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Health Supply Chain Management

Assessment of Inventory Management Practices of Essential Medicines for Mental Health in Public Hospitals of Addis Ababa, Ethiopia

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Addis Ababa, Ethiopia

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A Thesis submitted to the Addis Ababa University, College of Health Science, Department of Pharmaceutics and Social Pharmacy for the partial fulfillment of the requirements for the Master's Degree in Health Supply Chain Management

Advisor: Michael Dejene (MD, MPH, MSc)

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School of Graduate Studies

This is to certify that the thesis prepared by Yitbarek Wana, entitled Assessment of inventory management practices of Essential Medicines for Mental Health in Public Hospitals of Addis Ababa, Ethiopia and submitted in partial fulfillment of the requirements for Master's Degree in Health Supply Chain Management complies with the regulations of the University and meets the accepted standards and with respect to originality and quality.

Signed by the examining Committee:

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Chair of Department or Graduate Program Coordinator

Statement of Declaration

I, Yitbarek Wana hereby declare that a thesis entitled with "**Assessment of Inventory Management Practices of Essential Medicines for Mental Health in Public Hospitals of Addis Ababa, Ethiopia**" is my original research work, produced it independently except for the guidance and suggestions of my research advisor Dr. Michael Dejene (MD, MPH, MSc) and has never been submitted to any other university for any diploma or degree. This thesis has been submitted to the Department of Pharmaceutics and Social Pharmacy in partial fulfillment of the requirements for the degree of Master of Health Supply Chain Management at the University of Addis Ababa. I also declare that all the resources used under this research has been acknowledged clearly.

Brief quotations from this thesis are allowed provided that accurate citation of it is being made. However, extended quotations and reproduction of this manuscript are strictly forbidden.

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Statement of Certification

This is to certify that Yitbarek Wana (BPharm) has carried out his thesis on the topic entitled **"Assessment of Inventory Management Practices of Essential Medicines for Mental Health in Public Hospitals of Addis Ababa, Ethiopia"**. He has conducted this thesis under my guidance and supervision. The study is his own original work and suitable for submission in partial fulfillment of the award of a Master's degree in Health Supply Chain Management.

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Abstract

Introduction: Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively, and is able to make a contribution to his or her community. Even in settings like low- and middle-income countries where the burden from infectious and nutritional conditions remains overwhelming, at least 9% of the overall burden of disease is attributable to mental disorders. Global mental health has documented that effective interventions exist for the large majority of mental health disorders. However About two-thirds of people with diagnosable mental health disorders do not receive treatment.

Objective: To assess inventory management practices of essential medicines for mental health at public health facilities in Addis Ababa, Ethiopia.

Methods: A sequential mixed study was employed. A facility based quantitative method was conducted using checklist, structured and semi structured questionnaire followed by qualitative method to explain the challenges and opportunities. Microsoft Excel Spreadsheet and SPSS version 20 was used to encode and analyze the data. Spearman's rho was used to determine the association between inventory management practice and performance. The critical value ($p<0.05$) was considered significant.

Results: Of twenty six medicines of mental health included under this study 28% were considered vital by public hospitals and 42.5% available on the day of visit. The mean stock out and frequency of stock out was found to be 0.73 and 0.86 respectively with average stock out duration of 95 days within six months of study period. Chlorpromazine, olanzapine, sertraline, clonazepam, Lithium carbonate, Lamotrigine, Phenobarbitone and promethazine tablets were out of stock at least once at each facility. The mean wastage rate of medicine for mental health was 4.5% with a value of 494,231.40 birr within six months of review, irregular consumption was the major reason for expiry.

Conclusion: Essential medicines of mental health were routinely not available in public hospitals and the practice was found poor and different between categories of medicines and from one public hospital to the other. Antipsychotics were found to be most available and anticholinergics were not found in any of the facilities under study on the day visit. Second generation antipsychotics and antidepressants were most frequently stocked out items. The responsiveness by the supplier was poor as it was not able to refill those items whenever the facilities requested nevertheless of frequent stock outs, hence stock out at the source was the major reason for stock out.

Key words: *inventory management practice, mental health medicines, stock recording accuracy, stock out rate, stock wastage, availability*

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Acronyms

AAU: Addis Ababa University

AACAHB: Addis Ababa City Administration Health Bureau

CNS: Central Nervous System

CV: Curriculum Vitae

EFMHACA: Ethiopia Food Medicine and Health Care Administration and Control Authority

EHIA: Ethiopian Health Insurance Agency

EPSA: Ethiopia Pharmaceutical Supply Agency

EPSS: Ethiopian Pharmaceutical Supply Service

FEFO: First Expiry First Out

FMOH: Federal Ministry of Health

GMH: Global Mental Health

HIV/AIDS: Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome)

IPLS: Integrated Pharmaceutical Logistic System

KI: Key Informants

LMIC: Low- and Middle- Income Countries

MH: Mental Health

MHC: Mental Health Care

MOH: Ministry Of Health (Ethiopia)

ORS: Oral Rehydration Salt

PHF: Public Health Facilities

PI: Principal Investigator

RHB: Regional Health Bureau

RRF: Report and Resupply Form

SOP: Standard Operation Procedure

US DHHS: United States Department of Health and Human Services

WHO: World Health Organization

Chapter One

Introduction

1.1 Background of the study

WHO defines health – as "a state of complete physical, mental and social well-being, not merely the absence disease or infirmity". (WHO 2003)

Health systems are complex mechanisms through which pharmaceuticals, services and care are delivered to patients. There is a growing recognition that many aspects of health care are connected to each other and that without consideration of these interrelated parts and how they affect one another, policies cannot act effectively in improving health outcomes because they will be unable to face barriers imposed across levels of the health system. Medicines are part of the systems for the improvement of health of individuals. (Rutta 2014)

Mental health, according to WHO, is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively, and is able to make a contribution to his or her community (Callahan 1973). Mental disorders are health conditions that are characterized by alterations in thinking, mood, and/or behavior that are associated with distress and/or impaired functioning. Mental disorders contribute to a host of problems that may include disability, pain, or death.

Mental, neurological and substance use (MNS) disorders affect one in 10 persons at any given time. More than one in five people living in settings affected by conflict have a mental health condition, and people with severe mental conditions die 10–20 years earlier than people in the general population. Globally, the economic cost due to MNS disorders is estimated to be more than US$ 2.5 trillion per year. (WHO 2020)

Even in settings like Low- and middle-income countries (LMIC) where the burden from infectious and nutritional conditions remains overwhelming, at least 9% of the overall burden of disease is attributable to mental disorders. (Abdulahi, Mariam et al. 2001)

The most prevalent psychiatric conditions are depressive disorders and anxiety disorders globally. In 2015, the total number of people living with depression in the world was estimated to be 322 million. There were also notable links between specific types of mental health disorders and suicide showing a

pooled relative risk of suicide across a range of mental health and substance use disorders. In 2015, suicide is estimated to take the life of over 800,000 people per year globally. (Whiteford, Ferrari et al. 2015)

A significant proportion of Ethiopian population is affected by common mental illnesses particularly depression and anxiety. The prevalence of common mental illnesses was higher among patients with comorbid conditions (36.4%). The prevalence of common mental illnesses in Ethiopian general population was also high (21.6%). Women experienced higher rates of mental illnesses than their men counterparts. Common mental illnesses were consistently prevalent across other study population characteristics.(Kassa and Abajobir 2018)

Global mental health (GMH) has documented that effective interventions exist for the large majority of mental disorders. (Patel and Thornicroft 2009) This interventions includes antipsychotics, antidepressants, benzodiazepines, antiepileptic's and mood stabilizers, as well as anticholinergic medications. However the proportion of people with mental illness who receive effective, evidence based care is very low; thus, the treatment gap remains high. (Wang, Aguilar-Gaxiola et al. 2007)

In many countries, psychiatry and psychiatric services have transformed from isolation and rejection to integration and active involvement in general medical care. Any good health system necessitates supply chains that can guarantee consistent availability of affordable, high-quality medicines, vaccines and health products at all health service delivery points. (Seiter 2010)

National Mental Health strategy states that Persons with mental health conditions should have affordable access to essential health and social services that enable them to achieve recovery and the highest attainable standard of health. Services at the primary health care level are generally the most accessible, affordable and acceptable for communities. Where mental health is integrated as part of these services, access is improved, mental disorders are more likely to be identified and treated, and comorbid physical and mental health problems managed in a seamless way. (FMOH, 2020)

Pharmacy inventory management is a complex but critical process within the healthcare delivery system. Without adequate pharmacy inventory management practices, hospitals run the risk of not being able to provide patients with the most appropriate medication when it is most needed. (Woo-Miles 2015)

1.2 Problem Statement

World Health Organization defines essential medicines as products that should appear all times with sufficient quantities for the management of common diseases that can affect majority of population. (WHO 2001).

There are several factors which affect access by the populations of low-income countries to effective medicines for the treatment of the diseases to which they are subjected. Wastage and inefficiencies in managing logistics and other problems of supply chain management add to low availability of medicines. (WHO 2004).

Non communicable diseases, mental health disorders, HIV/AIDS and tuberculosis combined represented 54% of the burden of all illness worldwide (WHO 2003). The mental and addictive disorders' point prevalence worldwide in 2016 was 1,110,075,000 (16% of the world's population). Mental and addictive disorders caused the loss of 162.5 million Disability-Adjusted Life Years (DALYs) and comprised 7% of all global burden of disease as measured in DALYs and 19% of all global Years Lived with Disability (YLD) in 2016. (Rehm and Shield 2019). Depression is the third leading cause of disease burden worldwide, representing 4.3% of total disability adjusted life years. (FMOH 2012)

More than one third of the World population lacks reliable access to essential medicines, a situation that directly contradicts the fundamental principle of health as a human right (Ali 2011) and access to pharmaceutical products especially essential medicines is still a major public health problem in Ethiopia (Shewarega, Paul et al. 2015). Limited availability of medicine and professionals, limited affordability, policy limitations, lack of education, and stigma are some of barriers to effective mental health treatment. (WHO 2021). According to a 2015 national survey finding, 11% and 21.9% of essential pharmaceuticals were out of stock on the day of the visit and during six months prior to data collection, respectively (Shewarega, Paul et al. 2015). Inaccessibility of medicines is major cause for high morbidity, mortality and poor adherence among patients. It also erodes public confidence on health professionals and the health care system. (Aronson and Addo-Atuah 2014)

Moreover, The COVID-19 pandemic threatens to increase mental health burdens. Measures being used in response, especially physical distancing, are likely to increase levels of loneliness, depression, harmful alcohol and drug use and self-harm or suicidal behavior. (WHO 2021)

Mental health is integral part of health. In Ethiopia, mental illness is the leading non-communicable disorder in terms of burden. At prevalence of 12-25% childhood mental illnesses make the highest burden of mental illnesses in the health sector. Through implementing the national mental health strategy, the MOH has made significant strides in expanding mental health care integrated in the mainstream primary health care system. However, limited access to these services remains an important challenge to effectively combat mental health concerns of adolescents and youth mental illness. These startling statistics show that mental illnesses have been overlooked as a major health priority in Ethiopia and other LMICs, and underscore the need for public health programs targeting mental illnesses. (FMOH 2020)

In the pharmaceutical sector assessment conducted by EFHACA and other partners in 2017, the overall indicators of access show that the median percent availability of basket of medicines selected in public warehouses was 70.7% and the public health facility dispensaries had median availability of 72.4%. Availability was slightly lower at private medicine retail outlets (67.3%). The individual median availability of 14 medicines out of 29 assessed in Public Health Facilities (PHFs) and 10 out of 27 in Private Medicine Retail Outlets (PMROs) were less than 65% (considered low). The median availability of basket of medicines used for chronic illness including hypertension, diabetes and mental illnesses was found to be low (54.5%). The median percentage availability of medicines for non-communicable diseases in majority of surveyed regions/city administrations was very low (< 50%). The length of stock out of medicines for non-communicable diseases duration was 19.6 and 26.6 days for public health facility dispensaries and warehouses supplying the public sector, respectively**.** (EFHACA et al 2017)

Mental illnesses are common in Ethiopia, they are associated with a high burden due to disability and mortality, they constitute important but largely unrecognized barriers to achieving the Millennium Development Goals, and, despite the existence of affordable and effective treatments, and fewer than one in 10 of the most severely affected people ever receive the treatment they need. (FMOH 2012)

Schizophrenia is one of the serious mental health problem characterized by clinical syndrome of variable, but profoundly disruptive, psychopathology that involves cognition, emotion, perception, and other aspects of behavior. The classic course of schizophrenia is one of exacerbations and remissions, and as a result patients usually relapse (Sadock and Sadock 2010). Antipsychotic medications are the mainstay of the treatment for schizophrenia and have reduced the number of recurrent psychotic

episodes among persons with schizophrenia**.** (Stahl 2000) Therefore availing essential antipsychotics is very important task.

Poor quantification practice which is not supported by technology; lack of transparent, lack of accountable pharmaceutical and finance transaction and services, inadequately trained staff for supply chain and high attrition of experienced staff presumed to be the major cause for this (FMOH 2015) Most of early deaths and complications associated to the diseases can be overcome if the needy had access to essential medicines through proper management of medicines with appropriate inventory control. In addition medicines account the highest health care budget around 50% to 90% of non-personnel costs, hence it is not difficult to imagine how much dollar can be lost because of inventory management malpractices. (Babar, Ibrahim et al. 2007)

Besides, introduction of community based health insurance increased the number of patients that visit health facilities and medicines related to the treatment. (Agency 2015)

In many countries, psychiatry and psychiatric services have transformed from isolation and rejection to integration and active involvement in general medical care, and this necessitates good inventory management performance of medicines for mental health. As evidenced above, significant gap exists on availability and inventory management of mental health medicines in public health facilities. Therefore with limited number of studies conducted in the area of inventory management practice of antipsychotics and the fact that medicines for mental health are not included in the list of tracer drugs in most health facilities and EPSS, this study has tried to assess the magnitude of how well inventory of this medicines was managed and probable causes at public hospitals in Addis Ababa, Ethiopia by answering the following questions

1. What does inventory management of medicines for mental health look like in public hospitals of Addis Ababa?
2. What is the status of availability, stock out and storage condition of mental health medicines in public hospitals of Addis Ababa?
3. What are the challenges contributing to inventory management of medicines of mental health?

1.3 Objectives of the Study

1.3.1 General Objective:

The general objective of the study was to assess inventory management practices of essential medicines for mental health at public hospitals in Addis Ababa, Ethiopia.

1.3.2 Specific Objectives:

The specific objectives of the study were:

1. To assess availability of essential medicines for mental health in public hospitals of Addis Ababa
2. To assess stock out rate of essential medicines for mental health in public hospitals of Addis Ababa
3. To assess stock wastage/expiry of essential medicines for mental health in public hospitals of Addis Ababa
4. To assess stock recording practice of essential medicines for mental health in public hospitals of Addis Ababa
5. To assess stock recording accuracy of essential medicines for mental health in public hospitals of Addis Ababa
6. To evaluate storage condition of essential medicines for mental health in public hospitals of Addis Ababa
7. To determine challenges faced during inventory management of mental health medicines in public hospitals of Addis Ababa
8. To determine opportunities faced during inventory management of mental health medicines in public hospitals of Addis Ababa

1.4 Significance of the study

The rationale of this study was to assess inventory management practice of medicines for mental health. It has aimed to assess whether mental health medicines were available or not and also even if available, how well inventory of those medicines was managed so that there will be minimum expire and wastage. It has also tried to explain challenges that contributed to mental health medicines stock out and wastage due to expire. It has also evaluated the magnitude of mental health medicines wasted due to expire.

As far as the knowledge of investigator is concerned, there were limited researches on mental health medicines inventory management in the country. And related studies mainly focused on other essential medicines and only included few items of mental medicines in their study so that the full picture of inventory management of these medicines was not clearly indicated. This lack of up-to-date data on the availability and inventory management practice of essential medicines for mental healthcare inhibits quality patient care, and the development, targeting, and testing of implementation, operations, and quality-improvement approaches to improve care and treatment for mental disorders. So, this study can provide base line data for supply decisions and future researchers to further investigate the challenges explained in this study.

It is of particular importance to Federal Ministry of health that is responsible to develop strategies and policies to further explore the challenges in delivering the mental health service and integrating the service to primary health care system. By encompassing all the available mental health medicines that were at least found in one public hospital under study, it filled the gaps by previous researches that only emphasized on other tracer medicines.

1.5 Scope of the study

This study was bounded aiming to investigate the inventory management practice of mental health medicines in public hospitals and identify the major challenges contributing to it. The investigator believes that assessing the practice at public hospitals could clearly show the magnitude and level of mental health care system and the extent of integration of mental health care into primary health care system as it is indicated by the recent national mental health strategy. And investigating the practice at all public hospitals in the city and assessing all mental health medicines, which are included in national essential drug list and at least available in one hospital, could help to determine the whole practice in the mental health care.

Chapter Two

Literature Review

2.1 Inventory management

Inventories are stocks of raw materials, work in progress, finished goods and supplies held by business organization to facilitate operations in the production. (Attacker 2005). Inventory begins from purchasing of materials for use of an organization, then storing, using and the remaining stock will be stored in the warehouse until requested for use**.** (Bose 2006)

Inventory management involves all activities put in place to ensure that customer have the needed product or service. Being heart of pharmaceutical supply system it informs health facilities when to order or issue, how much to order or issue, and how to maintain an appropriate stock level of all products**.** (Rachmania and Basri 2013)

It coordinates the purchasing, manufacturing and distribution functions to meet the marketing needs and organizational needs of availing the product to the customers. Inventory management is primarily involved with specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials. (Miller 2010)

The scope of inventory management also involves managing the replenishment lead time, replenishment of goods, returns and defective goods and demand forecasting, carrying costs of inventory, asset management, physical inventory, available physical space, demand forecasting, inventory valuation, inventory visibility, future inventory price forecasting and quality management. With a balance of these requirements, it is possible to reach an optimal inventory level, which is an ongoing process as the business needs shift and react to the wider environment**.** (Miller 2010)

2.2 Availability and Stock Out of Essential Medicines

In the last five years there has been a significant increase in the number of psychotropic medicines on the FMOH's Essential List of Drugs. However, there is a great need to ensure the consistent availability, accessibility and affordability of psychotropic medications throughout the country. (FMOH 2012)

Availability of medicines for mental illness and other chronic illness is the major problem in delivering quality service to patients in health care system. According to a survey done on health facilities in Ethiopia in 2016 on pharmaceutical assessment, availability of basket of essential medicines in Addis Ababa was found to 74.1% in PHF the median availability ranging from 66.05% to 81.4%. From medicines for mental health, Haloperidol 5mg tablet/capsule was available at 47.2% of dispensaries at PHF. Phenobarbiton100mg, Fluoxetine 20mg, Amitriptyline 25mg capsule/tablet, Diazepam 5mg 2ml injection was available at 88.9%, 100%, 63.9% and 63.9% respectively**.** (EFHACA et al 2017)

A study done 2012 in Ethiopia, Health facilities with stock out for tracer psychotropic medication was found to be 35%. (FMOH 2020)

In a study done in Mozambique Only 7 of 12 (58.3%) district warehouses, 11 of 24 (45.8%) of all health facilities, and 10 of 12 (83.3%) of facilities with trained Mental Health staff had availability of at least one medication in each category of antipsychotics, anti-epileptics and mood stabilizers, antidepressants, benzodiazepines and anticholinergics . Thioridazine was the most commonly available antipsychotic across all facilities (9 of 24, 37.5%), while chlorpromazine and thioridazine were most common at facilities providing MH care (8 of 12, 66.7%). The atypical antipsychotic risperidone was not available at any facility or district warehouse. Amitriptyline was the most commonly available antidepressant (10 of 12 districts; 12 of 24 overall facilities; 9 or 12 MH facilities). Despite being on the national essential drug list, fluoxetine was only available at one quaternary level facility and no district warehouses. (Wagenaar, Stergachis et al. 2015)

Stock out rate of basket of key essential medicines was assessed in 2016 retrospectively using stock cards of the health facilities and PFSA hubs covering the period of 6 to 12 months based on WHO's recommendation. Accordingly, the national median stock out duration (in days) in public health facilities was 19.6 (Min 6.59, Max 118.88); while in PFSA hubs it was 26.55 (Min 2.78, Max 225.95). (EFHACA et al 2017)

National survey done in South Africa in 2017 showed Amitriptyline 25mg was available at 95% of facilities studied. Other Psychiatry medicines such as Diazepam tablets (98%), haloperidol tablets (96%), Risperidone tablets (93%), Sodium Valproate tablets (98%) and Fluphenazine injection (90%) was available. The study also included facilities that reported stock out of this medicines. Accordingly from 1079 facilities under study, 24 facilities reported sodium valproate tablets being out of stock,

besides 49 facilities Amitriptyline tablets, 17 facilities Diazepam tablets, 41 facilities haloperidol tablets, 50 facilities Risperidone and 80 facilities Fluphenazine injection reported stock out. (EU 2017)

A study done in Cambodia showed that Out of 138 outlets visited, only 72 outlets (52.2%) had at least one Anti-Seizure Medication available. Phenobarbital 100 mg was the most available (35.5%), followed by carbamazepine 200 mg (21.7%), phenobarbital 50 mg (11.6%), sodium valproate 500 mg (9.4%), and phenytoin 100 mg (9.4%). (Sengxeu, Aon et al. 2021)

In a study done in 46 countries worldwide the average availability of generic Anti-epileptic drugs in the public sector was <50% for all medicines except diazepam injection. Private sector availability of generic oral AEDs ranged from 42.2% for phenytoin to 69.6% for phenobarbital. Despite its widespread use in LMICs, WHO/HAI survey data for phenobarbital was only available from a small number of countries. (Cameron, Bansal et al. 2012)

2.3 Stock Recording Practices

Accurate and updated stock records are crucial for proper inventory management since they are input to calculate future needs. Holding stocks is important to ensure availability of essential items almost all the time. The recording of the movement should be done at the time of movement. For expired, poor quality or over-stocked items, information of removal of such information should also be recorded. (Tayob 2012)

Availability and utilization of the logistics management information system (LMIS) formats necessary for recoding and reporting purposes were found to be reasonable; but, there is certainly room for improvement, and discrepancies were observed by level of facility and product types. However, in a considerable percentage of facilitates, data quality is an issue. For the products assessed, the average use of bin cards was found to be 73% in Hospitals and on average, nearly 77 percent of hospitals had bin cards within 10 percent accuracy (PFSA 2015).

The selection of items to stock should rely on their value to public health and volume of consumption. A study done in East Shewa Zone, Oromia regional state shows that 162 (40.50%) of the 400 bin-cards selected for the twenty key essential medicines were not updated and 238 (59.50%) bin-cards were updated. The average record accuracy rate was found to be 28.5 with the range of 15 for Oral Rehydration Salt and Medroxyprogesterone to 65 for RHZE (Fixed dose combination of Rifampin, Isoniazid, Pyrazinamide and Ethambutol). (Gurmu and Ibrahim 2017)

A study done in West Wollega Zone, Oromia Region in Public Health Facilities Showed 66.91% Bin cards were accurate, 12.52% Bin cards were near accurate and 20.57% Bin cards were inaccurate. (Kebede and Tilahun 2021)

2.4 Stock Wastage of Essential Medicines

Stock wastage due to expiration, damage or loss is one of other concerns in good inventory management. For the items assessed, stocking products within the recommended minimum-maximum seems to be an issue in most health facilities. National study done in 2015 showed that Overstocking is a particular concern. Almost 90 percent of facilities were overstocked with ciprofloxacin. To ensure resources are used wisely and waste is minimized, reinforcing system standards and strictly following the IPLS standard operating procedure (SOP) in requesting and resupplying are required. (Shewarega, Paul et al. 2015)

The study conducted in 2018 on selected health facilities and communities in Awi zone showed that Anti-infective medications were found to be the most frequently unused medications 63 (36.4%) followed by anti-pain medications 37 (21.4%) and cardiovascular medications 19 (11%). The wastage rate of antipsychotics was found to be 3.5%. (Ebrahim, Teni et al. 2019)

2.5 Storage Conditions of Essential Medicines

National study done in 2015 also showed that Storage conditions of medicines needs improvement in many Public Health Facility. It was further found that the storage condition for a significant percentage of health facilities did not meet the standard criteria. The FMOH, PFSA, Regional Health Bureaus (RHBs), and partners have been supporting health facilities to upgrade their storage conditions by supplying various types of shelves and other warehouse equipment**.** (Shewarega, Paul et al. 2015)

In a study conducted in four hospitals in Awi zone showed that only 2 hospitals had fulfilled the desirable storage conditions one hospital 100% and the other one 82%, while the remaining 2 hospitals had only fulfilled 65% of the storage conditions. (Ebrahim, Teni et al. 2019)

2.6 Barriers to Effective Mental Health Treatment

Around the world, mental health is one of the most neglected areas of health care. (WHO 2020). When it comes to Mental Health Care only 26% of the facilities are reported to integrate mental health service in their general service facilities. According to the mapping exercise conducted by mental health program in 2018-2019 only 25% of the hospitals were providing the service. (FMOH 2020)

Even though mental health problems are not well studied in Ethiopia, recent findings indicated there is high burden. Due to the burden of mental disorders, the available treatment gap, and high co-occurrence of physical and mental disorders, the integration of mental health in the primary healthcare service package is essential to increase access to the services, reduce stigma, and provide affordable and low-cost health services. (Yitbarek K, Birhanu Z et al 2021)

The study conducted in 2022 on the mental health service utilization in low resource setting showed despite the recent efforts to decentralize mental health services in Ethiopia, the perception that mental illness should be treated in specialized hospitals is still held by many health professionals. Moreover, the low literacy on mental health, stigma towards mental illness, and lack of government concern are major barriers to mental health service provision and utilization. (Mekonen T, Chan GCK et al 2022)

Of the total national health expenditure in 2004 in Ethiopia, only 1.7% was spent on mental health. 83% of mental health care expenditures by the government were directed to mental hospital. (WHO and FMOH 2006)

Financial related problems, poor communication, human resource and capacity building related problems are shown to be the major challenges in many facilities in East showa zone. (Gurmu and Ibrahim 2017)

According to (Kefale and Shebo 2019), better training and supervision increases stock accuracy. About 87 percent of pharmacy personnel and health extension workers (HEWs) managing products had received training on how to calculate reorder quantities. (PFSA 2015)

2.7 Identified Literature gap

As it can be noted from the reviewed literatures, health care system requires a good inventory management of medicines and mental health care needs chronic follow up by its nature and hence consistent flow and availability of products used for its treatment. However inventory management of mental health medicines was found to be considerably low, and these resulted in disintegration and neglected service. As the recent national mental health strategy dictates every public hospital to integrate and deliver mental health service, poor inventory practice could be the major challenge in implementation process. Most of the researches done in the country only included few quantities of mental health medicines in their study, therefore it could be difficult to clearly determine the current practice in the area. That's why this study was designed to assess inventory management practice of medicines for mental health at public hospitals and determine the major challenges contributing to it.

2.8 Conceptual Framework

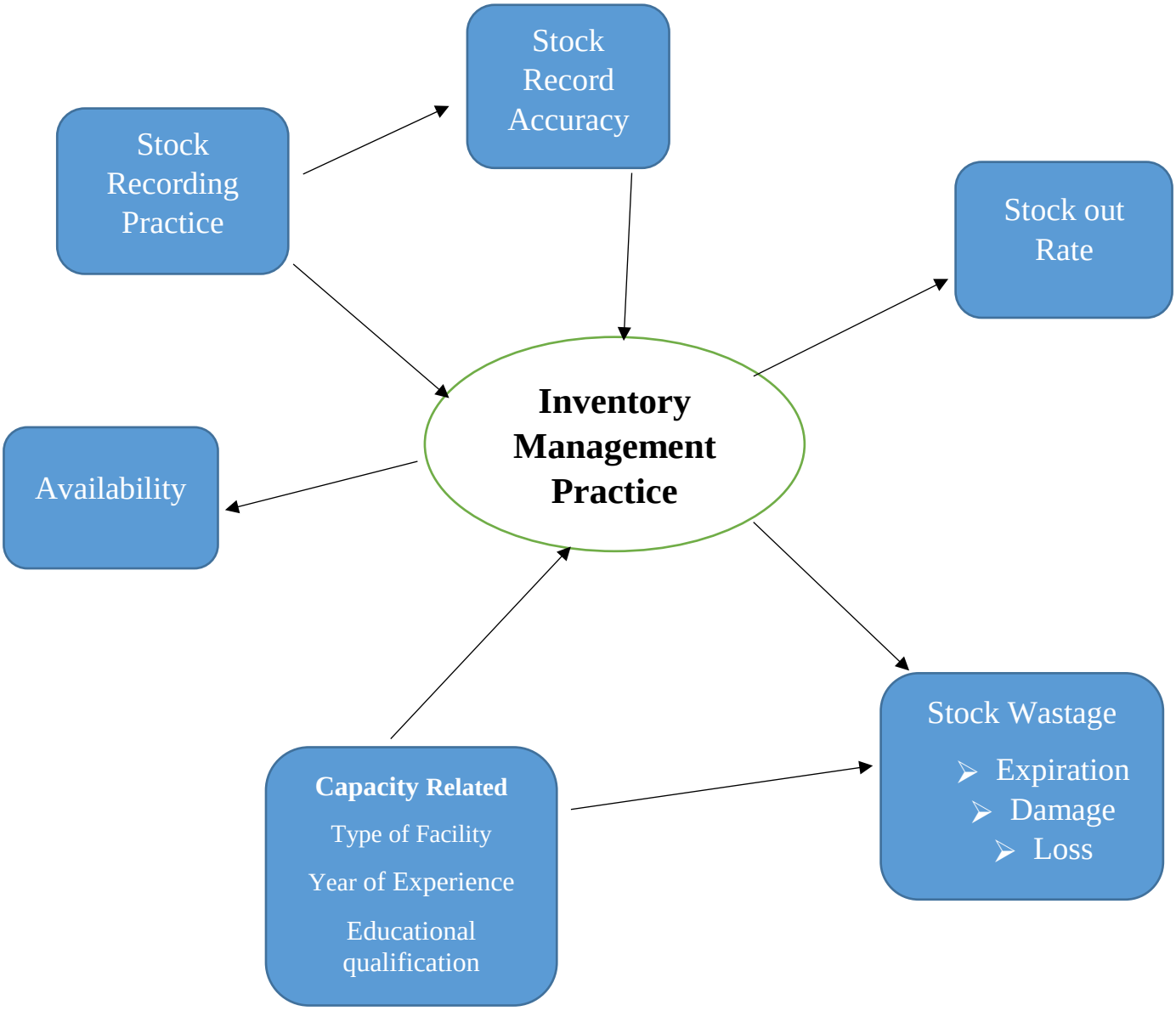

Figure 1: Conceptual framework for the assessment of inventory management practices of essential medicines for mental health in PHF in Addis Ababa, Ethiopia, 2022

Chapter Three

Methods

3.1 Study Area

The study was conducted at selected public hospitals in Addis Ababa, Ethiopia. Addis Ababa, is the capital city of Ethiopia, and administratively, divided into ten sub-cities, and 116 woredas. The total population of the city is estimated to be 5,006,000 in 2021. At the time of survey Addis Ababa has 13 public hospitals (Seven hospitals under Federal Ministry of Health and six hospitals under Addis Ababa City Administration Health Bureau, namely; Tikur Anbessa Specialized Hospital (TASH), Tirunesh Beijing Hospital (TBH), St Paul Hospital Millennium Medical College (SPHMMC), Gandhi Memorial Hospital (GMH), All African Leprosy, Tuberculosis Rehabilitation and Training Centre Hospital (ALERTH), Zewditu Memorial Hospital (ZMH), Eka Kotebe General Hospital (EKGH), Addis Ababa Burn, Emergency and Trauma Hospital (AABETH), St Peter Specialized Hospital (SPSH), Amanuel Mental Specialized Hospital (AMSH), Minellik II Referral Hospital (MRH), Ras Desta Damtew Memorial Hospital (RDDMH), Yekatit 12 Hospital Medical College (YHMC). Amanuel Mental Specialized Hospital is the only public mental specialized hospital in the city. In addition, there are 86 public health centers owned by the city administration.

According to the 2019 FMOH National Health Work Update, mental health professionals constitute 0.26% of the national health workforce. There are 111 practicing general psychiatrists; 46 Clinical Psychologist with MSc level training; 10 social workers; 165 Mental Health workers with MSc level training; 320 Psychiatry professional with a BSc level training and 111 Psychiatry professional with a advance Diploma. From this professionals more than 75% are reported working in health facilities located in Addis Ababa. (FMOH 2020)

3.2 Study Design

A sequential explanatory mixed study method was employed. To collect the quantitative data used for the study, a facility based quantitative data collection method was conducted using checklist, structured and semi structured questionnaire. And the results were triangulated (supported) with qualitative study design using key informant interview was used to explain the challenges and opportunities faced by the public hospitals in managing inventory management of essential medicines for mental health. Data was collected from April to May 2022

3.3 Population

3.3.1 Source facilities/population

The source population is all public hospitals in Addis Ababa and all health professionals involved in logistics management of health commodities in those facilities, all logistics reporting and recording tools, transaction recording tools and all medicines for mental health from selected public hospitals was used to source information for the study.

3.3.2 Study facilities/population

Selected public hospitals, all store managers in the selected facilities, selected pharmacy heads, selected medical directors, and selected supply chain coordinators were used as the source of information for the study. Selected medicines for mental health, and selected stock record keeping (bin-cards) and reporting forms (RRF), selected transaction recording tools (issuing voucher) were used.

3.4 Eligibility criteria

3.4.1 Inclusion criteria

- Public hospitals in Addis Ababa under the FMOH and AACAHB that started providing mental health care services, all reporting and resupply forms (RRFs) and bin card used within a period of six months.
- Professionals involved in the logistics management of mental health medicines.

3.4.2 Exclusion criteria

- Public hospitals in Addis Ababa not providing mental health care services and not under the FMOH and AACAHB.
- Professionals not involved in the logistics management of mental health medicines.

3.5 Source of data

Structured and semi structured questionnaires were administered to the medical directors, pharmacy directors, pharmacy store keepers and DSM officers. In depth face to face interview was used for the qualitative data. Bin cards, Stock record cards, essential drug lists and reports were reviewed and the data was used.

3.6 Sample size determination and sampling technique

3.6.1 Sample size determination

Sample size for health facilities

There are 13 public hospitals under FMOH and AACAHB in the capital, and all public hospitals were included in the study.

Sample size for medicines

A total of twenty six medicines for mental health: Nine antipsychotics; (of which one is injectable), five antidepressants, five Benzodiazepines (of which one is injectable) and six Antiepileptic and mood stabilizers were included in the study. Moreover one anticholinergic, that is used to treat the side effects of the above mentioned medicines, was also included. The type and number of medicines included in the study were based on the Ethiopia Essential Medicine List (FMOH/EFDA, 2020). For medicines with more than one strength, the strength that is available at the facility is used since it is possible to switch between the available dosage forms.

Sample Size for Review of documents

For review of documents, all bin cards/HCMIS of the included items, RRFs for the selected items, model 22, and list of expired products was included.

Sample size for Professionals

All store managers from the selected public hospitals were the sources for some part of the quantitative data. For the qualitative data thirteen key informants, four pharmacy directors, five supply chain officers, two key informants from public supplier (Ethiopia Pharmaceuticals Supply Service) supply chain officers and two key informants from private suppliers were interviewed.

3.6.2 Sampling Technique and Procedures

For quantitative data all hospitals were included. All personnel in charge of logistics activities in selected PH and all documents (Bin cards, RRF, issuing voucher (model 22)) for medicines for MH in selected hospitals was included. For qualitative data, a mix of different stakeholders was purposively selected from hospital pharmacy directors, hospital supply chain officers and coordinators, and public and private suppliers, who have better experience on managing inventory of medicines in general and mental health medicines in particular. The selection of KIs was based on their service year of greater than three years on their current position.

3.7 Variables

3.7.1 Dependent Variables

- Inventory management performance
  - ✓ Product status
    - ☐ Availability and stock out
  - ✓ Stock recording performance
    - ☐ Accuracy of logistic data
  - ✓ Wastage and expiry
  - ✓ Storage condition

3.7.2 Independent Variables

- Inventory management practices
  - ☐ Ordering and refilling practices
  - ☐ Stock recording practices
- Type of stock recording system
- Capacity Building
  - ☐ Type of public hospitals
    - ✓ Facility Essential Medicine List
  - ☐ Trainings provided on inventory management
  - ☐ Educational Qualification and Experience

3.8 Data Collection Instrument

Quantitative data was gathered through self-administrated questionnaires and checklists which were adapted from Logistics System Assessment tool (LSAT) (USAID 2009) and Logistics Indicator Assessment Tool (LIAT) prepared by USAID DELIVER Project (USAID 2008) were used to collect the necessary data from store managers, filling checklists by observation and physical count of stocks, and review of relevant documents. Bin cards and RRFs utilized with in period of six months was reviewed. The qualitative data was gathered through in-depth face-to-face inter-view with key informants. The interview guide was translated into the national working language, Amharic. Then, the interview has been undertaken with Amharic and audio tape recorded. The recordings were translated into English by the investigator. Each key informant was interviewed approximately for 15-20 minutes.

3.9 Data Management, Quality Assurance and Analysis

The quantitative data was checked for completeness of information and entered into MS Excel 2016 spreadsheet and statistical package for social science (SPSS) version 20 to encode and analyze. Spearman's rho tests was used to determine the associations between dependent and independent variables. A critical value of ($p < 0.05$) was considered as statistically significant. The qualitative data was analyzed manually using the thematic content analysis technique. Accordingly, the investigator, familiarized with the recorded data by listening repeatedly and taking notes. Then the data was coded in MS word using a table. The coded data was organized to search for subthemes. Finally, similar subthemes was brought together to form a theme. Themes described and report was produced.

3.10 Ethical Considerations

Prior to launching the survey, Ethical clearance and approval was secured from School of Pharmacy, Addis Ababa University and Addis Ababa City Administration Health Bureau respectively. Authorization letter was received from AAU and AACAHB and submitted to all public hospitals under study. Before data collection was started, pharmacy directors and store managers from study hospitals were asked for consent. For qualitative part of the study a verbal consent was obtained from key informants.

3.11 Plan for dissemination of the result

As part of the protocol of AAU, this thesis will be defended publicly and the final and approved document will be submitted to the School of Pharmacy, Addis Ababa University, and to the Addis Ababa City Administration Health Bureau. Effort will be made to publish the result of the study on a scientific journal. Recommendations made based on the study results will be forwarded to all concerned bodies for possible consideration for improvements.

3.12 Operational definitions

Inventory Management is a systematic approach to sourcing, storing, and selling inventory—both raw materials (components) and finished goods (products). In business terms, inventory management means the right stock, at the right levels, in the right place, at the right time, and at the right cost as well as price.

Medicines For Mental Health: Drugs available to treat mental illnesses. Some of the most commonly used are antidepressants, anti-anxiety, antipsychotic, mood stabilizing, and stimulant medications.

Stock Out: A situation in which an item is out of stock.

Stock out Rate: The percentage of items not available upon the requested need date

A Stock Record is a master list of the securities held by a brokerage firm on behalf of its customers

Stock Record Accuracy is a measure of how closely official inventory records match the physical inventory.

Storage Condition: The conditions specified for storing the product e.g. temperature, humidity, etc.

Stock Wastage: Stock that goes in the bin due to spoilage or inefficient portioning. Shrinkage: stock unaccounted for or missing as a result of an administrative error, theft, inaccurate recording or another unidentified reason.

LMIS data quality: The extent to which the data recorded on the logistics recording and reporting tool is complete, accurate and reported on time.

Product availability: Products were considered available if product is not stock-out (if physical count is not zero) on the day of visit in the facilities' store and dispensary.

Stock out in previous 6 months: Medicines were considered stock-out if ending balance on logistics recording tool (bin card) is zero in previous 6 months from data collection time. For products with no bin or not updated the store managers were asked to recall if the medicines were stock-out and model 19 and 22 were reviewed.

LMIS forms utilization: LMIS forms were considered utilized if there were either manual or electronic forms on which the transactions of the MH products were recorded.

Timely reporting: Reports were considered timely if submitted within the first 10 days of the reporting month to PSA for hospitals and health centers that directly submit their report to PSA and within 5 days of PSA reporting month to woreda stores for HCs that submit their report to woreda stores.

Bin card accuracy: Bin cards were considered accurate if there was no discrepancy between stock recorded on bin cards and physical stock count and considered inaccurate if there was discrepancy.

RRF accuracy: RRFs were considered accurate if there were a mean discrepancy of 20% or less between balance on bin card and stock on hand recorded on RRF with corresponding period.

Chapter Four

Results and Discussions

4.1 Results

4.1.1 Socio-demographic characteristics

A total of thirteen public hospitals (seven hospitals under FMOH and six hospitals under AACAHB) were surveyed to assess inventory management performance of essential medicines for Mental Health in Addis Ababa, Ethiopia. From these public hospitals 5 (38.5%) hospitals were general hospitals, four are specialized hospitals, two were medical college hospitals, and the remaining two were referral Hospital and mental specialized hospital. Eighty nine pharmacy professionals (on average approximately seven pharmacy professionals) were found working in the drug supply management units of the studied hospitals. (Table 1). Seventy six (85.4%) of the pharmacy professionals were pharmacists, three were druggists and 11.2% were Health Supply Chain Management Specialists (MSc). Eighty (89.9%), 59 (66.3%) and 5(5.6%) of the professionals reported having taken training on IPLS, on HCMIS (Dagu-1/2) and on Inventory Management respectively.

Table 1. Socio-demographic characteristics of public hospitals in Addis Ababa, Ethiopia, May 2022

SN	Variables		Frequency	Percentage	Total (%)
1	Type of Hospital	General Hospital	5	38.5	13(100)
		Specialized Hospital	4	30.8	
		Mental Specialized Hospital	1	7.7	
		Medical college Hospital	2	15.4	
		Referral Hospital	1	7.7	
2	Professionals under DSM unit	Pharmacist (BPharm)	76	85.4	89(100)
		Druggist	3	3.4	
		Health supply chain management specialist (MSc)	10	11.2	
3	Trainings taken by DSM unit	IPLS	80	89.9	89(100)
		HCMIS	59	66.3	
		Others,(Inventory Management)	5	5.6	

The majority of store managers that are responsible for managing medicines for mental health, and other medicines in general, were male (76.9%), pharmacists (92.3%), and have 1 up to 5 years' of experience at their current position (69.2%). (Table 2). Twelve (92.3%) of store managers reported have taken IPLS training.

Table 2. Socio-demographic characteristics of personnel responsible for managing medicines at public hospitals in Addis Ababa, Ethiopia, May 2022

Socio-demographic characteristics					
SN	**Variables**		**Frequency**	**Percentage**	**Total (number/%)**
1	Sex (Store Manager)	Male	10	76.9	13(100)
		Female	3	23.1	
2	Highest academic degree (Store Manager)	Diploma	0	0	13(100)
		Bachelor Degree	12	92.3	
		MSc	1	7.7	
3	Experience at current position in years (Store manager)	<1	4	30.8	13(100)
		1-5	9	69.2	
		>5	0	0	
4	Have you taken IPLS training? (Store manager)	Yes	12	92.3	13(100)
		No	1	7.7	

4.1.2 Inventory Management Practices:

Of surveyed hospitals 11(84.6%) used consumption method to quantify medicines for mental health and mostly get their supply from EPSS (100%). Only two (15.4%) of hospitals were additionally get supplied with these medicines from private suppliers and other facilities. As shown on table 3, the majority (61.5%) of these hospitals request and receive these products on monthly basis while three hospitals reported receiving their supplies weekly and two facilities indicated a bi-weekly supply. Most hospitals (92.3%) request suppliers of the items using purchase request letter, with average replenishment lead time of within a week (100%) since all these hospitals are placed at the same city to the supplier. Six (46.2%) of the public hospitals reported often request and receive the medicines of mental health whenever needed and if available at the source. Six of the studied hospitals have reported shortage of separate space to store medicines for mental health. Only one hospital (7.7%) conduct physical inventory every month. While, nine (69.2%) hospitals reported conducting physical inventory for medicines of mental health on quarterly basis and, 3

(23.1%) hospitals made inventory annually. None of the studied public hospitals are found to conduct their physical inventory every six months.

Table 3. Inventory Management practices of medicines of mental health at public hospitals in Addis Ababa, Ethiopia, May 2022

Inventory Management practices					
SN	**Variables**		**Frequency**	**Percentage**	**Total (number/%)**
1	Method of Quantification of medicines of mental health	Consumption method	11	84.6	13(100)
		Morbidity method	0	0	
		Both methods	2	15.4	
2	Supplier of medicines of mental health (Mostly)	Governmental(EPSS)	13	100	13(100)
		Private supplier	2	15.4	
		Other facilities, by donation/loan/transfer	2	15.4	
3	Requesting and receiving period of medicines of mental health (Stocking practice)	Weekly	3	23.1	13(100)
		Bi-weekly	2	15.4	
		Monthly	8	61.5	
		Quarterly	0	0	
		Whenever needed	6	46.2	
4	Average replenishment Lead time	< 1 week	13	100	13(100)
		1-2 weeks	0	0	
		>2 weeks	0	0	
5	Stock record forms used for reporting/ordering	RRF	1	7.7	13(100)
		IFRR	3	23.1	
		Purchase Request letter	12	92.3	
6	Separate Storage capacity for medicines of mental health	Adequate	7	53.9	13(100)
		Not-adequate	6	46.1	
7	Physical inventory period	Monthly	1	7.7	13(100)
		Quarterly	9	69.2	
		Every six months	0	0	
		Yearly	3	23.1	

4.1.3 Stock Recording Practices:

Accurate and updated stock records are crucial for proper inventory management since they are input to calculate future needs. In this study, common stock recording tools were assessed for availability and utilization for medicines of mental health and all facilities were found to use Bin

card, RRF, IFFR and HCMIS. However only 38.5% of the visited public hospitals were found using stock card. (Table 4)

Table 4. Availability and utilization of stock recording tools at public hospitals in Addis Ababa, Ethiopia, May 2022

SN	Stock Recording tools	Available		Utilized		Total (number/%)
		Frequency	Percentage	Frequency	Percentage	
1	Bin card	13	100	13	100	13(100)
2	Stock card	5	38.5	5	38.5	
3	HCMIS	13	100	13	100	
4	IFRR	13	100	13	100	
5	RRF	13	100	13	100	

The recording of the movement of medicines of mental health should be done at the time of movement. For expired, poor quality or over-stocked items, information on the removal of such items should also be recorded. Hence, stock recording tools were assessed for accuracy and on whether or not the tools were updated. On average 82% (Max=100%, Min=57.1%) bin card/HCMIS of these medicines were updated and 82.3% (Max=100%, Min=57.1%) were accurate. (Table 5). Additionally Facilities essential medicines list was also reviewed for medicines of mental health to evaluate their importance. Accordingly, only 28% (Max=100%, Diazepam injection, Min=0%, Imipramine tablets and Haloperidol tablet) considered vital drugs, 52% are essential drugs and 15% of these medicines were not included on the list. Haloperidol injection (62%), chlorpromazine tablets (23%), trifluperazine tablets (8%), Fluphenazine decanoate injection (23%), thioridazine tablets (8%), risperidone tablets (15%), olanzapine tablets (15%), clozapine tablets (23%), amitriptyline tablets (31%), clomipramine tablets (8%), sertraline tablets (15%), fluoxetine capsules (31%), diazepam tablets (31%), clonazepam tablets (46%), sodium valproate tablets (51%), phenobarbitone tablets (85%) and phenytoin tablets (69%) considered vital drugs by facilities.

Table 5. Stock record updating practice, record accuracy rate and facility specific VEN category of medicines for mental health at public hospitals in Addis Ababa, Ethiopia, May 2022

SN	List of medicines for Mental Health	Bin card/HCMIS updated		Accurate		Facility specific EDL (VEN category)			
		Y (%)	N (%)	Y (%)	N (%)	V (%)	E (%)	N (%)	NA (%)
1	Haloperidol 1.5mg/5mg	11(85)	2(15)	11(85)	2(15)	0(00)	13(100)	0(00)	0(00)
2	Haloperidol 5mg/ml, inj	12(92)	1(8)	12(92)	1(8)	8(62)	5(38)	0(00)	0(00)
3	Chlorpromazine 100/25mg	13(100)	0(0)	12(92)	1(8)	3(23)	10(77)	0(00)	0(00)
4	Trifluperazine 1mg/5mg	5(71)	2(29)	5(71)	2(29)	1(8)	6(46)	1(8)	5(38)
5	Fluphenazine Decanoate 25mg/ml	8(80)	2(20)	8(80)	2(20)	3(23)	7(54)	0(00)	3(23)
6	Thioridazine 25mg/100mg	4(57)	3(43)	4(57)	3(43)	1(8)	6(46)	1(8)	5(38)
7	Risperidone 1mg/2mg/4mg	13(100)	0(0)	12(92)	1(8)	2(15)	10(77)	1(8)	0(00)
8	Olanzapine 5mg	9(82)	2(18)	9(82)	2(18)	2(15)	9(69)	1(8)	1(8)
9	Clozapine 25mg/100mg	4(80)	1(20)	4(80)	1(20)	3(23)	3(23)	3(23)	4(31)
10	Amitriptyline 25mg	10(77)	3(23)	10(77)	3(23)	4(31)	9(69)	0(00)	0(00)
11	Imipramine 10mg/25mg	8(80)	2(20)	8(80)	2(20)	0(00)	10(77)	2(15)	1(8)
12	Clomipramine 25mg	7(100)	0(0)	7(100)	0(0)	1(8)	6(46)	1(8)	5(38)
13	Sertraline 50mg/100mg	6(67)	3(33)	6(67)	3(33)	2(15)	7(54)	0(00)	4(31)
14	Fluoxetine 20mg	9(69)	4(31)	8(62)	5(38)	4(31)	9(69)	0(00)	0(00)
15	Diazepam 5mg	10(77)	3(23)	10(77)	3(23)	4(31)	9(69)	0(00)	0(00)
16	Diazepam 10mg/2ml, inj	12(92)	1(8)	12(92)	1(8)	13(100)	0(00)	0(00)	0(00)
17	Clonazepam 0.5mg/2mg	8(73)	3(27)	9(82)	2(18)	6(46)	5(38)	1(8)	1(8)
18	Bromazepam 1.5mg/3mg	9(100)	0(0)	9(100)	0(0)	1(8)	8(62)	1(8)	3(23)
19	Lorazepam 1mg	8(89)	2(11)	8(89)	2(11)	1(8)	8(62)	0(00)	4(31)
20	Lithium carbonate 300mg	6(75)	2(25)	6(75)	2(25)	2(15)	6(46)	1(8)	4(31)
21	Sodium valproate 200/500mg	10(77)	3(23)	10(77)	3(23)	7(54)	5(38)	1(8)	0(00)
22	Carbamazepine 200mg	12(92)	1(8)	12(92)	1(8)	3(23)	10(77)	0(00)	0(00)
23	Lamotrigine 50mg/100mg	2(100)	0(100)	2(100)	0(100)	2(15)	3(23)	0(00)	8(62)
24	Phenobarbitone 30mg/100mg	10(77)	3(23)	10(77)	3(23)	11(85)	2(15)	0(00)	0(00)
25	Phenytoin 50mg/100mg	9(69)	4(31)	9(69)	4(31)	9(69)	4(31)	0(00)	0(00)
26	Promethazine 25mg	5(71)	2(29)	5(71)	2(29)	1(8)	6(46)	3(23)	3(23)
Average		**82%**	**18%**	**82%**	**18%**	**28%**	**52%**	**5%**	**15%**
Maximum		**100%**	**43%**	**100%**	**43%**	**100%**	**100%**	**23%**	**62%**
Minimum		**57%**	**0%**	**57%**	**0%**	**0%**	**0%**	**0%**	**0%**

V= Vital, E=Essential, N=Non-Essential, NA=Not Available, Y=Yes, N=No

Association of stock recoding practice and its possible contributing factors have been assessed using non parametric parameter called Spearman Rank Correlation Coefficient. Hence number of pharmacy professionals with DSM, IPLS training, year of Experience, Physical Inventory period were found to have no significant association with Bin card updating practice and accuracy. And the test showed there was significant positive association between updating practice and bin card accuracy ($P<0.05$). (Table 6). Hence timely updated tools were found accurate.

Table 6. The association of bin card updating practice and accuracy with the contributing factors at public hospitals in Addis Ababa, Ethiopia, May 2022

Correlations (Spearman's rho)					
S/N	**Variables**	**Bin card Updating practice**		**Bin card Accuracy**	
		Correlation coefficient (R)	**Sig. (P)**	**Correlation coefficient (R)**	**Sig. (P)**
1	Number of pharmacy Professionals under DSM	-0.710	0.817	0.580	0.849
2	Years of experience	-0.780	0.799	-0.235	0.439
3	Trainings (IPLS)	-0.138	0.654	-0.026	0.933
4	Physical Inventory Period	0.200	0.513	0.111	0.718
5	Updating Practice	--	--	0.783	0.002**

R=Correlation Coefficient, P=Significance

4.1.4 Availability, Stock out and Reason of stock out of medicines for Mental Health:

The most important output of a logistics system is stock availability, which will improve health outcomes. Availability of Medicines for Mental Health were also assessed in public hospitals, and the overall average availability of these medicines on the day of visit was found to be 42.5% (Max=73.3%, Min=18%). (Table 7). Antipsychotics was found to the most available medicines (64.1%), and Promethazine was not found in any of the hospitals (0%) at the time of the visit. Availability was found to be different from one public hospital to the other with maximum of 73.4% in hospital 5 to a minimum 18% in hospital 6. Haloperidol tablet and injection, risperidone, diazepam injection and phenytoin tablets were available in 92% of the facilities. Clozapine tablets, sertraline tablets, and clomipramine tablets were available in only two of the hospitals. Lithium carbonate capsules and clonazepam tablets were only available in one hospital. All the hospitals had no lamotrigine tablets and promethazine in their stock at the day of visit. When medicines for mental health were put in category, antipsychotics (64.1%), antidepressants (44.6%), benzodiazepines (60%), antiepileptic/mood stabilizers (43.6%), and anticholinergics (0%) were available.

Table 7. Availability of Medicines for Mental Health by category on the day of visit at Public Hospitals in Addis Ababa, Ethiopia, May 2022

SN	Public Hospitals	Availability of medicines for mental health by category					Total (%)
		AP (%)	AD (%)	BD (%)	AE/MS (%)	AC (%)	
1	Public Hospital 1	77.8	60	80	33.3	0	50.2
2	Public Hospital 2	33.3	20	60	33.3	0	29.3
3	Public Hospital 3	77.8	20	60	16.7	0	34.9
4	Public Hospital 4	66.7	20	80	33.3	0	40
5	Public Hospital 5	100	100	100	66.7	0	73.4
6	Public Hospital 6	0	20	20	50	0	18
7	Public Hospital 7	66.7	40	20	50	0	35.3
8	Public Hospital 8	44.5	40	40	50	0	34.9
9	Public Hospital 9	55.6	60	20	33.3	0	33.8
10	Public Hospital 10	77.8	60	60	50	0	49.6
11	Public Hospital 11	77.8	40	80	66.7	0	52.9
12	Public Hospital 12	77.8	60	80	50	0	53.6
13	Public Hospital 13	77.8	40	80	33.3	0	46.2
Average		**64.1**	**44.6**	**60**	**43.6**	**0**	**42.5**
Maximum		**100**	**100**	**100**	**66.7**	**0**	**73.3**
Minimum		**0**	**20**	**20**	**16.7**	**0**	**18**

AP=Antipsychotics, AD=Antidepressants, BD=Benzodiazepines, AE/MS=Antiepileptic/Mood Stabilizers, AC=Anticholinergics

Availability of medicines for mental health could be affected by other factors. Hence using spearman Rank Correlation Coefficient the association was tested. The result showed there was significant association between availability and Facility Essential Drug List. Vital and essential drugs were significantly associated (p=0.023, p=0.048 respectively) with availability and Medicines that were not included in the list were significantly associated with average Stock out (p=0.002) and Days out of stock (p=0.000). (Table 8). Non-essential medicines and medicines that were not included in the facilities drug list were significantly associated with stock out (p=0.003, p=0.002 respectively). All categories of the list (vital, essential, non-essential and not available) were associated with duration of days out of stock regardless of their importance to the mental health service.

Table 8. The association of Availability and Facility Essential Drug List at public Hospitals in Addis Ababa, Ethiopia, May 2022

Correlations (Spearman's rho)								
S/N	**Variables**		**Availability**		**Mean Stock out**		**Days out stock**	
			R	**P**	**R**	**P**	**R**	**P**
1	Facility Essential Drug List	Vital	0.444	0.023	-0.073	0.722	0.525	0.006
2		Essential	0.817	0.048	-0.076	0.714	-0.504	0.009
3		Non-essential	-0.200	0.327	0.557	0.003	0.831	0.000
4		Not available	-0.073	0.724	0.574	0.002	0.866	0.000

R=Correlation Coefficient, P=Significance

Documents were assessed if these essential medicines for mental health have been out of stock within the last six months. All medicines were stocked out at least once in one of the hospitals under study. The mean stock out and frequency of stock out was found to be 0.73 and 0.86 respectively. Chlorpromazine tablets, olanzapine tablets, sertraline tablets, clonazepam tablets, Lithium carbonate, Lamotrigine tablets, Phenobarbitone tablets and promethazine tablets were out of stock at least once at each facility. Meanwhile haloperidol tablets and phenytoin tablets were the least stocked out items with mean stock out of 0.08 and 0.31 respectively. And the average duration of stock out was 95 days (Max=175, Min=7). This could be one indication of availability is the major problem in delivering quality service to patients in mental health care system. Olanzapine and Clonazepam have most frequently stocked out item with average of 1.38, and haloperidol was found to be the least (0.08). Thirteen items have been stocked out for at least half the review period, which is three months. As shown below in Table 9, chlorpromazine tablets (140 days), trifluperazine tablets (112 days), thioridazine tablets (119 days), clozapine tablets (154 days), amitriptyline tablets (113 days) were out of stock to list a few.

Table 9. Stock out rate of essential medicines for mental health with in the last six months in public hospitals in Addis Ababa, Ethiopia, May 2022

SN	List of Medicines for Mental Health	Stock out rate		
		The Mean stock out of medicines for mental health	The Mean frequency of Stock out	The Mean duration of stock out (days)
1	Haloperidol 1.5mg/5mg	0.08	0.08	14
2	Haloperidol 5mg/ml, inj	0.62	0.62	51
3	Chlorpromazine 100mg/25mg	1.00	1.08	140
4	Trifluperazine 1mg/5mg	0.69	0.69	112
5	Fluphenazine Decanoate 25mg/ml	0.46	0.46	59
6	Thioridazine 25mg/100mg	0.85	0.85	119
7	Risperidone 1mg/2mg/4mg	0.54	0.69	31
8	Olanzapine 5mg	1.00	1.38	83
9	Clozapine 25mg/100mg	0.92	0.92	154
10	Amitriptyline 25mg	0.85	1.08	113
11	Imipramine 10mg/25mg	0.62	0.92	83
12	Clomipramine 25mg	0.85	0.85	124
13	Sertraline 50mg/100mg	1.00	1.15	155
14	Fluoxetine 20mg	0.69	1.00	60
15	Diazepam 5mg	0.54	0.46	72
16	Diazepam 10mg/2ml, inj	0.85	1.31	50
17	Clonazepam 0.5mg/2mg	1.00	1.38	107
18	Bromazepam 1.5mg/3mg	0.38	0.46	53
19	Lorazepam 1mg	0.38	0.38	58
20	Lithium carbonate 300mg	1.00	0.85	169
21	Sodium valproate 200/500mg	0.69	1.08	94
22	Carbamazepine 200mg	0.77	1.23	71
23	Lamotrigine 50mg/100mg	1.00	1.00	175
24	Phenobarbitone 30mg/100mg	1.00	1.23	134
25	Phenytoin 50mg/100mg	0.31	0.31	7
26	Promethazine 25mg	1.00	1.00	170
Average		**0.73**	**0.86**	**95**

On average antidepressants (107 days), antiepileptic's/mood stabilizers (108 days) and anticholinergics (170 days) have found to be out of stock for at least three months with in six months of review period. The mean stock out of first generation antipsychotics was slightly lesser (0.62) than other categories with average frequency of stock out of 0.63. (Table 10). Second

generation antipsychotics and antidepressants were most commonly stocked out items categorically compared.

Table 10. Stock out rate of medicines for mental health by category in public hospitals of Addis Ababa, Ethiopia, May 2022

SN	Category of medicines for mental health		Stock out rate		
			The mean stock out of medicines for mental health	The mean frequency of Stock out	The mean duration of stock out
1	Antipsychotics	First generation	0.62	0.63	83
		Second generation	0.82	1.00	89
2	Antidepressants		0.80	1.00	107
3	Benzodiazepines		0.63	0.80	68
4	Antiepileptic/Mood Stabilizers		0.79	0.95	108
5	Anticholinergics		1	1	170

The association of availability, frequency of Stock out and duration of stock out with possible independent variables was performed using non-parametric test, Spearman Rank Correlation Coefficient. Therefore type of hospital had significant association with availability (p=0.007), mean stock out (p=0.042), days of stock out (p=0.026), and frequency of stock out (p=0.041). In addition stocking practice of facilities had significant association with availability (p=0.003), average stock out (p=0.015), days out of stock (p=0.037), and frequency of stock out (p=0.003) of medicines for mental health in public hospitals. (Table 11). Hence availability and stock out of medicines were different between general, specialized and mental specialized hospitals.

Table 11. The association of availability, and stock out of medicines with the contributing factors at public Hospitals in Addis Ababa, Ethiopia, May 2022

Correlations (Spearman's rho)					
S/N	**Variables**	**Type of hospital**		**Stocking practice**	
		Correlation coefficient (R)	Sig. (P)	Correlation coefficient (R)	Sig. (P)
1	Availability of medicines for mental health	0.702	0.007	-0.755	0.003
2	Average stock out of medicines for mental health	0.562	0.042	-0.521	0.015
3	Duration of stock out (Days)	0.614	0.026	-0.583	0.037
4	Frequency of stock out	0.571	0.041	-0.758	0.003

R=Correlation Coefficient, P=Significance

The most common reasons for stock out of medicines of Mental Health was also reviewed in the study. Hence stock out at the source/supplier (42%) and absence of client/demand (29%) were found to be the most common reasons for stock out of medicines of Mental Health in the facilities, (Table 12), and lack of information about the item accounting the least of reasons (1%).

Table 12. Reasons for stock out of medicines for mental health in Public Hospitals in Addis Ababa, Ethiopia

Sn	**List of medicines for mental health**	**Reasons for stock out**					
		Inadequate supply	**Stock out at source**	**Expiry**	**Delayed request**	**No client/ demand**	**Lack of information**
1	Haloperidol 1.5mg/5mg	0	0	0	0	100	0
2	Haloperidol 5mg/ml, inj	0	30	60	0	10	0
3	Chlorpromazine 100/25mg	18	71	6	0	6	0
4	Trifluperazine 1mg/5mg	0	0	0	22	78	0
5	Fluphenazine Decanoate 25mg/ml	0	0	0	17	83	0
6	Thioridazine 10/25/100mg	0	33	0	8	58	0
7	Risperidone 1mg/2mg/4mg	40	30	0	20	10	0
8	Olanzapine 5mg	18	71	6	0	6	0
9	Clozapine 25mg/100mg	0	21	7	0	71	0
10	Amitriptyline 25mg	20	67	7	7	0	0
11	Imipramine 10mg/25mg	22	44	0	11	22	0
12	Clomipramine 25mg	0	8	23	0	62	8
13	Sertraline 50mg/100mg	6	63	13	0	19	0
14	Fluoxetine 20mg	17	75	8	0	0	0
15	Diazepam 5mg	0	50	13	25	13	0
16	Diazepam 10mg/2ml, inj	13	40	40	7	0	0
17	Clonazepam 0.5mg/2mg	24	76	0	0	0	0
18	Bromazepam 1.5mg/3mg	0	0	0	33	67	0
19	Lorazepam 1mg	17	17	17	0	50	0
20	Lithium carbonate 300mg	7	36	0	7	50	0
21	Sodium valproate tablets	17	75	8	0	0	0
22	Carbamazepine 200mg	27	53	7	7	7	0
23	Lamotrigine 50mg/100mg	0	57	0	0	36	7
24	Phenobarbitone 30/100mg	20	65	15	0	0	0
25	Phenytoin 50mg/100mg	25	25	0	50	0	0
26	Promethazine 25mg	7	87	7	0	0	0
	Average	**11%**	**42%**	**9%**	**8%**	**29%**	**1%**

4.1.5 Expiry and Wastage of medicines for Mental Health:

From twenty six medicines enrolled in the study only thirteen were included in the calculation of wastage rate. The average wastage of medicines for mental health in public hospitals was found to be 4.5%, with Promethazine tablet (20%), Clozapine tablet (11.8%), Diazepam injection (11.17%) and Haloperidol injection (5.2%) being expired the most. (Table 13). Lorazepam tablets (0.1%) and Imipramine tablets (0.2%) were wasted least in this category.

Table 13. Wastage of medicines of mental health within six months before study in Public Hospitals in Addis Ababa, Ethiopia

SN	List of Medicines for Mental Health	Unit	Usable Stock	Expired	Wastage rate (%)
1	Haloperidol 5mg/ml, injection - Ampoule	Ampoule	17510	955	5.2
2	Chlorpromazine 100mg/25mg - Tablet	1000	13105	30	0.2
3	Risperidone 1mg/2mg/4mg - Tablet	10x10	10095	190	1.9
4	Olanzapine 5mg - Tablet	10x10	10565	114	1.1
5	Clozapine 25mg/100mg - Tablet	5x10	1773	238	11.8
6	Imipramine 10mg/25mg - Tablet	10x10	3771	6	0.2
7	Clomipramine 25mg - Tablet	5x20	1254	86	6.4
8	Sertraline 50mg/100mg - Tablet	10x10	1010	6	0.6
9	Diazepam 10mg/2ml, injection - Ampoule	Ampoule	69720	8770	11.2
10	Lorazepam 1mg - Tablet	10x10	841	1	0.1
11	Phenobarbitone 30mg/100mg - Tablet	1000	2458	6	0.2
12	Phenytoin 50mg/100mg - Tablet	200	13025	28	0.2
13	Promethazine 25mg - Tablet	100x10	4	1	20
				Average	**4.5**

The value of expired/wasted medicines was also assessed to determine the total cost of expiry. A total of 494,231.40 birr was wasted due to expiry of these medicines in six months. Diazepam injection (58.8%) taking the lion share of expiry in terms of value/cost, costing 290,637.00 birr. Clozapine tablets ((26.2%), 129,472.00 birr), Risperidone tablets ((4.2%), 20,596.00 birr), Olanzapine tablets ((3.4%), 16,792.00 birr) were expired. Lorazepam tablet (0.02%) and promethazine tablet (0.08%) were the least valued expired medicines. (Table 14)

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Table 14. Value of expired medicines for mental health in public hospitals in Addis Ababa, Ethiopia

SN	List of Medicines for Mental Health	Unit	Expired (Qty)	Unit cost(birr)	Total cost (birr)	Percentage of costs (%)
1	Haloperidol 5mg/ml, injection - Ampoule	Amp	955	6.65	6350.75	1.3
2	Chlorpromazine 100mg/25mg - Tablet	1000	30	185	5550	1.1
3	Risperidone 1mg/2mg/4mg - Tablet	10x10	190	108.4	20596	4.2
4	Olanzapine 5mg - Tablet	10x10	114	147.3	16792.2	3.4
5	Clozapine 25mg/100mg - Tablet	5x10	238	544	129472	26.2
6	Imipramine 10mg/25mg - Tablet	10x10	6	129	774	0.2
7	Clomipramine 25mg - Tablet	5x20	86	214.6	18455.6	3.7
8	Sertraline 50mg/100mg - Tablet	10x10	6	131.8	790.8	0.2
9	Diazepam 10mg/2ml, injection - Ampoule	Amp	8770	33.14	290637	58.8
10	Lorazepam 1mg - Tablet	10x10	1	86.8	86.8	0.02
11	Phenobarbitone 30mg/100mg - Tablet	1000	6	431	2586	0.5
12	Phenytoin 50mg/100mg - Tablet	200	28	62.6	1752.8	0.4
13	Promethazine 25mg - Tablet	1000	1	386.6	386.65	0.08
				Total	**494,231.40**	**100**

Reasons of expiry were also assessed for expired medicines. Hence, receiving near expiry drugs (22%), and Irregular consumption (74%) were the two most commonly reported reasons for expiry/wastage. No single medicine was reported to be expired because of failing to practice FEFO/FIFO and delay of supply since the supplier is in the same town. (Table 15)

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Table 15. Reasons of expiry of medicines for mental health in public hospitals in Addis Ababa, Ethiopia

SN	List of Medicines for Mental Health	Reasons of expiry (%)				
		Receiving near expiry drugs	Fail to practice FEFO/FIFO	Over supply of medicine	Delay of supply	Irregular consumption
1	Haloperidol 5mg/ml, injection	33	0	22	0	44
2	Chlorpromazine 100mg/25mg	0	0	0	0	100
3	Risperidone 1mg/2mg/4mg	100	0	0	0	0
4	Olanzapine 5mg - Tablet	0	0	0	0	100
5	Clozapine 25mg/100mg - Tab	67	0	0	0	33
6	Imipramine 10mg/25mg - Tab	0	0	0	0	100
7	Clomipramine 25mg - Tablet	0	0	0	0	100
8	Sertraline 50mg/100mg - Tablet	0	0	0	0	100
9	Diazepam 10mg/2ml, injection	53	0	27	0	20
10	Lorazepam 1mg - Tablet	0	0	0	0	100
11	Phenobarbitone 30mg/100mg	33	0	0	0	67
12	Phenytoin 50mg/100mg - Tab	0	0	0	0	100
13	Promethazine 25mg - Tablet	0	0	0	0	100
	Average	**22**	**0**	**4**	**0**	**74**

4.1.6 Storage conditions of medicines for mental health

Seventeen standards were assessed to determine the storage practice of medicines in public hospitals in Addis Ababa. The result showed that on average 93% of these standards were adhered by the facilities (Max=100%, Min=77%). Table 16 shows adequacy of storage space with possible expansion (77%) and availability of fire safety equipment (77%) were the least adhered standards in the category followed by protection from direct sunlight (85%) and stacking products less than 2.5meters high (85%).

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Table 16. Adherence of public hospitals to good storage standards of essential medicines for mental health in Addis Ababa, Ethiopia

S. No	Standards	Yes	No	Adherence in %
1	Products that are ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.	13	0	100
2	Products are stored and organized in a manner accessible for first to-expire, first-out (FEFO) counting and general management.	13	0	100
3	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation	12	1	92
4	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory.	11	2	85
5	Cartons and products are protected from water and humidity.	13	0	100
6	Products are protected from direct sunlight.	11	2	85
7	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings or insects].)	13	0	100
8	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel.	13	0	100
9	Products are stored at the appropriate temperature according to product temperature specifications.	12	1	92
10	Roof is maintained in good condition to avoid sunlight and water penetration.	13	0	100
11	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).	13	0	100
12	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).	10	3	77
13	Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered).	10	3	77
14	Products are stored separately from insecticides and chemicals.	13	0	100
15	Products are stacked at least 10 cm off the floor.	12	1	92
16	Products are stacked at least 30 cm away from the walls and other stacks.	12	1	92
17	Products are stacked no more than 2.5 meters high.	11	2	85
		Average		**93%**

4.1.7 Qualitative Results

A high-quality mental health system requires forethought and planning long before a health worker engages with a patient. For policy-makers and health planners, the challenges are great: providing mental health services to all who need them, in an equitable way, in the most effective manner possible, and in a fashion that promotes human rights and health outcomes. (WHO 2009)

A total of thirteen key informants were interviewed to assess the challenges faced in inventory management of medicines for mental health in public hospitals of Addis Ababa. Four pharmacy directors, five supply chain management officers in these hospitals, two supply chain officers from public supplier and two supply chain officers from private suppliers were interviewed. The results were categorized and analyzed thematically, and presented as follows.

4.1.7.1 Inventory management practice of medicines for mental health:

Almost all KIs from hospitals replied managing medicines for mental health is different since these drugs are controlled and liable for abuse. Therefore storage, distribution and patients use is also different. These medicines should be kept separate and in restricted area with locked cabinet regardless of the quantities of drugs being stored. Besides some of these medicines are prescribed using designated prescription paper that is psychotropic prescription papers. Rational use of these prescription papers are closely monitored and controlled by respective organizations. While describing the current practice one KI said:

"As our facility is a general hospital, we do not stock these items that much. The type and quantity of these items are limited in our essential drug list and are separate from other facilities. These items are not considered as vital drugs for our facility except for the two/three items and these items are even used for other purposes in addition to mental health. But that doesn't mean we should not stock these items at all. There is no problem with stocking limited number of these medicines just like other medicines, but usually the number of patients visiting our facility/consumption is difficult to predict since patient adherence to these medicines is uncertain."

On the same issue another KI also said:

"I think mental health is neglected/adequate attention is not given to it. When forecasting is done, the quantity is a little washed out, and few items are considered. The extent of current mental health problem and demand for these items is not exactly known and has not been given attention like other category of diseases. There is no policy or association of mental health like other chronic

diseases that to shout about. Associations shout if other medicines are stocked out and/discontinued but this is not common psychiatric medicines."

4.1.7.2 Availability and supply related practices of medicines for mental health:

All KIs from health facilities complained that availability of medicines for mental health is the major challenge to provide mental health care. These medicines are mostly supplied from public supplier called EPSS (Ethiopian Pharmaceutical Supply Service). And there is little or no practice of donating medicines for mental health to public health facilities like other categories of medicines. While describing the current practice one KI said:

"We are not an importer or manufacturer; we receive the drugs from those who produce/import them. These medicines are almost entirely supplied by EPSS. It would be great if there are other suppliers that also supplies these drugs and if public and private suppliers can do in coordination. Psychiatry department in our hospital does not have its own pharmacy. I think these service is often isolated."

Medicines for mental health were frequently stocked out and not available on the day of visit. Some respondents from the visited hospitals indicated that mental health is not considered as a problem since the service was given little attention. On this issue one KII said the following:

"We do not see the lack of psychiatric drugs as a problem except for certain vital drugs. We do not see it as a problem as only a limited number of patients are dealt with in one room of outpatient department. However, we try to source vital/essential medicines of mental health as much as possible from EPSS, even if one pack of requested item is available at the source."

"Patients often go to other health facilities in search of better treatment. Because of that, the service here is minimum, so we provide, handle and store these medicines accordingly. Quantification is often difficult; because of the increase and decrease in the number of patients"

"We get medicines for mental health only from EPSS. Even when we issue tenders to buy other medicines from private suppliers twice a year which are not available from EPSS, we usually do not include these medicines except for vital medicines"

Even though most respondents said availing medicines for mental health is the problem of the public health facilities or public supplier, respondents from mental health facility indicated that private suppliers are not availing them even though it's required by their facility. These could be exemplified by the respondent from mental health facility as:

"*Mostly these medicines are supplied by Ethiopian Pharmaceuticals Supply Service. And we request items that are not available at EPSS using open tender bi-annually. But these items are mostly not available with the private suppliers, therefore the supply is entirely dependent on EPSS."*

4.1.7.3 Medicines wastage and expiry:

Quantification related factors, fluctuation of the number of patients (demand) visiting the facilities and receiving near expiry of these medicines were mostly indicated by the respondents as the major causes of wastage and expiry of medicines for mental health. These could be exemplified as: "*Quantification is often done using consumption data. Patients go to other health facilities for better treatment and due to interruption in supply of medicines. In addition to the fact that these medicines are not available in large/adequate quantities, when they arrive, they are near expiry. If once expired, they will be out of stock. Likewise, if they are once stocked out, it takes too long to be found."*

Future opportunities for provision of mental health service and inventory management of these medicines was also indicated by respondents as increased demand from patients, trained human power in supply chain management and development of national mental health strategy. These could be exemplified as:

"There is increased awareness and demand of patients and/or society for mental health and use of these medicines. Previously the service was entirely neglected/given for mental health institutions but nowadays every health institution is obligated to provide the service, these will further motivate the private sector to get involved in availing the medicines. Therefore there will be increased availability and decreased wastage and stock out."

Ways to improve inventory management practice of medicines for mental health was also indicated by the respondents. Improved attention, developing policy, inclusion of some of these items in the tracer drugs list, involvement of private sector and working in coordination with the public

supplier, use of morbidity data for quantification and provision of rational drug use were the mostly forwarded/indicated ways. These could be exemplified as:

"From EPSS down to facilities these medicines should be seen differently and special attention should be given. It's better if there is policy that obligates facilities to avail medicines for mental health and strict regulatory mechanism. During quantification it's better to use morbidity data rather than consumption data since there is fluctuation of patient flow. Moreover inclusion of some items in the tracer medicines list will improve the availability."

4.2 Discussions

4.2.1 Stock Recording Practice:

Good inventory management of pharmaceuticals requires the provision and use of logistics management information system tools, the preservation of data, the regular tracking of stocks, and the minimization of recording errors in order to accomplish the intended target of serving the customers with the reasonable cost. (Shewarega, Paul et al. 2015) The National Survey of the Integrated Pharmaceuticals Logistics System shows use of bin card in public hospital was 73%.

In this study both manual and electronic LMIS tools were available and utilized in all facilities except stock card which is only available and utilized in five facilities (38.5%) which is in line with the results of study conducted in Addis Ababa that stated 96.3%. (Tilahun, Geleta et al. 2016), and Superior results were seen for all LMIS tools than similar study done in public hospitals of Jimma that stated only 69.9% of items have bin cards. This difference is might of the difference in the items under the study, the study conducted in Jimma used laboratory items. (Befekadu, Cheneke et al. 2020).

Accurate and consistent recording of LMIS tools should be done at the time of movement since this information is the engine that drives the whole supply chain for decision making. (Kumurya 2015). In the present study it was observed that 82.1% of Bin cards of medicines for mental Health were updated and 82.3% were accurate. This result was better than the study conducted on ARV drugs in Public Hospitals of Addis Ababa that states 71.1% of bin cards were updated within 30 days. (Gemechu, Ayalew et al. 2021). National survey indicated at hospitals, accurate balances ranged from 29 percent (amoxicillin) to 71 percent (dextrose); with an average of 49 percent. (Shewarega, Paul et al. 2015). This difference might be due to the number of facilities involved in the study.

4.2.2 Availability, Stock out and Reason of stock out of medicines for Mental Health

The ultimate goal of inventory management system is ensuring availability of essential medicines whenever customers need them. (Gleissner and Femerling 2013). The most important output of a logistics system is stock availability, which will improve health outcomes. Medicine availability and prices in both public and private sectors are key indicators of access to treatment.

A study conducted in 2017 showed availability of medicines for chronic illness including mental health in public health facilities in Addis Ababa was 59.1%. (EFHACA 2017). In current study overall availability of medicines for mental health at the day of visit was found to be 42.5% ranging

from 18% to 73.3% depending on the type of facilities which is significantly less than the average availability of essential drugs in public facilities that stated 91% in 2009 done in the entire country, Ethiopia. (Carasso, Lagarde et al. 2009) The same study done in Mozambique in 2015, showed that 45.8% of facilities under study had current availability of at least one medication of each category for mental health provision with antipsychotics were only less than 38% availability. (Wagenaar, Stergachis et al. 2015). This result was consistent with findings of my study nevertheless of the fact that the medications included in the study were based on the respective national drug list. But national study on essential drugs states, the majority of the health facilities had most of the essential pharmaceuticals in stock on the day of the visit: average availability was 89 percent for the basket of commodities, for all facilities. (Shewarega, Paul et al. 2015). From this findings it's clear that medicines for mental health are less available than other essential drugs.

Additionally the current study revealed that antipsychotics were mostly found (64.1%) in the facilities compared to other categories followed by benzodiazepines (60%). In contrast to the study (Wagenaar, Stergachis et al. 2015)that states promethazine was found in 91.7% facilities, No single facility in present study had promethazine on the day of visit.

Categorically, availability of anti-epileptic and mood stabilizer medicines was 43.6%. These findings were consistent with the survey done worldwide in 46 countries that stated availability of generic AEDs was less than 50% for all medicines except diazepam. (Cameron, Bansal et al. 2012)

Amitriptyline, an anti-depressant, and diazepam, an anxiolytic drug, are classified as essential medications by the World Health Organization (WHO 2015). The study done on the availability of two essential medicines for mental health in Bangladesh, the Democratic Republic of Congo, Haiti, Nepal, Malawi, Senegal, and Tanzania in 7958 health facilities showed an estimated 8.2% of facilities had amitriptyline and 46.1% had diazepam on the day of assessment. (Rahman, Babaye et al. 2022). The findings of this study were quite different indicating 77% facilities had amitriptyline, (44.6% had antidepressants in general), and 69% facilities had diazepam (60% had Benzodiazepines) on the day of visit. The difference might be due to the fact that the current study was conducted only in the capital, Addis Ababa.

Five medicines were included in a pharmaceutical sector assessment in Ethiopia in 2017. Availability of haloperidol tablet was 47.2%, phenobarbitone tablet was 88.9%, fluoxetine capsules was 100%, amitriptyline tablet was 63.9% and diazepam injection was 63.9.

(FMHACA, 2017). In present study these figures were considerably low for phenobarbitone tablets (54%) and fluoxetine capsules (46%), and better availability was found for haloperidol tablets (92%), amitriptyline tablets (77%) and diazepam injection (69%). The difference might to be due the number of facilities included in each study.

The present study also showed availability of medicines for mental health were significantly affected by the type of facility and stocking practice of facilities, mental specialized hospital and specialized hospitals were more likely to have these medicines than general hospitals. Over 83% of the 12 facilities with specialized mental healthcare services in Mozambique had current availability of at least one medication from each category for mental healthcare provision. (Wagenaar, Stergachis et al. 2015). These findings of this study were further echoed by (Rahman, Babaye et al. 2022), and (Cameron, Bansal et al. 2012) and indicating that hospitals, faith-based and private-for-profit facilities, facilities with more staff, and facilities with more technological resources were more likely to have each medicine, relative to primary care facilities, public sector facilities, facilities with fewer staff, and facilities with fewer technological resources, respectively.

The current study also revealed the mean stock out, the mean frequency of stock out and average days out of stock of medicines for mental health to be 0.73, 0.86 and 95 days respectively. Superior results was seen in the study done in South Africa that states the mean stock out was 0.59 and days out of stock was only 45days. (DOH 2013). This difference could be accounted by the fact that the study was done before and after Covid-19 pandemic.

Phenobarbital, the most widely used AED in the developing world (Kwan and Brodie 2004), is included on the essential medicine list of nearly all low-income countries (96%) (WHO et al. 2005), and has been previously reported as the least expensive AED (Kwan and Brodie 2000). This is in contrast to my findings of phenobarbitone that this medicine was out of stock at least once in each facility, with mean frequency of 1.23 and average stock out duration of 134 days. This finding may lead to further understanding of increased burden of patients to more expensive AEDs.

Overall, present study revealed second generation antipsychotics, antidepressants and anticholinergics were out of stock at least once in all public hospitals. Benzodiazepines have shown shortest duration of stock out (68 days) compared to other categories. This might be due to the fact that these medicines have been used for illnesses other mental health.

The National Mental Health Strategy 2012-2026 mandated that mental health should be integrated into the primary health care system. The strategy promoted a decentralized approach in which mental health services are available at local hospitals, district and regional health centres and tertiary facilities. It also aimed to ensure that those who require services have access to treatment as close to their home as possible and in the least restrictive environment. (FMOH 2020). All public hospitals under study were expected to avail medicines for patients whenever they need. In this study the average duration of stock out was found to be 95 days (Max=175 days, Min=7 days). In addition 72.7% health facilities in Addis Ababa had at least one drug (ARV) stock-out lasting in an average of 80 days. (Gemechu, Ayalew et al. 2021). Hence the reasons for stock out were revealed for medicines that were out of stock on the day of visit. These medicines were out of stock mainly because of medicines stock out at the source (42%), lack of client/demand for specific medicines (29%) and inadequate supply on request (11%). This findings except lack of client/demand were further echoed by the study in East Shewa Zone, Oromia Regional state indicating that the reasons for stock out of key essential medicines as reported by the health facilities includes inadequate supply of medicines (27.7%), stock out at re-supply point (30.9%), because of medicines expiration (26.8%) and order changed at the re-supply point (18.9%). (Gurmu and Ibrahim 2017). Taken together it is a clear indication of the fact that the reasons for stock out was similar for all facilities regardless of the type of facility, medicines and patients being served.

These items should be stored in a proper storage space, which is free of humidity and high temperatures and should be equipped with shelves (Quick et al. 2013). Overall 93% of seventeen standards of good storage practice were adhered by public hospitals in Addis Ababa. This is in contrast with the findings of, (Gemechu, Ayalew et al. 2021), that stated merely 36.36% and the national study, (FMHACA, 2017), that showed only 55% health facilities met acceptable storage conditions. These difference might be due to inclusion of health centers in later study.

4.2.3 Expiry and Wastage of medicines for Mental Health

Many medicines and related supplies are expensive commodities and have a short shelf-life, usually less than 2 years by the time they reach a health facility and should, therefore, be handled with care to avoid deterioration and to minimize expiries. Unused/expired pharmaceuticals pose a threat to both the health care system and to the environment. (Kamba, Ireeta et al. 2017). Overall present study revealed the average wastage rate of medicines for mental health in public hospitals Addis Ababa was found to be 4.5% with promethazine tablets (20%), diazepam injection (11.2%),

clozapine tablets (11.8%), haloperidol injection (5.2%) and clomipramine tablets (6.4%) expiring the most. The results of this experiment are quite different to the findings of, (Befekadu, Cheneke et al. 2020), that showed wastage rate to be 27.2% and, (Gurmu and Ibrahim 2017), that indicated wastage rate of key essential medicines was 10.4%. The differences might be because of the difference in the type of medicines and the typical near expiry nature of laboratory commodities. Additionally a study conducted at selected health facilities in Awi zone, Amhara regional state, Ethiopia in 2018 showed 3.5% of antipsychotics were expired/unused. (Ebrahim, Teni et al. 2019)

The value of these expired medication for mental health at public health facilities in Addis Ababa in six months was birr 494,231.40, of which 58.8% (birr 290,637.00) was diazepam injection and 26.2% (birr 129,472.00) was clozapine tablets. The most common reasons for expiry were irregular consumption or unpredictable nature of patient flow to the facilities (74%) and receiving near expiry medicines from the supplier (22%). The same study done on essential drugs in East Showa Zone showed receiving near expiry medicines (55%), inadequate store room (75%), failed to apply first- expire first out principle (25%), poor protection from direct sun light (40%) were the major reasons for wastage. (Gurmu and Ibrahim 2017). This findings may lead to better understanding of existence of push system along supply chain downwards.

4.2.4 Challenges and Opportunities in the management of medicines for mental health

A high-quality mental health system requires forethought and planning long before a health worker engages with a patient. For policy-makers and health planners, the challenges are great: providing mental health services to all who need them, in an equitable way, in the most effective manner possible, and in a fashion that promotes human rights and health outcomes. (WHO, 2009)

The present study revealed challenges in the inventory management of MMH. It showed supply of these medicines is mostly from public supplier, called EPSS. There is little/no involvement of private suppliers and coordination among them. Moreover absence of policy, little/no attention given to the service, medicines not being considered vital/essential and not included in the tracer medicine list, receiving near expiry drugs, fluctuation of the number of patients, use of consumption data for quantification, and absence of clear understanding of mental health burden are mostly forwarded challenges in the inventory management of medicines for mental health.

Chapter Five

Conclusion and Recommendation

5.1 Conclusion

Inventory management is an important component of the logistics cycle which have a crucial role in improving the availability of medicines, proper record keeping and reporting, reducing wastage of medicines, and proper storage of medicines.

All public hospitals in Addis Ababa were found to use Bin cards and e-HCMIS but only 38.5% use manual stock cards. Stock recording practice was found to be good with more than eighty percent of Bin card/e-HCMIS were updated and accurate.

Importance of medicines of mental health to public hospitals was concerning as only 28% considered vital and 15% were not even included in their essential medicines list.

Essential medicines of mental health were routinely not available in public hospitals. Availability of medicines for mental health was found to be different between products and categories and, from one facility to the other. Antipsychotics were found to be most available and anticholinergics were never found in any of the facilities under study on the day visit.

There was high mean duration of stock out which indicates poor responsiveness of the supplier to stock out, as most of the KIs are complaining. All medicines of mental health were stocked out at least once in one of the facilities under study. The average stock out duration was more than three months (95 days) with in the six months of review period. Second generation antipsychotics and antidepressants were the most frequently stocked out items. The supplier was not able to refill those items whenever the facilities requested by the facilities nevertheless of frequent stock outs, hence stock out at the source was the major reason for stock out.

The average wastage rate of medicines for mental health was found to be within the range of acceptance. The total value of expired medicines within six months of study was estimated at birr 494,231.40. Receiving near expiry and irregular pattern of patients flow were the most common reasons of wastage.

All public hospitals were observed to adequately adhere the good storage principles except separate storage of medicines for mental health.

5.2 Recommendations

All public Hospitals

Appropriate attention should be given to the mental health service and availability of medicines, need to be recognized like other health care services.

Facility specific essential medicines list should be revised to include all mental health medicines that are in national EDL and their importance to the health care delivery.

Psychiatry department should have its own pharmacy like other departments

All hospitals should work together to promote the mental health services

Ministry of Health

Policy and strategy should be developed that dictates every facility to deliver the service and avail the medicines

Some medicines should be prioritized and included in the tracer medicines list

Mental health related morbidity data available in the hospitals should be analyzed and the result should be used for drug quantification, procurement and use

Public supplier

All medicines for mental health should be supplied to health facilities based on the needs for such medicines by the health facilities.

Procurement list of the health facilities should be revised to include all items in the national essential medicines list

Private suppliers

Private suppliers should work in coordination with public supplier in order to fulfill the demand for mental health medicines by health facilities providing mental health care.

Future Studies

Inventory management practice of medicines for mental health at all level of health facilities to evaluate the implementation of national mental health strategy.

5.3 Strengths and Limitations of the study

5.3.1 Strengths of the study

Inclusion of all public hospitals in Addis Ababa that are under the management of FMOH and AACAHB.

The study evaluated the inventory management of all available medicines for mental health that were at least found in one public hospital.

The study explained for possible reasons of the challenges in the management of these medicines.

5.3.2 Limitations of the study

The study only included one type of health facility that is public hospital.

The medicines that were included in the national essential medicines list but not available at public hospitals were excluded from the study

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Annex I

Quantitative Data Collecting Tool

Date_____

Interviewer name_____

Informed consent letter

Hello, my name is Yitbarek Wana. I am conducting a survey on health commodity supply chain system for a study undergoing for partial fulfillment of MSc. I am looking at the availability of selected medicines for mental health and inventory management performance in general. I am visiting public health facilities in Addis Ababa and your facility is one of the selected health facility. The objective of this study is to assess inventory management of key medicines for mental health and determining the challenges faced. This is not supervisory visit and the performance of individual staff will not be evaluated.

The results of this study will provide information to make recommendations to the concerned bodies and to make substantial improvements to the performance.

I would like to ask the person in charge of logistic activity a series of questions about inventory management performance of medicines for mental health in this facility. Moreover, I would like to observe the selected products, the stock records, transaction records, storage condition and count the items stock status today.

ሰላም ይትባረክ ዋና እባላለሁ። የ MScን በከፊል ለማሟላት ለሚካሄደው ጥናት በጤና ምርት አቅርቦት ሰንሰለት ስርዓት ላይ የዳሰሳ ጥናት እያካሄድኩ ነው። በአጠቃላይ ለአእምሮ ጤና እና ለንብረት አስተዳደር አፈጻጸም የተመረጡ መድሃኒቶች መኖራቸውን እየተመለከትኩ ነው። በአዲስ አበባ የሚገኙ የህዝብ ጤና ተቋማትን እየጎበኘሁ ነው እና የእርስዎ ተቋም ከተመረጡት የጤና ተቋማት አንዱ ነው። የዚህ ጥናት አላማ ለአእምሮ ጤና ቁልፍ የሆኑ መድሃኒቶችን የዕቃ አያያዝን መገምገም እና ያጋጠሙትን ተግዳሮቶች ለመወሰን ነው። ይህ የቁጥጥር ጉብኝት አይደለም እና የግለሰብ ሰራተኞች አፈጻጸም አይገመገምም።

የዚህ ጥናት ውጤት ለሚመለከታቸው አካላት ምክሮችን ለመስጠት እና በአፈፃፀሙ ላይ ተጨባጭ ማሻሻያዎችን ለማድረግ መረጃ ይሰጣል.

የሎጂስቲክስ እንቅስቃሴን የሚመለከተውን ሰው በዚህ ተቋም ውስጥ የአእምሮ ጤና መድሃኒቶችን ስለ ክምችት አስተዳደር አፈፃፀም ተከታታይ ጥያቄዎችን መጠየቅ እፈልጋለሁ። ከዚህም በላይ, የተመረጡትን ምርቶች, የአክሲዮን መዝገቦችን, የግብይት መዝገቦችን, የማከማቻ ሁኔታን ለመመልከት እና የንጥሎቹን የአክሲዮን ሁኔታ ዛሬ መቁጠር እፈልጋለሁ.

Part I. Socio-Demographic and Practice Setting Information

Description of Public Health Facility

1. Name of Health Facility. _____
2. Location: _____
3. Code:_____

4. Type of Health Facility
    a. General hospital
    b. Specialized hospital
    c. Primary hospital
    d. Referral hospital
    e. Mental Specialized Hospital
5. Number of pharmacy professionals under Drug supply unit?
    a. Pharmacist_____
    b. Druggist_____
    c. MSc_____
    d. Others, specify_____

Detail of Personnel Interviewed For This Survey

6. Sex
    a. Male
    b. Female
7. Title of Profession/Current Position
    a. Store manager
    b. Supply chain officer
    c. Pharmacy Department head
    d. Other, _____ specify
8. Highest academic degree
    a. Diploma
    b. Bachelor degree
    c. MSc
    d. Other_____specify
9. No of years of experience at your current position: _____Years

Part II. Inventory Management Related Questions

1. Have you taken any training on IPLS
    a. Yes
    b. No
2. How are the quantities of medicines for mental health determined?
    a. Based on consumption
    b. Based on morbidity data
    c. Do not know
    d. Other……specify
3. Which supplier do your hospital use mostly to receive medicines for mental health?
    a. Governmental supplier(EPSA)
    b. Private suppliers
    c. Hospitals and health facilities, by donation or loan
    d. Others _____ specify

4. How often do you request and receive medicines for mental health?
    a. Weekly
    b. Bi-weekly
    c. Monthly
    d. Bi-annually
    e. Annually
    f. Whenever needed
5. What is the average replenishment lead time for medicines for mental health?
    a. 1 week
    b. 2 week
    c. 2-4 week
    d. Greater than 4 weeks
6. What stock record forms do you use for reporting/ordering?
    a. RRF
    b. IFRRF
    c. Other_____ specify
7. How often the LMIS reports sent to higher level? *(more than one answer is possible)* a. Bi-weekly
    b. Monthly
    c. Bi-annually
    d. Annually
    e. Anytime
8. Is the existing storage capacity adequate to handle all the quantities of mental health medicines needed in order to prevent stock outs?
    a. Yes
    b. No
9. How often does the facility conduct physical inventory?
    a. Monthly
    b. Every two months
    c. Every three months
    d. Every six months
    e. More than Every six months

Part III. Inventory Management Performance Related Questions

1. Availability and utilization of stock recording tools

S. No	Stock recording tools	Availability		Uti ized		Remark
		Yes	No	Yes	No	
1	Bin card					
2	Stock card					
3	HCMIS					
4	IFRRF					
5	RRF					

2. Stock record updating practice and accuracy

S. No	List of products	Bin card/HCMIS updated		Accuracy		Facility specific EDL (VEN category)
		Yes	No	Yes	No	
1	Haloperidol 1.5mg/5mg					
2	Haloperidol 5mg/ml, inj					
3	Chlorpromazine 100mg/25mg					
4	Trifluperazine 1mg/5mg					
5	Fluphenazine Decanoate 25mg/ml					
6	Thioridazine 10mg/25mg/100mg					
7	Risperidone 1mg/2mg/4mg					
8	Olanzapine 5mg					
9	Clozapine 25mg/100mg					
10	Amitriptyline 25mg					
11	Imipramine 10mg/25mg					
12	Clomipramine 25mg					
13	Sertraline 50mg/100mg					
14	Fluoxetine 20mg					
15	Diazepam 5mg					
16	Diazepam 10mg/2ml, inj					
17	Clonazepam 0.5mg/2mg					
18	Bromazepam 1.5mg/3mg					
19	Lorazepam 1mg					
20	Lithium carbonate 300mg					
21	Sodium valproate 200mg/500mg					
22	Carbamazepine 200mg					
23	Lamotrigine 50mg/100mg					
24	Phenobarbitone 30mg/100mg					
25	Phenytoin 50mg/100mg					
26	Promethazine 25mg					

3. Availability and Stock out rate of medicines for mental health in the last six months

S. No	List of products	Available today? Y/N	Stock out in last 6 months ? Y/N	Days out of stock	Frequency of stock out	Reason of stock out (from Q4(a-g))
1	Haloperidol 1.5mg/5mg					
2	Haloperidol 5mg/ml, inj					
3	Chlorpromazine 100mg/25mg					
4	Trifluperazine 1mg/5mg					
5	Fluphenazine Decanoate 25mg/ml					
6	Thioridazine 10mg/25mg/100mg					
7	Risperidone 1mg/2mg/4mg					
8	Olanzapine 5mg					
9	Clozapine 25mg/100mg					
10	Amitriptyline 25mg					
11	Imipramine 10mg/25mg					
12	Clomipramine 25mg					
13	Sertraline 50mg/100mg					
14	Fluoxetine 20mg					
15	Diazepam 5mg					
16	Diazepam 10mg/2ml, inj					
17	Clonazepam 0.5mg/2mg					
18	Bromazepam 1.5mg/3mg					
19	Lorazepam 1mg					
20	Lithium carbonate 300mg					
21	Sodium valproate 200mg/500mg					
22	Carbamazepine 200mg					
23	Lamotrigine 50mg/100mg					
24	Phenobarbitone 30mg/100mg					
25	Phenytoin 50mg/100mg					
26	Promethazine 25mg					

4. What do you think is the Reason of stock out of items with frequent stock outs? *(more than one answer is possible)*
    a. Inadequate supply from the source
    b. Stock out at the source
    c. Expiry of the item
    d. Untimely request/delay of the facility to request the item
    e. Lack/no client demand
    f. Lack of information about the item, weather its available or not in the country
    g. Other, _____ specify
5. Stock wastage/expiry and value of medicines for mental health in the last six months

S.No	**List of products**	**Received**	**Wasted/ Expired**	**Unit cost in birr**	**Total cost**	**Reason of expiry (from Q6 (a-g))**
1	Haloperidol 1.5mg/5mg					
2	Haloperidol 5mg/ml, inj					
3	Chlorpromazine 100mg/25mg					
4	Trifluperazine 1mg/5mg					
5	Fluphenazine Decanoate 25mg/ml					
6	Thioridazine 10mg/25mg/100mg					
7	Risperidone 1mg/2mg/4mg					
8	Olanzapine 5mg					
9	Clozapine 25mg/100mg					
10	Amitriptyline 25mg					
11	Imipramine 10mg/25mg					
12	Clomipramine 25mg					
13	Sertraline 50mg/100mg					
14	Fluoxetine 20mg					
15	Diazepam 5mg					
16	Diazepam 10mg/2ml, inj					
17	Clonazepam 0.5mg/2mg					

18	Bromazepam 1.5mg/3mg					
19	Lorazepam 1mg					
20	Lithium carbonate 300mg					
21	Sodium valproate 200mg/500mg					
22	Carbamazepine 200mg					
23	Lamotrigine 50mg/100mg					
24	Phenobarbitone 30mg/100mg					
25	Phenytoin 50mg/100mg					
26	Promethazine 25mg					

6. What is/are the reasons for wastage/expiry of medicines for mental health? *(more than one answer is possible)*
    a. Receiving near expiry drugs
    b. Store room not sufficient
    c. Fail to practice FEFO/FIFO
    d. Over supply of medicines
    e. Delay of supply of medicines
    f. Irregular consumption/unpredictable pattern
    g. Other, _____ specify
7. Storage condition of medicines

S. No	Standards	Yes	No	Remarks
1	Products that are ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.			
2	Products are stored and organized in a manner accessible for first to- expire, first-out (FEFO) counting and general management.			
3	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation			
4	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory.			

5	Cartons and products are protected from water and humidity.			
6	Products are protected from direct sunlight.			
7	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings or insects].)			
8	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel.			
9	Products are stored at the appropriate temperature according to product temperature specifications.			
10	Roof is maintained in good condition to avoid sunlight and water penetration.			
11	Storeroom is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).			
12	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).			
13	Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered).			
14	Products are stored separately from insecticides and chemicals.			
15	Products are stacked at least 10 cm off the floor.			
16	Products are stacked at least 30 cm away from the walls and other stacks.			
17	Products are stacked no more than 2.5 meters high.			

Qualitative Questions for Pharmacy Director/DSM Manager of the Health Facilities and supply chain officers of public and private suppliers

1. Is there any difference between medicines for mental health and other medicines in terms of inventory management, and HOW?
2. What are the barriers/challenges of inventory management of medicines for mental health?
3. What are the future opportunities of inventory management of medicines for mental health?
4. How could inventory management performance of medicines for mental health be improved?

Amharic version of Qualitative Questions

1. ለአእምሮ ጤና መድሃኒቶች እና ለሌሎች መድሃኒቶች ከዕቃ አያያዝ አንፃር ልዩነት አለ እና እንዴት?
2. ለአእምሮ ጤና የመድሃኒት ክምችት አያያዝ እንቅፋቶች/ተግዳሮቶች ምን ምን ናቸው?
3. ለአእምሮ ጤና የመድሃኒት ክምችት አያያዝ የወደፊት እድሎች ምን ምን ናቸው?
4. ለአእምሮ ጤና መድሃኒቶች የዕቃ ዝርዝር አያያዝ አፈጻጸም እንዴት ሊሻሻል ይችላል?

Annex II

List of medicines for mental health

No	Medication Category	Specific medication	Remark
1	Antipsychotics(9)	Haloperidol 1.5mg/5mg	
		Haloperidol 5mg/ml – Injection	
		Chlorpromazine 25mg/100mg	
		Trifluperazine 1mg/5mg	
		Fluphenazine Decanoate 25mg/ml - Injection	
		Thioridazine 10mg/25mg/100mg	
		Risperidone 1mg/2mg/4mg	
		Olanzapine 5mg	
		Clozapine 25mg/100mg	
2	Antidepressants(5)	Amitriptyline 25mg	
		Imipramine 10mg/25mg	
		Clomipramine 25mg	
		Sertraline 50mg/100mg	
		Fluoxetine 20mg	
3	Benzodiazepines(5)	Diazepam 5mg	
		Diazepam 10mg/2ml - Injection	
		Clonazepam 0.5mg/2mg	
		Bromazepam 1.5mg/3mg	
		Lorazepam 1mg	
4	Antiepileptic's and mood stabilizers (6)	Lithium carbonate 300mg	
		Sodium valproate 200mg/500mg	
		Carbamazepine 200mg	
		Lamotrigine 50mg/100mg	
		Phenobarbitone 30mg/100mg	
		Phenytoin 50mg/100mg	
5	Anticholinergics(1)	Promethazine 25mg	

****The strength that's available at the facility on the day of visit used for investigation*