a certain degree staff's commitment needs improvement.

XIV. How could you describe the bureaucracy of procurement process that could contribute to unavailability of laboratory Commodities in your hospital?

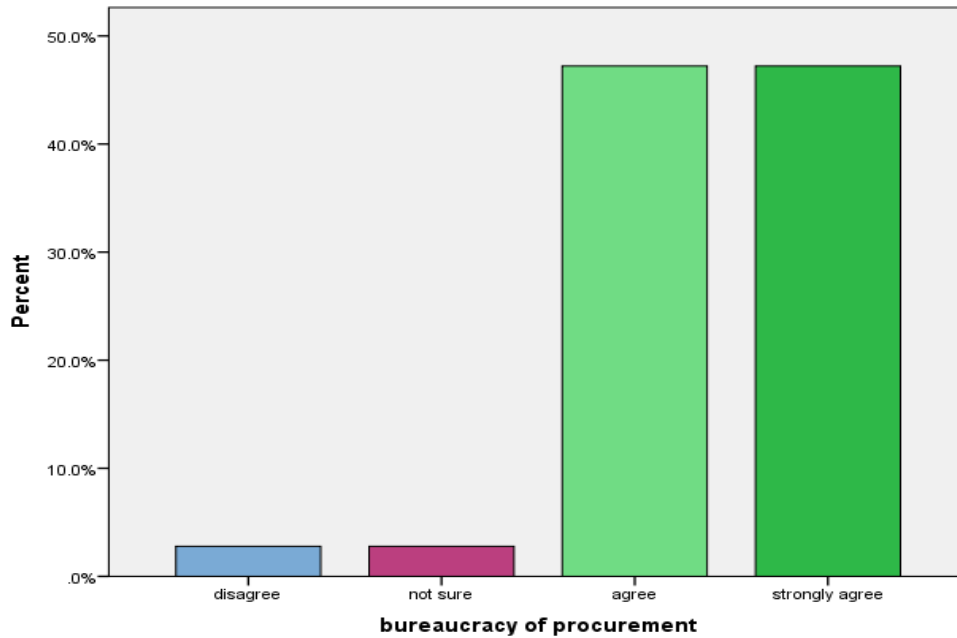


Figure 4. 4 Bureaucracy of procurement process in related to laboratory Commodities
Source: Own Survey May, 2017

Based on the data obtained from SPSS software, the respondent described for the bureaucracy of procurement process which could contribute to unavailability of laboratory Commodities in their respected hospital as 1(2.8%) disagree, 1(2.8%) not sure, 17(47.2%) agree and 17(47.2%) strongly agree. This implies that, almost all hospitals are experiencing lengthy procurement process whenever they are in a condition of procuring laboratory Commodities by themselves. Therefore, in order to make the performance of laboratories efficient and effective, the procurement process should be flexible and very active without compromising accountability.

XV. How could you describe the inadequate involvement of lab personnel in procurement process that could contribute to unavailability of laboratory Commodities in your hospital?

Inadequate involvement of lab personnel in procurement process

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| strongly disagree | 1 | 2.8 | 2.8 | 2.8 |
| Disagree | 4 | 11.1 | 11.1 | 13.9 |
| not sure | 1 | 2.8 | 2.8 | 16.7 |
| Agree | 14 | 38.9 | 38.9 | 55.6 |
| strongly agree | 16 | 44.4 | 44.4 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

*Figure 4. 5 Inadequate involvements of lab personnel in the procurement process
Source: Own Survey May, 2017*

According to the data obtained from SPSS software, the respondent described the inadequate involvement of lab personnel in related to unavailability of laboratory Commodities in their respected hospital as 1(2.8%) strongly disagree, 4(11.1%) disagree, 1(2.8%) not sure, 14(38.9%) agree and 16(44.4%) strongly agree. This implies that, the involvement of lab personnel in the procurement process in related to availability of Commodities under studied hospitals is inadequate. Hence, it leads to inconsistent supply and availability of Commodities which contributing for incomplete lab service. Therefore, their involvement in the process of procurement needs to be improved for the sake of optimal availability of lab Commodities at all point of service.

XVI. How could you describe the capacity limitation of private supplier that could contribute to unavailability of laboratory Commodities in your hospital?

| Limited supplier capacity | | | | | |
|---------------------------|-------------------|---------|---------------|--------------------|-------|
| | Frequency | Percent | Valid Percent | Cumulative Percent | |
| Valid | strongly disagree | 1 | 2.8 | 2.8 | 2.8 |
| | disagree | 1 | 2.8 | 2.8 | 5.6 |
| | not sure | 1 | 2.8 | 2.8 | 8.3 |
| | agree | 19 | 52.8 | 52.8 | 61.1 |
| | strongly agree | 14 | 38.9 | 38.9 | 100.0 |
| | Total | 36 | 100.0 | 100.0 | |

*Figure 4. 6 Capacity limitation of private supplier in related to supply of lab Commodities
Source: Own Survey May, 2017*

Based on the data obtained from SPSS software, the respondent described for the limited supplier capacity which could contribute to unavailability of laboratory Commodities in their respected hospital as 1(2.8%) strongly disagree, 1(2.8%) disagree, 1(2.8%) not sure, 19(52.8%) agree and 14(38.9%) strongly agree. This implies that, almost all hospitals were experiencing unavailability of needed commodity when they were involved to procure from private supplier as a result of a serious limitation encountered by the supplier. Therefore vendors’ capacity of supply needs to improve.

XVII. How could you describe reliance on foreign source of lab supply that could contribute to unavailability of laboratory Commodities in your hospital?

| reliance on foreign source of lab supply | | | | | |
|--|----------------|---------|---------------|--------------------|-------|
| | Frequency | Percent | Valid Percent | Cumulative Percent | |
| Valid | Disagree | 3 | 8.3 | 8.3 | 8.3 |
| | not sure | 7 | 19.4 | 19.4 | 27.8 |
| | Agree | 15 | 41.7 | 41.7 | 69.4 |
| | strongly agree | 11 | 30.6 | 30.6 | 100.0 |
| | Total | 36 | 100.0 | 100.0 | |

Table 4. 11 Reliance on foreign source of lab supply (Source: Own Survey May, 2017)

According to the data obtained from SPSS software, the respondent described the reliance on foreign source of needed commodity supply in related to unavailability in their respected hospital as 3(8.3%) disagree, 7(19.4%) not sure, 15(41.7%) agree and 11(30.6%) strongly agree. This implies that, there is high dependency on foreign source of needed laboratory commodity which could contribute to unavailability of supplies whenever needed and resulted for inconsistent service delivery. Therefore, alternative or local source of lab commodity need to be consider.

XVIII. How could you describe the frequent stock-out of lab supply at the point of supplier (PFSA) that could contribute to unavailability of laboratory Commodities in your hospital?

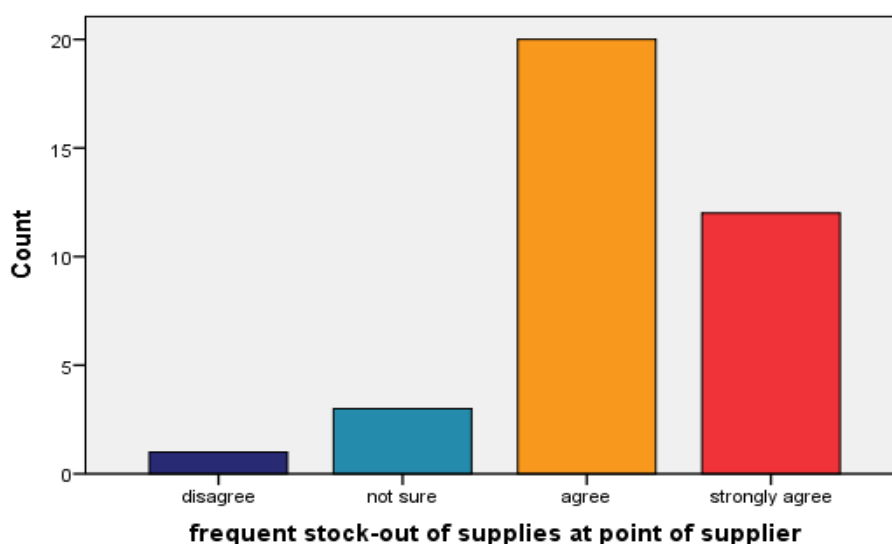


Figure 4. 7 Frequent stock-outs of supplies at point of supplier (PFSA)

Source: Own Survey May, 2017

Based on the data obtained from SPSS software, the respondent replied for the frequent stock-out of supplies at the point of supplier (PFSA) which could contribute to unavailability of laboratory Commodities in their respected hospital as 1(2.8%) disagree, 3(8.3%) not sure, 20(55.6%) agree and 12(33.3%) strongly agree. This implies that, there is a serious frequent stock-out of laboratory supplies at PFSA which could contribute to laboratory service interruption in all health facility. Hence,

hospitals are suffering from sub optimal availability of essential laboratory Commodities and providing incomplete laboratory services. Therefore, stakeholders need to work more closely with PFSA since it is the major supplier of drugs, medical and non-medical supplies including laboratory Commodities to all public health facility to insure the optimal availability of Commodities.

XIX. How could you describe inefficient data management for request and report that could contribute to unavailability of laboratory Commodities in your hospital?

| Inefficient data management for request & report | | | | | |
|--|-------------------|---------|---------------|--------------------|-------|
| | Frequency | Percent | Valid Percent | Cumulative Percent | |
| Valid | strongly disagree | 5 | 13.9 | 13.9 | 13.9 |
| | Disagree | 5 | 13.9 | 13.9 | 27.8 |
| | not sure | 6 | 16.7 | 16.7 | 44.4 |
| | Agree | 16 | 44.4 | 44.4 | 88.9 |
| | strongly agree | 4 | 11.1 | 11.1 | 100.0 |
| | Total | 36 | 100.0 | 100.0 | |

Table 4. 12 Inefficient data management for request and report (Source: Own Survey May, 2017)

According to the data obtained from SPSS software, the respondent described for inefficient data management for request and report in related to unavailability of laboratory Commodities in their respected hospital as 5(13.9%) strongly disagree, 5(13.9%) disagree, 6(16.7%) not sure, 16(44.4%) agree and 4(11.1%) strongly agree. This implies that, in the majority of hospital, data management for request and report in related to availability of Commodities is acceptable. However, in some studied hospitals it is slightly inefficient. Therefore, concerning body need to work to improve data management for request and report that could help the hospitals to have lab Commodities on time at all point of service.

XX. How could you describe the lack of adequate fund that could contribute to unavailability of laboratory Commodities in your hospital?

| Lack of adequate funding | | | | |
|--------------------------|-----------|---------|---------------|--------------------|
| | Frequency | Percent | Valid Percent | Cumulative Percent |
| Disagree | 1 | 2.8 | 2.8 | 2.8 |
| not sure | 4 | 11.1 | 11.1 | 13.9 |
| Valid Agree | 18 | 50.0 | 50.0 | 63.9 |
| strongly agree | 13 | 36.1 | 36.1 | 100.0 |
| Total | 36 | 100.0 | 100.0 | |

Table 4. 13 Lack of adequate fund for lab commodity (Source: Own Survey May, 2017)

Based on the data obtained from SPSS software, the respondent replied for the lack of adequate fund which could contribute to unavailability of laboratory Commodities in their respected hospital as 1(2.8%) disagree, 4(11.1%) not sure, 18(50.0%) agree and 13(36.1%) strongly agree. This implies that, there is inadequate fund in the hospitals to procure the intended laboratory Commodities to provide all laboratory services requested by patients. Hence, stakeholders need to work more closely to find solutions regarding to funding that could be allocated for the procurement of optimal laboratory Commodities demanded by the hospital for the benefit of the society at large.

4.3 Qualitative Data Presentation, Analysis and Discussion

4.3.1 The Interview data presentation, analysis and discussion at the hospital level

This semi structured interview was used to gather data which helps to see the current challenges that hospitals under Addis Ababa City Administration health bureau are facing regarding to availability of laboratory Commodities. Accordingly, thematic analysis was employed. The main category of questions asked to respondents were management practice on availability of essential laboratory Commodities in their hospital, opinion regarding to external barriers and internal factors that could constrain essential laboratory Commodities in their hospital, in general areas of concern for availability of laboratory Commodities at the hospital level and their recommendation for optimal availability of essential laboratory Commodities in Addis Ababa.

Management Practice on Availability of Essential Laboratory Commodities

According to the interview made with the heads of laboratory and heads of pharmacy in all studied hospital and physical visit made by the researcher regarding to the management practice on availability of essential laboratory Commodities, all hospitals have activities of need base planning for laboratory Commodities to acquire based on their laboratory level of capacity. The laboratory quantifies and forecast the needed laboratory Commodities which include Commodities, supplies and infection prevention materials based on consumption data per daily, weekly, monthly, quarterly, biannually and annually bases. The forecasted need would submit to the hospital management for consideration and approval. After it got approved wholly or

partly then authorized request for replenishment bimonthly would sent through the hospital pharmacy using Integrated Pharmaceutical Logistics System (IPLS) to PFSA which is the main and only supplier of medical (drugs) and non-medical supplies including laboratory Commodities for public health facilities. When PFSA have the required Commodities then it would supply them based on its distribution procedure and the hospital would receive and perform all the necessary activities and keep it in the main store based on the nature of the Commodities. When the laboratory demand Commodities it will fill Internal Facility Report & Requisition Form (IFRRF), submit to pharmacy and get supplied. However, in all these process all hospitals under AACAHB are not getting all what they are looking for their laboratory to provide the intended laboratory services to the patients. All hospitals except Tirunesh Beijing have two stores, one main store for pharmaceuticals and another store for supplies. Storage conditions will affect the quality of the Commodities being stored. Each laboratory has its own mini-store to keep Commodities for a month. Rooms that are too hot, stacks of cartons that are too high, and other poor storage conditions can cause damage or cause of a reduction in shelf life. A well-organized store room will simplify a facility's work; time will not be wasted trying to find needed supplies. Most of the hospital store uses bin-card for inventory management and keep reagent based on FEFO.

External Barriers on Availability of Essential Laboratory Commodities

Based on the interview conducted with the heads of laboratory and heads of pharmacy in all studied hospital regarding to external barriers which could constraining availability of essential laboratory Commodities in their facility; the respondent explained that, after they did all the necessary procedure to acquire the needed

laboratory supplies they are encountering a number of challenges that are hindering availability of laboratory Commodities to deliver their objective. Some of the challenges are listed as:

- ❖ Frequent stock-out of supplies at PFSA
- ❖ Lengthy government procurement process,
- ❖ Limited supplying capacity of local vendors after getting the contract award,
- ❖ The nature of laboratory Commodities i.e. having very short shelf life,
- ❖ Delayed provisions of verified letter from PFSA for stock-out supply which could allow the hospitals to procure from private suppliers.

Internal Factors on Availability of Essential Laboratory Commodities

According to the interview conducted with the heads of laboratory and heads of pharmacy in all studied hospital regarding to internal factors which could constraining availability of essential laboratory Commodities in their facility; the respondent explained that, there are a number of issues that need to be consider such as:

- Somehow, inappropriate quantification and forecasting.
- Over lengthy procurement process for stock-out laboratory Commodities after securing verification from PFSA.
- Inadequate storage facility.
- Inadequate involvement of laboratory personnel on procurement process.
- Communication gaps between laboratory and pharmacy departments.

- Less consideration given to all quantified laboratory items prepared by the laboratory unit for approval by the hospital management.
- Inappropriate data management.
- Inadequate commitment from the management.

Generally, area of concern on Availability of Essential Laboratory Commodities

Based on the interview conducted with the heads of laboratory and heads of pharmacy in all studied hospital regarding to area of concern that could constraining availability of essential laboratory Commodities in their facility; the respondent explained some issues which need focus by all stakeholders to secure essential laboratory Commodities that could help the hospitals in providing quality and consistent service to the patients as:

- ✓ Hospitals' management attention towards laboratory commodity like for medicines.
- ✓ Almost all laboratory Commodities are imported; so, better to find local source.
- ✓ Being closed system of most chemistry and hematology machines.
- ✓ Having varied equipment which is using Commodities of different manufacturing companies to perform same test (absence of standardization).

Possible recommendation for optimal Availability of Essential Laboratory Commodities

The heads of laboratory and heads of pharmacy in all studied hospital provide their recommendation for optimal availability of essential laboratory Commodities in Addis Ababa as:

- ✚ The laboratory should quantify and forecast its consumption properly including contingency.
- ✚ Improving procurement system to be more flexible without compromising accountability.
- ✚ Increasing number of supplier/ sourcing
- ✚ Improving supplying capacity
- ✚ Increasing storage facility
- ✚ Improving reagent storage facility
- ✚ Serious attention should be given to laboratory services.
- ✚ Good communication system should be there between pharmacy and laboratory.
- ✚ If possible, policy consideration for laboratory unit to procure its own Commodities.
- ✚ Developing hospital to hospital communication system for sharing of information and allocation of laboratory supplies.
- ✚ Policy consideration on standardization of laboratory machines all over the country in order to simplify procurement process in certain extent.

- ✚ Increasing adequate and qualified human resource in the laboratory and store.
- ✚ PFSA should have adequate stock of laboratory Commodities at all times.
- ✚ PFSA should modernize its supply system; provide prompt response to hospitals for stock-out laboratory items.
- ✚ Enough budgets should be allocated for laboratory Commodities.
- ✚ Accountability and commitment in all stakeholders should be practiced.

4.3.2 The Interview data presentation, analysis and discussion at the PFSA level

According to the interview conducted with the coordinators and some concerned employees of laboratory commodity supply chain at PFSA regarding to factors that could constraining supply of essential laboratory Commodities to health facility in Addis Ababa revealed that there are a lot of challenges faced by PFSA which could negatively affecting availability of laboratory Commodities at health facilities such as:

- ❖ Challenges associated with forecasting, sourcing, distributing and funding.
- ❖ Over lengthy procurement process which is contributing to longer lead-time
- ❖ Multiple sites of storage facility for laboratory Commodities at PFSA HQ.
- ❖ Inadequate laboratory professionals with limited supply chain knowledge in the institution.
- ❖ Inadequate vehicle with cold storage & Transportation problems(actually for regional distribution)

- ❖ Being the only government agency to supply all medical and non-medical supplies to all public health facilities all over the country so resulting capacity limitation.
- ❖ Lack of Management commitment.
- ❖ Inadequate knowledge and practice of both lab Commodities and supply chain management.
- ❖ Conflict of interest among different units in the institution.
- ❖ Technological changes of laboratory equipment.
- ❖ The nature of laboratory Commodities such as shorter shelf life, multiple purpose, etc.
- ❖ Having variety of laboratory equipment for same investigation(absence of standardization)
- ❖ Issues associated with hard currency for the procurement of items from foreign sources.
- ❖ Inadequate collaboration among different stakeholders to ensure security of laboratory Commodities.
- ❖ Lack of monitoring and evaluation by the PFSA on availability of laboratory Commodities in its institution and health facilities
- ❖ Inadequate usage of information technology for data sharing and management.
- ❖ Lack of quality monitoring agent on locally available laboratory Commodities
- ❖ Price inflation of some laboratory Commodities on the international market against the proposed budget.

CHAPTER FIVE

Findings and Discussion of the Study

5.1 Major findings of the study

The major findings of this research were triangulated based on both quantitative and qualitative analysis regarding to the research question and presented as follow:

1. Regarding to the availability status of essential laboratory Commodities on day of visit and in the past six months under the studied public hospitals Addis Ababa

According to the analysis made based on questionnaire, interview and checklist the availability of essential laboratory Commodities in the studied hospital is found sub-optimal during the study period. Besides, many of the studied hospitals experienced stock-out of multiple Commodities (i.e. combination of chemistry and hematology Commodities) simultaneously.

For the majority of idle lab equipment in the studied hospital, both absence of Commodities and maintenance challenges are the major problems for the cause of idleness.

2. Regarding to factors that are negatively affecting availability of essential laboratory Commodities in the studied public hospitals Addis Ababa

A. The quantitative and qualitative analysis from the hospital revealed that **quantification** and **forecasting** practice was fair. However, the qualitative analysis based on PFSA showed that there was inappropriate quantification and forecasting practices both in the public health facilities and PFSA itself.

- B. As per the analysis, the majority of studied hospitals had not adequate **storage facility** for laboratory Commodities.
- C. According to the analysis, the **procurement process** both at the public hospitals under studied and PFSA was found lengthy, which was affecting the timely availability of laboratory Commodities at the point of service delivery.
- D. The analysis revealed that, there was **inadequate involvement of laboratory personnel in the procurement process** under studied hospital and also the study showed that there was a lack of **human resource** with the knowledge of both supply chain management and laboratory science at PFSA.
- E. According to the analysis, there was a serious **capacity limitation of local supplier** (vendor) of laboratory Commodities.
- F. The quantitative and qualitative analysis regarding to sourcing revealed that, there was **high dependency on foreign source (supplier)** of laboratory Commodities which was contributing to longer lead time and resulting to inconsistent laboratory supplies.
- G. As per the analysis made from quantitative and qualitative data collected from both the hospitals under study and PFSA; there was a **frequent stock out of laboratory Commodities at PFSA** which contributes to sub-optimal availability of lab supplies at the hospital and resulted on service interruption.
- H. According to the analysis, there is **inadequate funding** for the procurement of intended laboratory Commodities for the public health facilities.

5.2 Discussion of the study

The hospital respondent replied that, laboratory department quantify and forecast their demand for a year using consumption data which can help them to provide their service to the client smoothly and submitted to the hospital management for approval and procurement. Regarding to availability of laboratory Commodities (Commodities, chemicals and supplies) at the public hospitals, the minimum and maximum stock level of laboratory Commodities shall be for two months and four months respectively. Each hospital's pharmacist sent their reagent request to PFSA through IPLS bimonthly as PFSA is the main supplier to public health facilities. When PFSA got stock-out of what requested by the health facilities, it would provide them "verification of stock-out" which can authorize them to procure those specific stock-out item from private supplier.

According to the combined analysis of both quantitative and qualitative study conducted at the intended hospitals and PFSA, 33.3% respondents replied that, these hospitals were experiencing sub-optimal availability of essential laboratory Commodities as a result of challenges associated with internal factors i.e. born by the hospital and external factors i.e. beyond their control. 72.2% of respondent agreed that, there was a stock-out of multiple Commodities that included hematology, chemistry and serology in the studied hospital. Besides, 58.3% of the respondent replied that all the studied hospitals have laboratory equipment which was not functional because of a combination of both specific reagent to them and maintenance challenges. Having that idle equipment, the hospitals were not able to perform the required test for the patient and patients were obliged to look for the service from outside the facility to the private service provider and resulted to suffering from unnecessary cost.

According to the study, among the internal factors which were contributing for sub-optimal availability of needed lab Commodities 19.4% of the participant dissatisfied with the forecasting and quantification practice by their hospital and also the interview from the PFSA should that, laboratory Commodities availability challenge is resulted by the inappropriate forecasting and quantification of both health facilities and PFSA. Storage facility was one of the logistical factors facilitating or hindering the smooth operation of any business including medical services by keeping the minimum and maximum inventory. The study also revealed that 58.3% of the respondent agreed that the storage facilities for laboratory Commodities were inadequate and it has the negative impact on Commodities quantity and quality.

The study also showed that, lengthy procurement process as one of the logistical factor which was hindering optimal availability of laboratory supplies and resulting to patient dissatisfaction at the point of service delivery. In the Ethiopia health system, pharmacists are responsible for the procurement of drugs, medical and non-medical supplies including laboratory Commodities. According to the interview from the head of laboratory under the studied hospital and PFSA should that, this practice of procuring the lab supplies by the pharmacist has been resulting the everlasting challenges in associating with availability of laboratory Commodities specially at public health facilities. One of the respondent replied as “*you know what you need in your house but your neighbor is the one who will buy somehow different types and items*”. As it was discussed above the laboratory only did the quantification of their demand but the procurement was carried out by the pharmacist. As per the statistical analysis 83.3% of the respondent agreed that there is inadequate involvement of laboratory personnel in the procurement process from end to end and this has resulted

to inadequate and incomplete supplies of laboratory Commodities in the majority of the studied hospitals.

Technical experts with specific knowledge in the selection and use of diagnostics, including end-users, should be involved in procurement processes for diagnostics and laboratory items/equipment (WHO manual 2013). According to 83.3 % of the respondent at the studied hospital as well as all respondent of PFSA, the inadequate involvement of laboratory personnel in the procurement process was one of the major challenges which could hinder optimal availability of laboratory commodities in all public health facility. This was may be the policy issue which allowed only pharmacist centrally to manage supplies of medical and non-medical items in the public health facility however, the problem of availability of laboratory commodities still inevitable.

Since PFSA is the only supplier of laboratory equipment and Commodities to public health facilities using public procurement policy from international and local market, according to the interview from the PFSA should that it was always encountered supply challenge as a result of shortage of currency, frequent price change in the international market. At times when hospitals allowed procuring laboratory Commodities from private supplier (vender) they couldn't have the capacity to satisfy the need of those health facilities.

The study also showed that; frequent stock-out of laboratory reagent at PFSA, dependency on foreign source of laboratory reagent and inadequate funding were among the main factors which were affecting the availability of essential laboratory commodities at all public health facilities under study.

As per the qualitative analysis, there were also a lot of issues in related to availability challenges of laboratory Commodities like; the nature of laboratory Commodities (i.e. shorter shelf-life) since majority of laboratory Commodities are imported from abroad and having longer lead time then the shelf-life of the Commodities will be shorten at the point service delivery, having varied types & lots of laboratory machines and equipment (absence of standardization) using different types of Commodities for same function is contributing to complicated procurement process and resulting to inadequate availability of laboratory supplies at point of service delivery, lack of effective communication between pharmacy units and laboratory units of health facility, poor integrity between PFSA and Health facility in ensuring security of laboratory Commodities, price inflation of some laboratory Commodities on the international market against the proposed budget.

CHAPTER SIX

Conclusions and Recommendations

6.1 Conclusions

Based on the result of the study, the following points have been drawn as a conclusion:

Hospitals under AACAHB have been implementing SLMTA (Strengthening Laboratory Management towards Accreditation) aiming to improve laboratory service. However, the availability of essential laboratory Commodities such as hematology, chemistry and serology Commodities in the majority of studied hospitals under AACAHB are frequently sub-optimal for considerable period of time. According to the study, the situation is resulted from a number of challenges such as inappropriate quantification and forecasting practice of both in the health facilities and PFSA, inadequate storage facility in keeping the minimum and maximum stock that could help the hospital to raise order of resupply for smooth operation and not to raise order of procurement to avoid overstock, inadequate involvement of laboratory personnel in the procurement process, frequent stock-out of reagent at the point of PFSA since it is the main supplier, lengthy procurement process, supplying limitation of vendors after bidding award had been given, high dependency on foreign source of laboratory supply, inadequate funding for laboratory Commodities are also some of the challenges hindering availability of laboratory Commodities in public hospitals under study.

The hospitals also have idle laboratory equipment for quite period of time due to reagent stock-out and maintenance issues some of the machines are supplied by

donors through PFSA in support of the national HIV/AIDS prevention and control program and the others are procured from Revolving Dug Fund (RDF) by the government. As per the visit majority of the hematology machine found in all hospital named as CellDyn 1800 of donation had serious reagent shortage as a result of the manufacturing company is changing the technology or no more producing its reagent and the closed system nature of the machine.

Accordingly, the study conducted for triangulation purpose at PFSA regarding to the study objectives revealed that, challenges associated with unavailability of laboratory Commodities at health facility are mainly born from PFSA's supply chain performance. Hence, the factors that are constraining availability of laboratory Commodities in the public hospital Addis Ababa are complemented with the challenges faced by PFSA in related to supply of essential laboratory Commodities all over the country. It can be concluded that, there should be a systematic and holistic approach to secure the availability of laboratory Commodities at the point of service delivery.

6.2 Recommendations

Based on the above conclusion the following recommendations are suggested

- ❖ The quantification and forecasting practice of hospitals and PFSA should be integrated.
- ❖ The concerning body, need to consider additional storage facility for laboratory Commodities and supplies to those hospital in need of it.
- ❖ AACAHB need to consider Procurement process for laboratory Commodities and supplies to be prompt.

- ❖ There should be a policy consideration on how to improve the involvement of laboratory personnel in the procurement process.
- ❖ Government need to advocate and support local investors to involve on the business of laboratory commodities manufacturing.
- ❖ PFSA need to implement a flexible procurement procedure by collaborating with the Procurement Agency and improve supply chain efficiency.
- ❖ Fund for the procurement of laboratory reagent and chemicals should be aligning with the economy and demand of the society.
- ❖ Hospitals under AACAHB need to improve communication barrier between pharmacy and laboratory unit.
- ❖ PFSA and AACAHB need to consider the cost and maintainability of laboratory equipment and accessibility of their parts before supplying for public use

6.3 Areas of Future Research

In this thesis more emphasis has been given to investigate the current challenges of hospitals under AACAHB in related to availability of essential laboratory Commodities. However, unlike pharmaceuticals research, the area of supply chain associated with laboratory Commodities is untapped especially here in Ethiopia. Hence, this same paper could be done by focusing on the detailed availability challenges for public hospitals all over the country.

Besides, as observed from this thesis the procurement process of the sector is very long and complex, hence how to improve the procurement efficiency of PFSA as well as the public hospitals could also be interesting to investigate in the future.

Reference

Adzimah, E.D. et al., 2014. HEALTH CARE DELIVERY ; A SUPPLY CHAIN PERSPECTIVE . THE CASE OF. , 3(8), pp.78–103.

Alemnji, G.A. et al., 2014. Strengthening national health laboratories in sub-Saharan Africa: A decade of remarkable progress. *Tropical Medicine and International Health*, 19(4), pp.450–458. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24506521> [Accessed December 15, 2016].

Anon, 2009. Assessment of the HIV / AIDS Medical Supplies and Laboratory Commodities Supply Chain in Lesotho , November 2007. , (February).

Anon, HIV Laboratory Supply challenges in Ethiopia.pdf.

Anon, Laboratory services and medical supplies Part I: Policy and economic issues Part II: Pharmaceutical management Part III: Management support systems Planning and administration.

Berhanemeskel, E., Beedemariam, G. & Fenta, T.G., 2016. HIV/AIDS related commodities supply chain management in public health facilities of Addis Ababa, Ethiopia: a cross-sectional survey. *Journal of pharmaceutical policy and practice*, 9(1), p.11. Available at: <http://jopp.biomedcentral.com/articles/10.1186/s40545-016-0060-z> [Accessed December 15, 2016].

Boadu, N.Y. et al., 2016. Challenges with implementing malaria rapid diagnostic tests at primary care facilities in a Ghanaian district: a qualitative study. *Malaria journal*, 15, p.126. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26921263>

[Accessed December 15, 2016].

Com, L.I. V, *D iagnostics and L aboratory T echnology*,

Cooper, D.J.B.D.J.C.M.B., 2002. *SUPPLY CHAIN LOGISTICS MANAGEMENT*,
New York: McGraw-Hill/Irwin.

Desale, A. et al., 2013. Assessment of laboratory logistics management information system practice for HIV/AIDS and tuberculosis laboratory commodities in selected public health facilities in Addis Ababa, Ethiopia. *The Pan African medical journal*, 15, p.46. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/24106574> [Accessed December 15, 2016].

Hasselback, L. et al., 2014. Rapid diagnostic test supply chain and consumption study in Cabo Delgado, Mozambique: estimating stock shortages and identifying drivers of stock-outs. *Malaria journal*, 13(1), p.295. Available at:
<http://malariajournal.biomedcentral.com/articles/10.1186/1475-2875-13-295>
[Accessed December 15, 2016].

Ibegunam, I. & McGill, D., 2012. Journal of Humanitarian Logistics and Supply Chain Management Health commodities management system: priorities and challenges. *Journal of Humanitarian Logistics and Supply Chain Management Iss Journal of Humanitarian Logistics and Supply Chain Management Iss Journal of Humanitarian Logistics and Supply Chain Management*, 2(2), pp.54–84.

Jahre, M., *Improving health in developing countries : reducing complexity of drug supply chains*,

Kumurya, A.S., 2015. Supply Chain Management of Health Commodities and Logistics: Fundamental Components of Booming Medical Laboratory Services.

European Journal of Logistics, 3(4), pp.62–72.

Mcgill, D., 2012. Health commodities management system : priorities and challenges.

Peter, T.F. et al., 2009. The need for standardization in laboratory networks. In

American Journal of Clinical Pathology. pp. 867–874.

Pettersson, A., 2008. Measurements of Efficiency in a Supply Chain. , p.108.

Project, D., 2010a. Measuring Supply Chain Performance Guide to Key Performance Indicators for Public Health Managers.

Project, D., 2010b. Measuring Supply Chain Performance Guide to Key Performance Indicators for Public Health Managers.

Project, U.D., 2011. Quantification of Health Commodities : Laboratory Commodities Companion Guide Forecasting Consumption of Laboratory Commodities. , (October).

Sinishaw, M.A., Gebregergs, G.B. & Shiferaw, M.B., 2015. Distribution and Availability of Essential Tuberculosis Diagnostic Items in Amhara Region, Ethiopia. *PloS one*, 10(12), p.e0141032. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26641097> [Accessed December 15, 2016].

USAID, 2008. Guidelines for managing the laboratory supply chain: Version 2. *John Snow, Inc.*, (July).

USAID, 2009. Laboratory Logistics Handbook. , (June).

USAID | DELIVER PROJECT, Task Order 1. 2008. Logistics Indicators Assessment Tool (LIAT). ArlingtonVa.: USAID | DELIVER PROJECT, T.O. 1., 2008. Logistics Indicators Assessment Tool (Liat). , pp.1–44.

Vries, J. De & Huijsman, R., Guest editorial Supply chain management in health

services : an overview.

Wales, J. et al., 2014. identifying solutions. , (March).

Williams, J. et al., 2016. Progress in Harmonizing Tiered HIV Laboratory Systems:

Challenges and Opportunities in 8 African Countries. *Glob Health Sci Pract*,

4(3), pp.467–480. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/27688718>

[Accessed December 15, 2016].

Appendix: Data collection Instrument

- Annex 1. Quantitative Data Collection Tool for respondents at public hospitals under study in Addis Ababa.

- Annex 2. Quantitative Data Collection Tool for respondents at PFSA in Addis Ababa.

- Annex 3. Qualitative Data Collection guide for Head of Laboratory, Pharmacy at public Hospitals under study in A.A.

- Annex 4. Qualitative Data Collection guide for Coordinators of Lab commodity SC at PFSA in A.A.

- Annex 5. Availability Assessment Check List for Selected Laboratory Commodities at public hospitals under study.

Annex 1. Quantitative Data Collection Tool for respondents at public hospitals under study in Addis Ababa.

Questionnaire for Health Workers in Public Hospital Addis Ababa

Hello Dear,

I, Samuel Temesgen, am a graduate student of Logistics and Supply Chain Management at School of Commerce, Addis Ababa University. Currently, I am working my thesis entitled as "*Factors affecting availability of essential laboratory Commodities in Addis Ababa: the case of all Public Hospitals under Addis Ababa City Administration Health Bureau.*"

The objectives of the survey are to collect current information on factors constraining availability of essential lab Commodities, assessing their stock status and opinions for improvement on availability.

I would like to ask you a few questions about your perception on availability of essential laboratory Commodities in your hospital. In addition, I would like to actually assess those products you have in stock today and observe the general storage conditions. Do you have any questions?

The data collection process will involve purposively selected employees who are working at public hospitals and PFSA in Addis Ababa who have a direct connection with laboratory Commodities. The confidentiality of all participants will be protected in my thesis and individuals will not be identified by name or any other distinguishing factor. I will be the only person who will access to this data, including transcription. It is my hope that your involvement will helps me greatly to find data that can be used to improve availability of essential laboratory Commodities which leads to higher levels of health care service delivery.

Your participation in helping me to finalize the study is greatly appreciated. For any of your inquiries or in need of additional information, I can be reached via email at: samjam2005@gmail.com and / or Cell Phone +251-911-796 - 755.

The Questionnaire has Two Main Sections:

Section I. General information

Code (to be filled by the researcher): _____

| | | | |
|------|-------------------------------------|--|---------|
| | Date | | |
| GI 1 | Gender | 1. Female | 2. Male |
| GI 2 | Qualification | 1. MSc/MA 2. BSc/BA 3. Diploma 4, if other, Please specify _____ | |
| GI 3 | Total Service Year in this hospital | | |
| GI 4 | Position | | |
| GI 5 | Name of Health Facility | | |
| GI 6 | Level of the facility: | 1. PFSA 3. District Referral Hospital 2. Federal Hospital Laboratory | |

Section II: Questions related to the study objectives

The following **three sections** are all about availability and its determinant of essential laboratory Commodities and opinion for its improvement. Please **Circle** your preferences from the choice given and provide **short answer** whenever needed.

ALC. Availability of essential laboratory Commodities

| | |
|---|---|
| <p>1. What logistical form are you using to manage laboratory inventory (Commodities)?</p> <p>Comment: _____</p> | <p>1. Bin card / Stock card</p> <p>2. Ledger (log book)</p> <p>3. Bin card & Ledger</p> <p>99. I don't know</p> |
| <p>ALC 2. Does your hospital have a set minimum stock level of lab Commodities to the main store to be used by the laboratory?</p> | <p>1. Yes</p> <p>2. No</p> <p>99. I don't know</p> |
| <p>ALC 3. If yes for # 2, please indicate the minimum months of stock level.</p> | <p>1. 1 month</p> <p>2. 2 months</p> <p>3. 3 months</p> <p>99. I don't know</p> |
| <p>ALC 4. Does your hospital have a set maximum stock level for Commodities and consumables to be used by the laboratory?</p> | <p>1. Yes</p> <p>2. No</p> <p>99. I don't know</p> |
| <p>ALC 5. If yes for ALC 4, please indicate your maximum months of stock level</p> | <p>1. 4 months</p> <p>2. 5 months</p> <p>3. 6 months</p> |

99. I don't know

ALC 6. How frequent is you ordering for resupply of essential laboratory Commodities from supplier like PFSA?

Comment:

- 1. monthly
- 2. bi-monthly
- 3. quarterly
- 99. I don't know

ALC 7. Who is procuring laboratory Commodities for your hospital?

Comment:

- 1. Laboratoriest
- 2. Pharmacist
- 3. Other (specify)_____
- 99. I don't know

ALC 8. What are the sources of funds for laboratory Commodities and What percentage of total funding is contributed by each source (**more than one answer can apply**)

- 1. Government____% of total fund
- 2. Donors_____% of total fund
- 3. Other Source_____% of total fund
- 99. I don't know

ALC 9. What are the source of essential laboratory Commodities for this hospital? (**more than one answer can apply**)

- 1. PFSA
- 2. Private Suppliers
- 3. Donor

ALC 10. In your view how would you describe the **availability** of essential laboratory Commodities in relation to the minimum stock level in your hospital?

1. Always above the minimum stock 3. Rarely below the minimum stock
2. Always within the minimum stock 4. Always below the minimum stock

ALC 11. Do you have idle equipment in your laboratory?

1. Yes
2. No
99. I don't know

ALC 12. If yes for ALC11, how long did it idle for?

1. A month
2. Three months
3. Six months
4. \geq One year
99. I don't know

ALC 13. What is the reason for idleness of the equipment? (**More than one answer can apply**)

1. Reagent stock-out 3. Other(please specify)_____
2. Maintenance issue 99. I don't know

ALC 14. Which laboratory supply has been the most frequently stock-out and for the longest period of time during the past year? (**More than one answer can apply**)

1. Hematology Reagent 4. Serology Reagent
2. Chemistry Reagent
3. Bacteriology Reagent

BALC- Barriers to availability of essential laboratory Commodities

| | |
|--|---|
| <p>BALC1. Are forecasts made for your laboratory Commodities and consumables?</p> | <p>1 Yes 2 No 99. I don't know</p> |
| <p>BALC2. If yes for BALC1, do you always receive those laboratory Commodities as per the forecast?</p> | <p>1. Yes 2. No 99. I don't know</p> |

BALC3. If no for BALC2, what could be the challenges for not receiving as per forecasted?

Please, Explain

How could you describe the following **possible factors** that could **contributed to unavailability** of laboratory Commodities in your hospital?

Please, **Tick** your choice on the 5 point Likert Scale prepared for this purpose.

| SNo | Possible Factors | Strongly Agree (5) | Agree (4) | Not sure (3) | Disagree (2) | Strongly Disagree (1) |
|-------|---|----------------------|-------------|----------------|----------------|-------------------------|
| BALC4 | Forecasting and Quantification | | | | | |
| BALC5 | Inadequate storage | | | | | |
| BALC6 | Inappropriate storage practice / handling | | | | | |

| | | | | | | |
|--------|---|--|--|--|--|--|
| BALC7 | Insufficient cold storage space | | | | | |
| BALC8 | Lack of vehicles with cold chain | | | | | |
| BALC9 | Inappropriate usage in the laboratory | | | | | |
| BALC10 | Inadequate human resource | | | | | |
| BALC11 | Lack of staff commitment | | | | | |
| BALC12 | Bureaucracy in the procurement process | | | | | |
| BALC13 | Inadequate involvement of lab. personnel in the procurement process | | | | | |
| BALC14 | Reliance on foreign source of lab. supply | | | | | |
| BALC15 | Limitation of private supplier | | | | | |
| BALC16 | Frequent stock-out at the supplier(PFSA) | | | | | |
| BALC17 | Inefficient data management for request & report | | | | | |
| BALC18 | Lack of adequate fund | | | | | |

Comments:

OALC- Opinions for improving availability of essential laboratory Commodities.

OALC 1. In your opinion, what shall be done to ensure reliable availability of essential lab Commodities in public health facilities in Addis Ababa?

Annex 2. Quantitative Data Collection Tool for respondents at PFSA in Addis Ababa.

Questionnaire for Employees at PFSA in Addis Ababa

Hello Dear,

I, Samuel Temesgen, am a graduate student of Logistics and Supply Chain Management at School of Commerce, Addis Ababa University. Currently, I am working my thesis entitled as "*Factors affecting availability of essential laboratory Commodities in Addis Ababa: the case of Public Hospitals under Addis Ababa City Administration Health Bureau.*"

The objectives of the survey are to collect current information on factors constraining availability of essential lab Commodities, assessing their stock status and opinions for improvement on availability. The study is for academic purpose only.

I would like to ask you a few questions about your perception on availability of essential laboratory Commodities in your hospital. Do you have any questions?

The data collection process will involve purposively selected employees who are working at public hospitals and PFSA in Addis Ababa who have a direct connection with laboratory Commodities. The confidentiality of all participants will be protected in my thesis and individuals will not be identified by name or any other distinguishing factor. I will be the only person who will access to this data, including transcription. It is my hope that your involvement will helps me greatly to find data that can be used to improve availability of essential laboratory Commodities which leads to higher levels of health care service delivery.

Your genuine participation in helping me to finalize the study is greatly appreciated. For any of your inquiries or in need of additional information, I can be reached via email at: samjam2005@gmail.com and / or Cell Phone +251-911-796 - 755.

Section I. General information

Code (to be filled by the researcher): _____

| | | | |
|------|---|--|---------|
| | Date | | |
| GI 1 | Gender | 1. Female | 2. Male |
| GI 2 | Higher Qualification | 1. MSc/MA 2. BSc/BA 3. Diploma 4, if other, Please specify _____ | |
| GI 3 | Total Service Year in this Organization | | |
| GI 4 | Position | | |
| GI 5 | Name of the Organization | | |
| GI 6 | Level of the facility: | 1. PFSA-HQ 3. District Referral Hospital 2. Federal Hospital | |

Section II: Questions related to the study objectives

The following **three sections** are all about availability and its determinant of essential laboratory Commodities and opinion for its improvement. Please **Circle** your preferences from the choice given and provide **short answer** whenever needed.

ALC. Availability of essential laboratory Commodities

| | |
|--|---|
| <p>ALC1. Does the PFSA have a list of essential laboratory Commodities?</p> | <p>1. Yes</p> <p>2. No</p> <p>99. I don't know</p> |
| <p>ALC2. If no for ALC1, which approach did it used to get essential lab Commodities? Please, specify: _____</p> <p>_____</p> | |
| <p>ALC3. Which budget strategy does the PFSA applied to access essential laboratory Commodities? (more than one answer can apply)</p> <p>Comment:</p> | <p>1. RDF</p> <p>2. Program</p> <p>3. Other(specify)_____</p> <p>99. I don't know</p> |
| <p>ALC4. Does the PFSA have a supply system for managing laboratory Commodities?</p> | <p>1. Yes</p> <p>2. No</p> <p>99. I don't know</p> |
| <p>ALC5. What logistical system does the PFSA used to monitor delivery to and availability of laboratory Commodities both at public health facility and itself?</p> | <p>1. LMIS</p> <p>2. IPLS</p> <p>3. RRF</p> <p>4. Other, pls specify_____</p> <p>99. I don't know</p> |

| | |
|---|--|
| <p>ALC6. Does the PFSA have a set minimum and maximum stock level for Commodities and consumables?</p> | <ol style="list-style-type: none"> 1. Yes 2. No 99. I don't know |
| <p>ALC7. If yes for ALC6, please indicate your minimum stock level for laboratory Commodities.</p> <p>Comment:</p> | <ol style="list-style-type: none"> 1. Four months 2. Five months 3. Six months 99. I don't know |
| <p>ALC8. If yes for ALC6, please indicate your maximum stock level for laboratory Commodities.</p> | <ol style="list-style-type: none"> 1. Seven months 2. Eight months 3. Nine months 4. Other _____ 99. don't know |
| <p>ALC9. How frequent is your supply of essential laboratory Commodities to Referral hospitals located in A.A?</p> | <ol style="list-style-type: none"> 1. monthly 2. bi-monthly 3. quarterly 4. bi-annually 99. I don't know |
| <p>ALC10. Who determines how much to supply of laboratory Commodities to public health facilities?</p> <p>Comment:</p> | <ol style="list-style-type: none"> 1. Laboriorest 2. Pharmacist 3. Other (specify) _____ 99. I don't know |

ALC11. What are the sources of funds for laboratory Commodities and What percentage of total funding is contributed by each source(**more than one answer possible**)

Comment:

1. Government_____ % of total fund
2. Donors_____ % of total fund
3. Other Source_____ % of total fund

ALC12. How does the PFSA receive supplies of essential laboratory Commodities? (**more than one answer possible**)

1. Directly Procured by PFSA 1. Mostly 2. Sometimes 3. Rarely 4. Never
2. Directly Supplied by Agent 1. Mostly 2. Sometimes 3. Rarely 4. Never
3. Donation 1. Mostly 2. Sometimes 3. Rarely 4. Never
4. Other(Specify)_____ 1. Mostly 2. Sometimes 3. Rarely 4. Never

ALC13. Are stock balances at all client levels monitored regularly by PFSA?

1. Yes 2. No 99. I don't know

ALC14. If yes for ALC13, which monitoring tool did it used? Please specify

BALC. Barriers to availability of essential laboratory Commodities

| | |
|--|--|
| <p>BALC1. Are requests made regularly for needed laboratory supplies (Commodities and consumables) by public health facilities?</p> | <p>1. Yes 2. No 99. I don't know</p> |
| <p>BALC2. If yes for BALC1, do you always deliver the needed laboratory supplies as per the request?</p> | <p>1. Yes 2. No 99. I don't know</p> |

BALC3. If no for BALC2, what are the challenges for not delivering the lab supplies as per the request?

BALC4. In your opinion what **external barriers** are affecting PFSA in supply of lab Commodities to public health facilities?

BALC5. In your opinion what **internal factors** are affecting PFSA in supply of lab Commodities to public health facilities?

BALC. How could you describe the following **possible factors** that could **challenge PFSA** in supplying lab Commodities to public health facilities? Please, **Tick** on the **5 point Likert Scale** prepared for this purpose.

| S.No | Possible Factors | Strongly Agree (5) | Agree (4) | Not sure (3) | Disagree (2) | Strongly Disagree (1) |
|--------|--|-------------------------|----------------|-------------------|-------------------|----------------------------|
| BALC6 | Inappropriate forecasting and quantification by public health facilities (users) | | | | | |
| BALC7 | Inappropriate forecasting and quantification by PFSA | | | | | |
| BALC8 | Inadequate storage | | | | | |
| BALC9 | Inappropriate storing practice / handling | | | | | |
| BALC10 | Scattered storage for lab supplies | | | | | |
| BALC11 | Insufficient cold storage | | | | | |
| BALC12 | Inadequate vehicles for distribution | | | | | |
| BALC13 | Inadequate Vehicles with cold chain | | | | | |
| BALC14 | Lack of GPS to monitor distribution | | | | | |
| BALC15 | High Cost of Transport | | | | | |
| BALC16 | Waste in the process of Distribution | | | | | |
| BALC17 | Inadequate human resource | | | | | |
| BALC18 | Unqualified human resource | | | | | |
| BALC19 | Lack of staff commitment | | | | | |
| BALC20 | Bureaucracy in the procurement process | | | | | |
| BALC21 | Inadequate involvement of laboratory personnel in procurement process | | | | | |
| BALC22 | Limited private supplier capacity | | | | | |
| BALC23 | Reliance on foreign source for lab Commodities | | | | | |
| BALC24 | Technological change of laboratory equipment | | | | | |
| BALC25 | Inefficient data management for requisition and report | | | | | |
| BALC26 | Lack of adequate funding | | | | | |

OALC. Opinions for improving availability of essential laboratory Commodities.

OALC1. What could be your opinion for optimal availability of essential lab Commodities in the public health facilities in Addis Ababa/Ethiopia?

Annex 3. Interview Guide for Respondents at Public Hospital in A.A

Hello, Dear Respondent

I, SAMUEL TEMESGEN, am a post graduate M.A student of AAU School of Commerce. As part of my studies in Logistics and Supply Chain Management. I am conducting a research about What Factors are affecting availability of essential laboratory Commodities for comprehensive laboratory services.

I have a brief interview that would take about 15 minutes of your time to complete. Your participation is entirely voluntary; you may skip any questions that you don't want to answer. No personally identifying information is being collected. The confidentiality of your participation will be protected in my thesis and individuals will not be identified by name or any other distinguishing factor. I will be the only person who will access to this data, including transcription. I will only use aggregated data in my research study report. If you allowed me, I would record the interview for full capturing of your opinion.

It is my hope that your involvement will helps me greatly to find data that can be used to improve availability of essential laboratory Commodities which leads to higher levels of health care service delivery in public health facility. Do you have any questions about the research study?

Are you ready to begin?

Thank you for your participation in this research study. If you have any questions later on, you may reach me by email at samjam2005@gmail.com or by phone at +251911796755

Interview Questions for Head of Laboratory and Pharmacy at public hospitals in Addis Ababa:

1. How would you describe management practice for essential laboratory Commodities in your hospital?

2. In your opinion, what external barriers are constraining for availability of lab Commodities in your hospital?

3. In your opinion, what internal factors are constraining the availability of lab Commodities in your hospital?

4. What are the areas of concern for availability of laboratory Commodities at the hospital level?

5. What would you recommend for optimal availability of essential laboratory Commodities at public health facilities in Addis Ababa?

Annex 4. Interview Guide for Respondents at PFSA in A.A

Hello, Dear Respondent

I, SAMUEL TEMESGEN, am a post graduate M.A student of AAU School of Commerce. As part of my studies in Logistics and Supply Chain Management. I am conducting a research about What Factors are affecting availability of essential laboratory Commodities for comprehensive laboratory services.

I have a brief interview that would take about 15 minutes of your time to complete. Your participation is entirely voluntary; you may skip any questions that you don't want to answer. No personally identifying information is being collected. The confidentiality of your participation will be protected in my thesis and individuals will not be identified by name or any other distinguishing factor. I will be the only person who will access to this data, including transcription. I will only use aggregated data in my research study report. If you allowed me, I would record the interview for full capturing of your opinion.

It is my hope that your involvement will helps me greatly to find data that can be used to improve availability of essential laboratory Commodities which leads to higher levels of health care service delivery in public health facility. Do you have any questions about the research study?

Are you ready to begin?

Thank you for your participation in this research study. If you have any questions later on, you may reach me by email at samjam2005@gmail.com or by phone at +251911796755

Interview Questions for Coordinators of Lab Commodities Supply Chain at PFSA

Addis Ababa:

1. How would you describe supply chain practice for essential laboratory Commodities among your supplier, PFSA and health facility ?

2. In your opinion, what external barriers are constraining for availability of lab Commodities in PFSA?

3. In your opinion, what internal factors are constraining the availability of lab Commodities in PFSA?

4. What are the areas of concern for availability of laboratory Commodities at the hospital level?

5. What would you recommend for optimal availability of essential laboratory Commodities at public health facilities in Addis Ababa?

Annex 5. Assessment Check List On Availability Of Selected Essential Lab Commodities And Infection Prevention Supplies

Name of Facility:

Date of Visit:

| | ESSENTIAL LAB COMMODITIES | Available in day of visit | | Days Out of Stock (please, Tick accordingly) | | | Remark |
|----------------------------------|--|---------------------------|----|--|----------|----------|--------|
| | | Yes | No | 1 month | 2 months | 3 months | |
| Hematology Test Supply | | | | | | | |
| 1 | Hematology Auto analyzer's Reagent | | | | | | |
| 2 | Giemsa Stain Reagent | | | | | | |
| 3 | Write Stain Reagent | | | | | | |
| 4 | Methanol Reagent | | | | | | |
| Bio-Chemistry Test Supply | | | | | | | |
| 1 | RFT Panel Reagent (BUN, Creatinine) | | | | | | |
| 2 | LFT Panel Reagent (GOT, GPT, ALP) | | | | | | |
| 3 | Glucose Test Kit | | | | | | |
| 4 | Lipid Panel Reagent(Cholesterol, HDL, LDL, TG) | | | | | | |
| 5 | Electrolyte Panel Reagent(Na+, K+, Cl-) | | | | | | |
| 6 | Uristix(Urine Dipstick) | | | | | | |
| Micro-Biology Test Supply | | | | | | | |
| 1 | AFB(TB) Microscopy Kit | | | | | | |
| 2 | Gram Stain Microscopy Kit | | | | | | |
| 3 | KOH Reagent | | | | | | |
| 4 | Glacial Acetic Acid | | | | | | |
| 5 | Immersion Oil | | | | | | |
| 6 | Xylene | | | | | | |
| 7 | Microscope Slide | | | | | | |
| 8 | Cover glass | | | | | | |
| Culture Media supply | | | | | | | |
| 9 | Blood Agar | | | | | | |
| 10 | Macconkey Agar | | | | | | |
| 11 | Muller Hinton Agar | | | | | | |
| 12 | Powder Hb | | | | | | |
| 13 | TSI (Triple Sugar Iron)Agar | | | | | | |
| 14 | Oxidase Commodities | | | | | | |

| | | | | | | | |
|--------------------------------------|---------------------------------|--|--|--|--|--|--|
| 15 | Sensitivity Antibiotic Discs | | | | | | |
| 16 | Deionized Water | | | | | | |
| Serological Test Supply | | | | | | | |
| 1 | HIV 1/2 Rapid Test Kit | | | | | | |
| 2 | VDRL/RPR test Kits | | | | | | |
| 3 | CD4 Test Commodities | | | | | | |
| 4 | ABO Anti Sera(Blood Grouping) | | | | | | |
| 5 | HCG Test Kit | | | | | | |
| 6 | Malaria Rapid Tests Kit | | | | | | |
| 7 | Widal & Weil felix Reagent | | | | | | |
| 8 | HBsAg Rapid Test Kit | | | | | | |
| 9 | HBsAb Rapid Test Kit | | | | | | |
| 10 | HCV Rapid Test Kit | | | | | | |
| Infection Control Commodities | | | | | | | |
| 1 | Hand soap | | | | | | |
| 2 | 70% Alcohol | | | | | | |
| 3 | Unused sharps boxes | | | | | | |
| 4 | Gloves | | | | | | |
| 5 | Waste disposal container | | | | | | |
| 6 | Goggles | | | | | | |
| 7 | Mask | | | | | | |
| 8 | Laboratory coats | | | | | | |