

**Inventory Management Practice of Maternal, New Born and
Child Health Life-Saving Drugs in Selected Public Hospitals in
Jimma Zone Southwest Ethiopia**



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**A Research Thesis Submitted to the School of Pharmacy, Faculty
of Health Science, Institute of Health, Jimma University, in
Partial Fulfillment of the Requirement for the Master of Science
(MSc) Degree in Pharmaceutical Supply Chain Management.**

August 2021

Jimma, Ethiopia

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Institute of Health
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Abstract

Background: *Effective inventory management minimizes stock outs and losses due to unnecessary expiry and ensures that the desired medicines are available at all times in sufficient quantities. Having the proper amount of stock in the right place at the right time was possible with effective inventory management control.*

Objective: *To assess inventory management practices of Life-Saving mother, new born and child health drugs in selected hospitals of Jimma Zone and Jimma city.*

Method: *A facility-based descriptive cross-sectional study accompanied by qualitative method was conducted from 01–30 October 2020. Six public hospitals were selected for the study, 78 bin cards, 36 Report and Resupply Forms, 13 maternal, neonatal and child health drugs were considered in the study in addition to key informants. The collected data were cleared and analyzed using Epi data version 3 and SPSS 24. For the qualitative data was analyzed using thematic analysis technique.*

Result: *-. Six public hospitals in Jimma Zone were included in the study. Logistics Management Information Systems tools such as reports and request form data transfer accuracy of the specific products were calculated to be 396 (84.61%). From 78 bin cards assessed, 65(83.3%) were updated. From the total of 13 items in the six hospitals of the available items were 59 (75.64%). The majority of the facility 6 items (28.63%) had faced stock out during the past one year of the study. Regarding storage conditions 5 (83.3%) of the hospitals fulfilled acceptable storage conditions. Managerial negligence, inadequate human resources, inadequate supply, supply of near expiry and lack of training and supportive supervision were the identified inventory management challenges.*

Conclusion: *The maternal, neonatal and child health drugs inventory management practice of the studied public hospitals was found to be weak in which the availability of the drugs was below the standard and inaccuracy of stock records were identified in the area. There were also higher stock out and wastage rates. The study conducted in selected hospitals has a good storage condition practice.*

Recommendations: *Therefore, public hospitals of Jimma City and Jimma Zone should give attention for the improvement of the maternal, neonatal and child health drugs inventory management more to decrease wastage rates and to increase quality of inventory control.*

Key words: *Inventory Management, Availability, Live-Saving drugs, Maternal, newborn and Child Health.*

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List of Abbreviations and Acronyms

AMC: Average Monthly Consumption

BC: Bin card

CHAI: Clinton Health Access Initiative

EPSA: Ethiopia Pharmaceutical Supply Agency

FMOH: Federal Ministry of Health

HMIS: Health Management Information System

IFRR: Internal Report and Requisition Form

IMP: Inventory Management Practice

IPLS: Integrated Pharmaceutical Logistics System

LIAT: Logistics Indicator Assessment Tool

LMIS: Logistics Management Information System

LSAT: Logistics System Assessment Tool

MDGs: Millennium Development Goals

MNCH: Mother, Neonates and Child Health

MOS: Months of Stock

MMR: Maternal Mortality Ratio

ORS: Oral rehydration salts

RRF: Report and Resupply Form

SCMS: Supply Chain Management Systems

SDG: Sustainable Development Goal

SDP: Service delivery point

SSA: Sub-Saharan Africa

UN: United Nations

UNCoLSC: UN Commission on Life-Saving Drugs for Women and Children

UNFPA: United Nations Population Fund Association

UNICEF: United Nations Children's Fund

USAID: United States Agency for International Development

WHO: World Health Organization

1. Introduction

1.1. Background

Inventory management control is used to show how much stock one has at any time, and how to keep track of it. Having the proper amount of stock in the right place at the right time was possible with effective stock control. It ensures that cash is not stranded unnecessarily and that output is protected in the event of supply chain issues (1).

Life-Saving maternal, new-born, and child health drugs are those medicines that successfully address primary preventable causes of death during pregnancy, childbirth and childhood and that, if made more generally available and used properly, could significantly reduce preventable deaths among women and children. According to a 2011 World Health Organization (WHO) report, 3.1 million children die each year during their new-born period over the world. Because of preterm deliveries, severe infections, and birth asphyxia, half of these occur during the first 24 hours of delivery and 75% occur in the early neonatal period (0 to 6 days after delivery) (2).

Despite previous efforts, the United Nations Children's Fund (UNICEF), the World Health Organization (WHO), and other UN institutions are uniting governmental, commercial, and civil society partners in an international campaign to reduce unnecessary maternal, new-born, and child deaths. In Sub-Saharan Africa, there are still major public health issues to address in order to reduce new-born mortality. Every year, 2.9 million babies die during the neonatal period, which is also when stillbirths and maternal deaths are most common (3).

Following the United Nations (UN) Millennium Declaration of 2000, eight Millennium Development Goals (MDGs) issued and set targets for social achievements by 2015 (4). The MDG agenda for maternal, new born, and child health (MNCH) was supported by the 2010 launch of the UN's Every Woman Every Child movement (5). Later in 2012, the UN's Commission on Life-Saving Drugs (UNCoLSC) was started in support of Every Woman Every Child and concentrated on improving access to 13 neglected life-saving drugs to treat the main causes of maternal, new born, and child deaths, such as postpartum haemorrhage, eclampsia, new-born sepsis, and childhood diarrhoea and pneumonia. Under the UNCoLSC, 10 primary activities were identified to address barriers preventing access to these life-saving drugs (6).

The strategy named on the global community to work together to save 16 million lives by 2015 by increasing access to and suitable utilization of essential medicines, and wellbeing supplies that effectively address leading avoidable causes of death during pregnancy, childbirth, and childhood (7). The UN Commission on Life-Saving Drugs for Women and Children, which is a part of Every Woman, Every Child movement, identified and endorsed an initial list of 13 unnoticed life-saving drugs that, if more commonly accessed and properly used, could save the lives of more than 6 million women and children (8).

Every day, around 800 women die from preventable causes associated to pregnancy and childbirth. Almost 80% of these deaths occur in low-income country due to difficulties of during birth, such as severe bleeding, infection, high blood pressure, and other issues. Despite significant progress in lowering global children and new-born mortality, 44% of all childhood deaths occur in developing countries (9).

Even though in the periods of freedom, most countries in sub-Saharan Africa are characterized by underachieving health systems in terms of low funding, operational and management inefficiency, poor quality of health services, inequities in distribution of the health workforce, and low capacity for planning, budgeting, and control (10). Specifically, most countries in sub-Saharan Africa, with the exception of Rwanda, Ethiopia, Malawi, Cape Verde and Tanzania did not encounter MDG goals 4 and 5 because of weak health systems (11).

The Ethiopian Demographic & Health Surveys of 2011 and 2016 reported maternal mortality rates of 676 and 412 per 100,000 live births, respectively. But Ethiopia still did not meet Millennium Development Goal (MDG) 5, which relates to reduce the problem of maternal mortality. Even though Ethiopia reduced under-five mortality by two-thirds from 204/1,000 live births in 1990 to 68/1,000 live births in 2012, despite fulfilling the MDG 4 objective three (3) years ahead of schedule, over 190,000 children still die every year (12). Ethiopia contributes to more than 4% of all global maternal deaths, which were projected at 1, 300 in 2013 (13). PFSA with its partners established and initiate implementing the IPLS in 2009. IPLS is proposed as an integrated health medicine supply chain that includes all health program drugs. So far, drug management of various health programs including family planning, human immunodeficiency virus (HIV), tuberculosis, and malaria have been included, but not MNCH drugs (14).

1.2. Statement of the Problem

Improving maternal, new born and child health is a global priority. Major obstacles to delivering worldwide basic health care for pregnant women and children have been recognized as persistent disparities in availability and access to life-saving MNCH medications. The supply chain for health pharmaceuticals is the most expensive activity in public health care, needing special attention, an effective strategy, and management (15).

The UN Secretary General launched the Every Woman Every Child (EWEC) movement in 2010 to address the main health challenges that women and children face around the world (10). The main Global Strategy for Women's and Children's Health was launched under this umbrella as a roadmap to improve financing, policy, and service delivery for the most vulnerable women and children. It brought attention to the estimated 8 million children who die each year from preventable causes, as well as the 350,000 mothers who die from complications related to pregnancy and childbirth (15).

Maternal and neonatal mortality are acceptably high in Sub-Saharan Africa compared to Western Europe and Northern America. This inequality is supported by the fact in Sub-Saharan Africa only three countries met their target for MDG 4,5and 6 UN 2013. Since 2000, most countries have absorbed on involvements that aim to increase health facility delivery, neonatal and early childhood services – high impact involvements for MNCH. Evidence was developed that during the same period health sector reforms in most sub-Saharan countries, including Kenya, delayed and health systems have remained weak as characterized by inadequate funding, incompetent resource management and poor policy implementation, workforce crises dilapidated infrastructure and weak health information systems (16).

In many underdeveloped countries, the capacity of the pharmaceutical supply management (PSM) system has always been challenging. Weak Drug supply management & inventory control indicates to stock out, loss due to unnecessary expiry and damage, theft and the desired pharmaceutical products are unavailable at all times in acceptable quantity. Inappropriate ways of managing these inventories were ending up in wastages, shortage and overage of MNCH drugs, increase in out-of-pocket expenditure and decline in quality of MCH services. (17).

The causes and determinants of maternal and newborn mortality are generally interrelated. An estimated 3 million births occur each year in Ethiopia and about 15% of pregnant women in

Ethiopia are estimated to develop life-threatening obstetric complications (18). Hemorrhage, hypertension in pregnancy, abortion and sepsis were identified as the leading causes of maternal death. Similarly, the major contributors of under-five mortality are pneumonia, diarrhea, and malaria with malnutrition as underlying cause. These are either preventable or treatable ones (19).

The introduction of IPLS, the PFSA initiated implementing an integrated health drugs supply chain planned to include all health program drugs. During the assessment period, IPLS manages various health program drugs family planning, human immunodeficiency virus (HIV), tuberculosis, and malaria but not MNCH drugs. IPLS is now implemented in almost all of the public hospitals in the country. Routine monitoring reports reveal that the amount of IPLS implementation, as well as the availability of medications at SDPs, has improved over time. (20).

However, MNCH drug availability presents current challenges as follows: Little data on stock status are readily available, particularly from service delivery points (SDPs) and from equivalent distribution. Supply chain system for MNCH drugs is not consistent or integrated into the IPLS. Lack of a coordinated national supply plan for maternal and child health drugs lead to shortages and ad hoc requests to partners and stakeholders for resources.

Appropriate storage conditions must control like suitable temperature, light and humidity, sanitation, ventilation and segregation should be maintained every hospital which the drug supplies are stored. Medicines Store should be secure and good shelves and equipment to be used for arranging drugs should be available, so that drugs can be accessible only to authorized personnel (21). Appropriate inventory management enables the organization to alleviate its inventory costs for example holding costs, stock out costs, and lead time (22).

Integrating IPLS is one of among the maternal, new born, and child health (MNCH) drugs giving for service delivery point to improve customer satisfaction, nevertheless were giving this service cannot be a solution for maternal, new born, and child health (MNCH) drugs. Therefore, the researcher would like to assess the drugs in terms of availability and utility to the hospitals although factors that influence utilization of maternal, new born, and child health (MNCH) drugs were being assessed to service delivery point (23).

1.3. Significance of the Study

Inventory management practice is key strategic area requiring significant attention and effective management especially in the health system of any country. It is one of the most expensive activities and improving the inventory was to have a significant impact on performance in terms of improving access to life-saving drugs and improving health outcomes. Therefore, the finding and recommendation from this study were being to promote evidence-based intervention for the health facility with a comprehensive view of all aspects of the MNCH Inventory management system and to identify MNCH drugs security problems and chances for better implementation of the system (24).

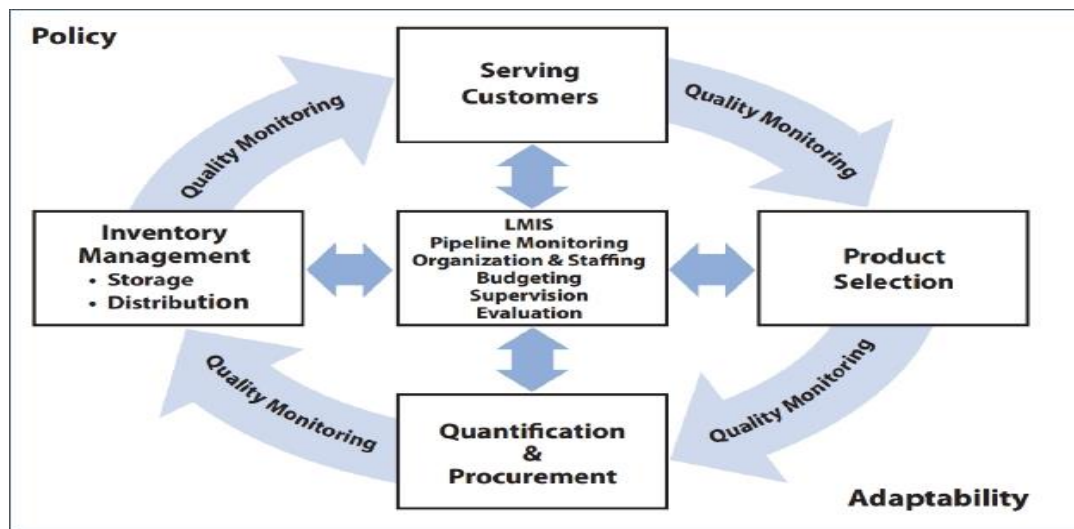
The finding was also offering a useful reference document to public hospitals or other stakeholders such Woreda Health Office, Zonal Health Department, Regional Health Bureau, Non-Governmental Organizations (NGOs), and other public health sector subdivisions in their activities to improve the quality of inventory management practice. Public hospital managers, head of pharmacy involved in health logistics activities and store manager was using this study as a supplementary and may plan to fill gaps to minimize the challenges associated with the MNCH drugs inventory management. Furthermore, policy-makers, EPSA and MOH may intervene with the inventory management malpractice of MNCH drugs. Academicians, students and those interested on further investigation on similar topics may use the findings as baseline information.

2. Literature Review

2.1. Inventory Management

One of the major reasons that medicines are wasted is that they may have expired without anyone observing that the shelf-life date was approaching. Failure to notice approaching expiry does might lead to the loss of a significant number of resources, especially in resource-limited countries. This type of damage is not acceptable to medicines. Expiry dates can be monitored by using different techniques so that appropriate action can be taken on short-dated products before they become unusable (25).

A well-designed distribution system should keep drugs in good condition throughout the distribution process, minimize drug losses due to spoilage and expiration, keep accurate inventory records, rationalize drug storage points, reduce theft and fraud, and provide information for forecasting drug needs. The distribution cycle includes the following steps: receipt and inspection; storage; inventory control; requisition of supplies; delivery; dispensing to patients, and reporting consumption (26). Accurate and updated stock records of MNCH drugs are critically required for need assessment and quantification exercises. Inaccurate or less quality records were lead to inaccurate quantification, shortages and overages, wastages, and inability to utilize limited resources. Therefore, attention should be given to regular monitoring and evaluation of the inventory management of MNCH drugs (27).



Source: USAID | DELIVER Project

Figure 1: The Logistics Cycle

Inventory management practice in the hospitals can be measured by availability of usable stock on hand within established max-min range of the country as measured by stock out rate. Inventory management's role is to keep a desired stock level of specified products or items at all times. (28). In addition, to plan regarding when and how much to order and reorder intervals should be considered. Ensuring availability of modern and essential life-saving maternal, new born and child medicines is a major challenge in Ethiopia, where under need is very high and funding for supplies is almost completely donor dependent. Ethiopian pharmaceutical supply chain has several problems including unavailability, unaffordability, poor storage, lack of stock management and irrational use of drugs (29).

2.2. Logistic Management Information system (LMIS)

Logistics Management Information System is a system that generates information, which is needed to make logistics decisions. The logistics decisions include selection, forecasting, procurement, training, resupply disposal, supervision, monitoring, and management. The LMIS can be manual or computerized. But all the United States Government (USG) partners like DELIVER, SCMS and MSH agree that 70% of the data collection should be done paper based even at location that had been using computerized sometime (30). Standardized formats for inventory management to be used in public hospitals include: Bin Card, Stock Record Card, Internal Facility Report and Resupply Form (IFRR), Report and Requisition Form (RRF) and Record for Returning Unusable Drugs (RRUC) (31).

In Ethiopia, LMIS was designed in 2007, and according to this system, the PFSA is expected to deliver health drugs directly to hospitals and collect reports from the hospitals. The UN Commission on Life-Saving Drugs for Women and Children (the Commission) takes on the challenge outlined in the UN Secretary General's Global Strategy for Women's and Children's Health of saving lives through improving equitable access to life-saving drugs(32).

The Commission, which is part of the EWEC movement, aims to improve access to inexpensive life-saving treatments in 50 of the world's poorest countries, which account for more than 80% of all maternal and child fatalities. The assumption underlying the estimates presented at the Family Planning Summit in London in July 2012 is used to calculate these costs. (15).

2.3. Availability of life-saving MNCH drugs

Most successful inventory management control systems are maximum–minimum inventory systems that to ensure the usable stock levels are maintained within an established range. Holding large quantities of stock in inventory requires more money and increased storage space and risk of pilferage, damage, and expiration was high (33).

In order to control inventory, the previous pharmaceutical fund and supply agency (PFSA) but now renamed as Ethiopian Pharmaceutical Supply Agency, has implemented an integrated pharmaceutical logistics system (IPLS) since 2009. In this system maximum months of stock, minimum months of stock and emergency order point were established for each public hospital so as to maintain adequate stock of health drugs. So public hospitals are required to report on a fixed schedule, and then based on the reports the hospitals were being resupplied by the nearest EPSA branch. The problem is the full applicability of IPLS is limited to health program drugs, as only RRF is generated to these drugs (34).

The presences of stock-out, overstock, inaccurate inventory record and high level of expiry indication of poor inventory management. Ensuring that every woman and child can survive a priority for Ethiopia’s health system, central to the goal of saving women’s lives and improving child health. Access to safe, high-quality, and affordable MNCH drugs is essential to achieving these national and global priorities. Many maternal, neonatal, and child deaths usually are due to preventable or treatable causes, which can be averted through skilled institutional care backed by the required health drugs and medical supplies (7).

The Federal Ministry of Health (FMOH) and partners have devised a variety of strategic interventions to accelerate progress and accomplish the post-2015 Sustainable Development Goals (SDGs). One of the most important objectives for preventing morbidity and mortality in Ethiopia is to increase the availability and access to MNCH medications (35). The amount of use of IPLS, as well as the accessibility of medications at service delivery points, has improved over time, according to routine checking reports (36).

Assessments made in Ethiopia to explore the reasons for not offering certain maternal medicines revealed, response delays by the main source, delay by the SDP to request, non-availability of the medicines in the market, low or no demand, no trained staff to provide the services, not in the drug list and unavailability of cold chain were frequently mentioned (37). To this effect, delay on

the part of main source was the most commonly cited cause of non-availability of life-saving maternal/reproductive health medicines. As for the two-essential life-saving medicines (Magnesium Sulphate and Oxytocin), delays in the part of the main source (34.6% for Magnesium Sulphate and 50.0% for Oxytocin), delay by the SDP to request (38.5% for Magnesium Sulphate and 20.0% for Oxytocin) were marked. Also, the reason presented as “no cold chain” was attributed to oxytocin in nearly one third (30.0%) of SDPs. Facility’s physical distance from the warehouse is also important factor that affects the facility’s stock status. Hospitals that are closer to the source of supply are less likely to encounter “stock out” compared to hospitals that are far away (38).

2.4. Storage Conditions of health facility storerooms

The storage condition for pharmaceutical products should observe with the recommended good storage practices so as to preserve the quality of the products stored. Well-located, well-built, well-organized, and secure storerooms are essential components of pharmaceutical supply system. The storage space was insufficient, there was a difficulty to maintain the cold supply chain due to recurrent power interruption, temperature monitoring of the cold supply chain was not monitored. Good inventory control needs careful thought about the sizes and design of the storage space, appropriate conditions for storage of different types of supplies, the importance of stock rotation and systematic arrangement of stock, as well as attention to cleanliness, fire prevention processes, and security within the store (39).

2.5. Challenges and Other Factors Associated with Inventory Management of MNCH drugs

MNCH drug availability presents current challenges as; little data on stock status are readily available, particularly from service delivery points and from parallel distribution. Lack of a coordinated national supply plan for maternal and child health drugs lead to shortages and problem requests to partners and stakeholders for resupply (40). Inappropriate use, wastage, and stock-outs were also reported in Kenya. These challenges were faced due to inadequate procurement practices, inappropriate management, and poor quality of MNCH drugs (41).

A major challenge in pharmaceuticals inventory management is to maintain usable stocks and avoiding wastages. Studies conducted in Zambian and Nigerian health facilities at different times identified that limited storage capacity at health facilities compromised quality of inventory management. Limited storage capacity, lack of reliable data, lack of adequate human resources

and poor performance of health care workers were the challenges of inventory management of MNCH drugs (42).

A major challenge in pharmaceuticals inventory management is to maintain usable stocks and avoid wastages. In Ethiopia, poor stock management was observed in terms of storage conditions, availability, and accuracy of records, as well as MNCH medicine inventory in hospitals. The following are some of the issues raised in relation to MNCH medicine inventory management: Drug stock outs are common, there is a lack of standard ordering processes and procedures, there is no established pipeline, there are many vertical pipelines due to program engagement in the replenishment process, medications are limited, and the present pipeline is too long (43).

2.6. Conceptual Framework of the Study

The conceptual framework is a structure of concepts and theories which are put together as a map for the study and it shows the relationship of research variables. In this study conceptual framework analyze MNCH drug management that was affecting the service of the hospitals. The following diagram was representing the overall activities of the pharmacy service.

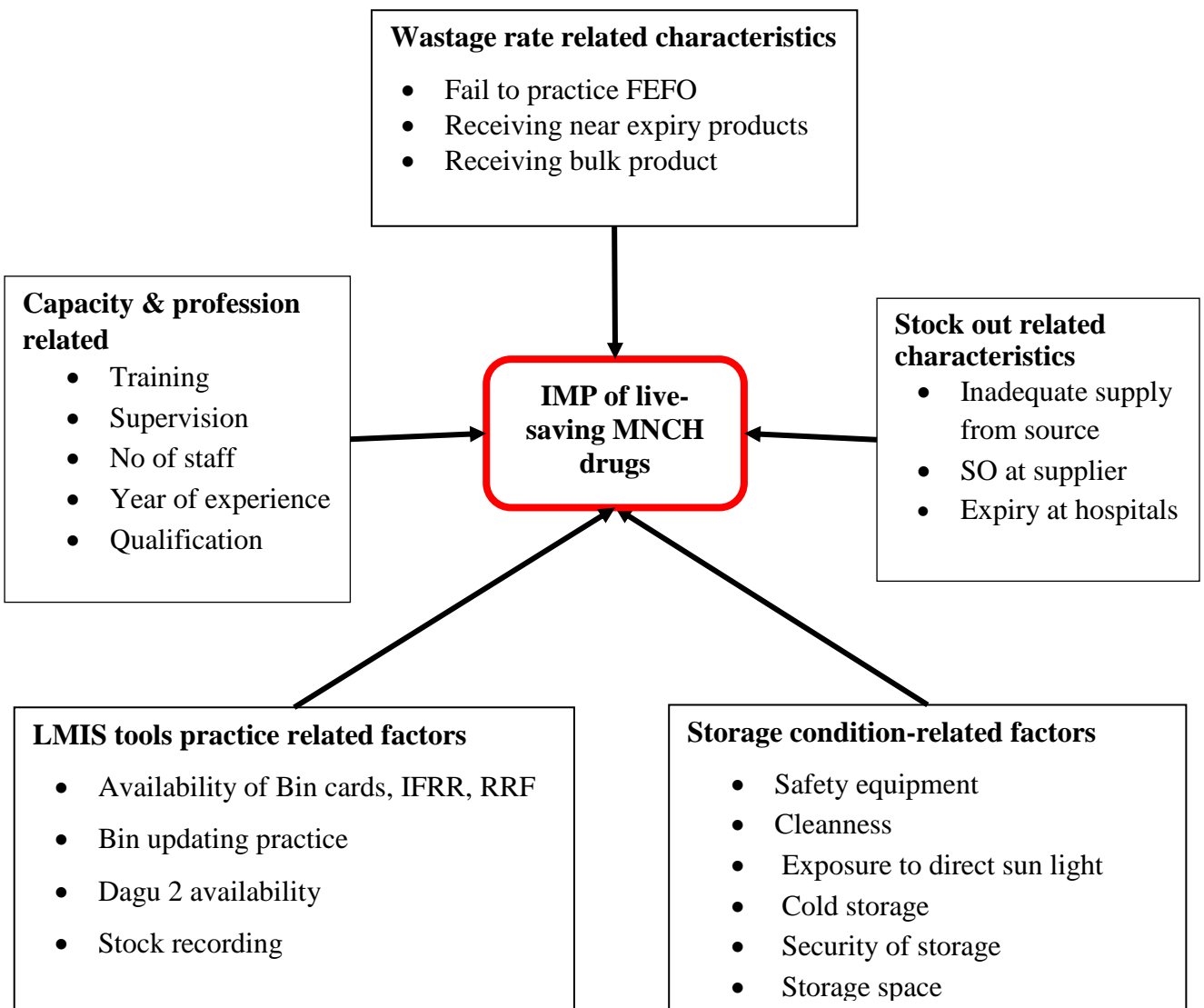


Figure 2: Conceptual Framework of the study on assessment of IMP of MNCH life-saving drugs.

3. Objectives

3.1 General objective

To assess the inventory management practices of Life-Saving MNCH drugs in selected public hospitals of Jimma Zone and Jimma city.

3.2. Specific objectives

- ❖ To assess stock status of MNCH Life-Saving drugs.
- ❖ To identify the wastage rate of MNCH drugs at selected hospitals.
- ❖ To assess the logistics management information system (LMIS) performance on MNCH life-saving drugs.
- ❖ To identify the storage condition within the hospitals
- ❖ To assess the challenges related to MNCH drugs inventory management

4. Method and Materials

4.1 Study area

The study was carried out in Jimma City and Jimma Zone public hospitals. Jimma Zone is one of 12 Zone in the Oromia region and located southwest of Addis Ababa. Jimma city is found 365 km to the southwest of the national capital Addis Ababa. Public hospitals found in Jimma Zone and Jimma City serve a total population of 2,486,155; and a total of 521,506 households were counted in this Zone. A total of 733 health facilities are found in Jimma Zone and 37 are in Jimma City. There are 7 public hospitals, 110 health centers, 487 health posts, 28 higher private clinics, 128 medium private clinics, 2 army hospitals, 3 private hospitals, 4 non-governmental clinics, and 4 diagnostic laboratories in Jimma zone and Jimma City (44).

4.2 Study period and design

The study was conducted from October 1 to 30, 2020 Health facility based quantitative cross-sectional study design which was complemented with qualitative method was employed to assess the practice of inventory management of the MNCH life-saving drugs in public hospitals found in Jimma City and Jimma zone.

4.3 Population

4.3.1 Source of population

All public hospitals found in Jimma City and Jimma zone, all health professionals involved in MNCH life-saving drugs management, all MNCH drugs, and all pharmaceutical documents.

4. 3.2 Study population

The study involved all public hospitals found in Jimma City and Jimma zone and all bin cards including health drugs management information system (Dagu 2), Model 19/health, Model 22/health, RRF, IFRR, selected MNCH life-saving drugs. The pharmacy head, Pharmacy Supply chain officer (in the absence of pharmacy head), different dispensary units and central store keepers.

4. 4. Eligibility criteria

4. 4.1. Inclusion criteria

- ❖ In order to get sufficient data for analysis, all public hospitals that function at least for a year prior to data collection were recruited.
- ❖ All pharmaceutical documents and store managers, pharmacy heads, supply chain coordinator in the absence of pharmacy head and dispensing unit coordinator were included.

4. 4.2. Exclusion criteria

- ✓ Private and army hospitals found in both Jimma zone and Jimma City were excluded from the study because the MNCH life-saving program drugs were not resupplied from the government.
- ✓ Hospital which was totally works Covid-19 at the time of data collection.
- ✓ Pharmacists not involved in the inventory management of MNCH drugs and experience less than six months

4.5. Sample size determination and Sampling Procedure

4.5.1 Sample size determination

There were six public hospitals found in both Jimma City and zone was considered. According to UN 2016, all the recommend MNCH life-saving drugs (n =13) were included in this study (39). Thirty-six RRFs used between November 1, 2019, to October 30, 2020, 78 bin cards and IFRR of MNCH life-saving drugs managed at the hospitals were taken.

4.5.2. Sampling procedures

The total of six public hospitals selected for MNCH life-saving drugs services in the 6 Woredas was taken from Jimma zone. From the 6 Woredas, all public hospitals were included in the study since they were situated in different Woredas. Concerning medicines, the selected MNCH life-saving drugs (n=13) that had been managed in selected public hospitals of Jimma zone were assessed.

4.5.2.1. For RRF, IFRR and bin card

According to integrated pharmaceuticals logistics system Standard Operating Procedures of Ethiopia, hospitals and health centers were expected to send RRF report bimonthly to the next higher level. So, six RRF reports from each hospital (RRF from November 1, 2019, to October 30, 2020) were considered. Thus, $6 \times 6 = 36$ RRFs were obtained for a retrospective review. Regarding logistics recording tools, all bin cards of MNCH life-saving drugs managed in the facility were considered. Thus, $13 \times 6 = 78$ bin cards were assessed in this study. IFRR is used to report the internal transfer of items between the hospital pharmaceutical store and Dispensing Units. The IFRR also calculates the quantity of each item that should be provided to the Dispensing Unit to reach maximum stock levels.

4.5.2.2. For qualitative study

Eighteen pharmacists working on pharmacy related with MNCH activities were selected for in-depth face-to-face interview. Six store managers and 6 pharmacy heads with work experience of greater than one year were involved in the interview. Six dispensary unit coordinators working in the pharmacy was also involved in the study but supply chain coordinator was an alternate of pharmacy head when the head not found in hospitals.

4.6 Study variables

4.6.1 Dependent variable

- LMP of live-saving MNCH drugs
 - ✓ LMIS data accuracy
 - ✓ Stock out rate
 - ✓ Inventory accuracy rate
 - ✓ Wastage rate
 - ✓ Storage condition

4.6.2 Independent variable

- LMIS record quality-related factors
 - ✓ Availability of Bin cards, IFRR, RRF
 - ✓ Bin updating practice

- ✓ Dagu 2 availability
 - ✓ Stock recording
 - ✓ RRF reporting
- Capacity & profession-related factors
 - ✓ Training
 - ✓ Supervision
 - ✓ number of staff
 - ✓ Year of experience
 - ✓ Qualification
- Wastage rate-related factors
 - ✓ Fail to practice FEFO
 - ✓ Receiving near expiry products
 - ✓ Receiving bulk product
- Storage condition-related factors
 - ✓ Safety equipment
 - ✓ Cleanness
 - ✓ Exposure to direct sun light
 - ✓ Cold storage
 - ✓ Security of storage
 - ✓ Storage space
- Stock out related factors
 - ✓ Inadequate supply from source
 - ✓ Stock out at resupply point
 - ✓ Expiry at hospitals

4.7. Data Collection Techniques

Structured and semi-structured questionnaire was developed through adapting the USAID deliver tools and modified it to our country situation (45). Then, data were gathered from hospital stores using the structured and semi-structured questionnaire.

Quantitative Data

Quantitative data has been collected using modified logistics indicator assessment tools (LIAT) developed by USAID| Deliver Project for assessment of facility-based logistics indicators (45). Availability of the medications was checked physically during data collection using check list and questionnaires by data collectors. All relevant documents used within the one year were reviewed for each MNCH drugs to evaluate LMIS and assess the inventory management practice of the MNCH drugs. Physical count of the products was also performed to check bin card accuracy.

Qualitative Data

Four pharmacy professionals working in different units of pharmacy-related activities were selected for in-depth face-to-face interview. 6 Store managers, 6 pharmacy head, 6 dispensary units' coordinators and supply chain coordinators (in the absence of the pharmacy head) with work experience of greater than one year was involved in the interview. The information collected using the LSAT was used to identify issues, opportunities and outline appropriate interventions (46). The principal investigator conducted the interview. The interview took 45 minutes on average. The language of the interview was English. Finally, direct estimates were being used to elaborate themes and clarify quantitative findings.

4.8. Data quality management

The data collection tool was tested on Jimma zone near hospital which was located in Jimma town to ensure the validity of the tools. Two-day training was given for data collectors on quantitative data collection tools and procedures. The principal investigator conducts regular supervision during data collection on the completeness of the collected data. Consistency and completeness of data were checked during data collection and after data collection.

4.9. Data processing and analysis

4.9.1. Quantitative data analysis

The collected data were checked for completeness and consistency of information. Quantitative data was entered into Epi data v3 and, prepared. The output of Epi-data was exported into

statistical packages for social science (SPSS) version 24.0. After analysis, the results of the quantitative data were presented using tables and graphs.

4.9.2. Qualitative data analysis

Qualitative data were analysed using a thematic analysis approach. The information obtained from key informants through in-depth face-to-face interview was collected. First familiarize the data to get an overview of all data collected before starting analysis. Next coding which needs to code the data usually the data was phrases or sentences. After coding generate themes to look over the codes then reviewing themes to summarize and analysed thematically and relevant quotations are used to explain subjects in the presentation of the study findings.

4.10. Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of Jimma University, Institute of Health. Then officials and responsible bodies working in the six public hospitals were communicated through letters. The respondent to the questioner and the interviews for this research was providing the information they know based on their willingness. Moreover, the respondent was informed about the research that the purpose of the study and no information was given to their employers in relation to the individual feedback. During data collection, each respondent was informed about the purpose, scope, and expected outcome of the survey. Respondents were told that participation was voluntary and the right to withdraw from the study at any time was secured. Personal identifiers were not recorded on the questionnaire and all information obtained by face-to-face interview was kept confidential.

4.11 Limitations of the Study

The other health facility (health centre, private clinics and health post) were not addressed due to the study was limited with lack of adequate finance though we had to ensure maximum utilization of available limited fund within the budget and the exposure of Covid-19 virus was high at the time of data collection.

4.12. Operational definitions

- **MNCH Drugs:** are medicines helped to prevent and treat Mother, new born and child health-related diseases and to prevent death.

- **Order Fill Rate:** is the percentage of difference between amounts ordered in the last ordered period and the amount received for that period.
- **Stock out:** the absence of these selected MNCH drugs through MNCH programs in a particular facility.
- **Stock out on the day of the visit:** Lack of the MNCH drugs from the hospitals on the day that the data collector arrived.
- **Wastage rate:** is an item that is unusable because of expiration or damage during a period of one year the acceptable standard was < 2% (47).
- **Bin card accuracy:** is the similarity of stock balance on a bin card with stock on hand obtained during physical count.
- **RRF accuracy-** is the similarity of stock balance reported in the RRF with the stock balance on the bin card on the date that RRF was completed.
- **Accurate-** means there is no discrepancy between the recorded and the stock on hand obtained through the physical count as well as between the records on bin cards and RRF.
- **Near accurate-** means equal to plus/minus ten percent discrepancy between the records on bin cards and RRF as well as between the balance on bin cards and physical count (i.e., the discrepancy ranges from 90% to 110%).
- **Not accurate-** refers to greater than/less than ten percent discrepancy between the records on bin cards and RRF as well as between the balance on bin cards and physical count (i.e., the discrepancy is > 110% or < 90%) (38).
- **Acceptable Storage Conditions:** facilities or medical stores that fulfilled at least 80% of the storage conditions defined to evaluate evaluation of stores (48).

5. Results

5.1. Socio-demographic characteristics of the study participants

The number of professionals working at selected hospitals was found to be 6 store managers, 6 pharmacy head and 6 dispensary unit coordinators was involved. Six (33.33%) of the professionals were working as store managers. Regarding educational qualification, 3(16.67%) of the staff were MSc holders, and the remaining 15(83.33%) were degree qualifiers. Three (16.67%) of the staff had service year of less than 2 years and 5(27.78%) of the staff had greater than 6 years (Table 1).

Table 1: Socio-demographic information of participants in the selected public hospitals, Jimma City and Jimma zone October 2020

Variable	Frequency (%)	Total (%)
Education level		
MSc	3(16.67%)	18(100%)
BPharm	15(83.33%)	
Service year of participant		
1 to 2 years	3(16.67%)	18(100%)
3 to 5 years	10(55.55%)	
Above 6 years	5(27.78%)	

Training received pharmacist working under pharmacy units

The majority of the staff working at pharmacy stores was 5 (83.33%) had trained on integrated pharmaceutical logistics systems (IPLS). While 4 (66.67%) of them had received on-the-job training like inventory management and storage condition management. The respondent was 3 (50%) have trained on health commodity management information systems (Dagu 2) and drug & therapeutics committee (DTC) trainings (Table2).

Table 2: Training received pharmacist working under pharmacy units in selected hospitals in Jimma Zone and Jimma City, October 2020

Variables		Frequency (%)	Total (%)
Logistics (IPLS) training	Received	5 (83.33)	6 (100)
	Not received	1 (16.67)	
On job training like (inventory and store Mgt)	Received	4 (66.67)	6 (100)
	Not received	2(33.33)	
Other (Dagu 2, DTC)	Receive	3 (50)	6 (100)
	Not received	3 (50)	

5.2. Logistics management information system practices

5.2.1. Availability and utilization of logistics tools

From six studied hospitals 5(83.33%) of them were using both paper-based and computerized LMIS (Dagu 2). Blank logistics recording and reporting formats such as bin cards, RRF and IFRR were available in the six assessed public hospitals. Accordingly, 6 (100%) of the hospitals were using Internal Report and Resupply Form (IFRR) for requisition to the store and resupply of the MNCH drugs (Table 3).

Table 3: Availability and utilization of logistic tools in Jimma City and Jimma zone October 2020

s.no	Type of LMIS tools	Available (N= %)		Utilized (N= %)	
		Results	Percent	Results	Percent
1	Bin card	6	100	6	100
2	IFRR	6	100	6	100
3	RRF	6	100	6	100
4	Computerized	6	100	5	83.33

5.2.2. Data Accuracy of RRF Report

A total of 468 RRF items were assessed in a selected public hospital. From that sampled RRF, 396(84.61%) of them were accurately filled, and 72 (15.39%) were found to be inaccurate. All hospitals used RRF to report and request MNCH drugs in every two months regularly scheduled to resupply from EPSA. For instance, Oxytocin 10 units/ml was reported to be 30 (83.33%) accurate in the selected hospitals. From six hospitals only 4 (66.67%) of the hospitals' timely submitted their reports. The total reports submitted to the next higher level, 32 (88.89%) of them were found to be complete (Table 4).

Table 4: Data transfer accuracy of RRF report of selected public hospitals in Jimma City and Jimma zone October 2020

s.no	Item description	Accurate (%)	Near accurate ($\pm 10\%$)	Not accurate ($> < 10\%$)
1	Oxytocin 10 units/ml	30(83.33)	6(16.67)	0(0)
2	Magnesium sulphate 50%/20 ml	24(66.66)	6(16.67)	6(16.67)
3	Misoprostol 200 mcg tab	36(100)	0(0)	0(0)
4	Calcium gluconate	36(100)	0(0)	0(0)
5	Dexamethasone injection or alternative injectable steroid	36(100)	0(0)	0(0)
6	Chlorhexidine gel	24(66.67)	12(33.33)	0(0)
7	Gentamicin injection	30(83.33)	6(16.67)	0(0)
8	Ampicillin or benzyl penicillin injection/procaine pen or alternative	36(100)	0(0)	0(0)
9	Ceftriaxone	36(100)	0(0)	0(0)
10	ORS	24(66.67)	12(33.33)	0(0)

11	Zinc 20 mg dispersible tab	24(66.66)	6(16.67)	6(16.67)
12	Amoxicillin 250 mg dispersible tab	24(66.66)	6(16.67)	6(16.67)
13	Amoxicillin 125 mg suspension	36(100)	0(0)	0(0)
	Subtotal	396(84.61)	54(11.54)	18(3.85)

5.2.3. Utilization and updating Bin card practices

A total of 78 bin cards were evaluated in the selected public hospitals. Accordingly, from the total of assessed MNCH drugs, 71(91.02%) of the items have bin-cards. From those items only 65(83.33%) of the bin cards were updated. The rest of bin cards 13 (16.67%) of the items were not updated. The bin card updating practices of the MNCH drugs was also indicated in the table below (Table 6).

Table 5: Bin card updating practice in selected hospitals, Jimma City and Jimma zone October 2020

s. no	Name of the product	Availability of BC		Updated BC		Not Updated BC	
		Result	%	Result	%	Result	%
1	Oxytocin 10 units/ml	6	100	6	100	0	0
2	Magnesium sulphate 50%/20 ml	5	83.33	5	83.33	1	16.67
3	Misoprostol 200 mcg tab	6	100	6	100	0	0
4	Calcium gluconate	5	83.33	5	83.33	1	16.67
5	Dexamethasone injection or alternative injectable steroid	5	83.33	5	83.33	1	16.67
6	Chlorhexidine gel	5	83.33	4	66.67	2	33.33
7	Gentamicin injection	5	83.33	4	66.67	2	33.33

8	Ampicillin or benzyl penicillin injection/procaine pen or alternative	6	100	5	83.33	1	16.67
9	Ceftriaxone	5	83.33	5	83.33	1	16.67
10	ORS	6	100	5	83.33	1	16.67
11	Zinc 20 mg dispersible tab	6	100	6	100	0	0
12	Amoxicillin 250 mg dispersible tab	5	83.33	4	66.67	2	33.33
13	Amoxicillin 125 mg suspension	6	100	5	83.33	1	16.67
	Subtotal	71	91.02	65	83.33	13	16.67

5.2.4. Data Accuracy of bin cards

From the total of 65 updated bin cards, the average accuracy of bin cards in the hospitals was calculated to be 59 (90.77%) of items. The bin card accuracy range was from 75% to 100% of items. 4 (6.15%) of items were nearly accurate in the tablet below (Table 8).

Table 6: Data Accuracy of Bin card practice in selected public hospitals, Jimma City and Jimma zone October 2020

s.no	List of products	Accurate	Near accurate ($\pm 10\%$)	Not accurate ($> \pm 10\%$)
1	Oxytocin 10 units/ml	5 (83.33%)	1(16.67%)	0%
2	Magnesium sulphate 50%/20 ml	5 (100%)	0%	0%
3	Misoprostol 200 mcg tab	6 (100%)	0%	0%
4	Calcium gluconate	4(80%)	1 (20%)	0%
5	Dexamethasone injection or alternative injectable steroid	5 (100%)	0%	0%

6	Chlorhexidine gel	3 (75%)	0%	1 (25%)
7	Gentamicin injection	3 (75%)	1 (25%)	0%
8	Ampicillin or benzyl penicillin injection/procaine pen or alternative	5 (100%)	0%	0%
9	Ceftriaxone	4 (80%)	0%	1 (20%)
10	ORS	5 (100%)	0%	0%
11	Zinc 20 mg dispersible tab	5 (83.33%)	1 (16.67%)	0%
12	Amoxicillin 250 mg dispersible tab	4 (100%)	0%	0%
13	Amoxicillin 125 mg suspension	5 (100%)	0%	0%
Subtotal		59 (90.77%)	4 (6.15%)	2(3.08%)

5.3. Inventory management practices of MNCH Drugs

5.3.1. Availability of stocks in the studied hospitals

From the total of 13 items in the six hospitals of the available items were 59 (75.64%). Oxytocin 10 units/ml was in a normal stock level (in between two to four months of stock) in 5 (83.33%) of hospitals. Over-stocking was seen for calcium gluconate in 4 (66.66%) and ORS in 5 (83.33%) of the studied hospitals. Ceftriaxone injection was below the minimum stock level in 3 (60%) of the studied public hospitals (Table 9).

Table 7: Percentage of stock status on the date of the visit in public hospitals, Jimma City and Jimma zone October 2020

s. no	List of products	No. of hospitals managing the product at time of data collection	Less than min stock level (%)	Greater than max stock level (%)	Max-Min stock level or normal (%)
1	Oxytocin 10 units/ml	6	1(16.67)	0(0)	5(83.33)
2	Magnesium sulphate 50%/20 ml	6	2(33.33)	1(16.67)	3(50)
3	Misoprostol 200 mcg tab	0	0(0)	0(0)	0(0)
4	Calcium gluconate	6	1(16.67)	4(66.66)	1(16.67)
5	Dexamethasone injection or alternative injectable steroid	3	0(0)	1(33.33)	2(66.67)
6	Chlorhexidine gel	0	0(0)	0(0)	0(0)
7	Gentamicin injection	4	1(25)	0(0)	3(75)
8	Ampicillin or benzyl penicillin injection/procaine pen or alternative	6	0(0)	1(16.67)	5(83.33)
9	Ceftriaxone	5	3(60)	0(0)	2(40)
10	ORS	6	0(0)	5(83.33)	1(16.67)
11	Zinc 20 mg dispersible tab	5	0(0)	1(20)	4(80)
12	Amoxicillin 250 mg dispersible tab	6	0(0)	2(33.33)	4(66.66)
13	Amoxicillin 125 mg suspension	6	1(16.67)	2(33.33)	3(50)
	Subtotal	59	(15.25)	7 (28.82)	3(55.93)

5.3.2. The stock out rate of MNCH Drugs and its contributing factors (N=13)

From the total of 13 items for each of selected six public hospitals, 22 items (28.20%) of them were stocked out at least once within the last 1 year with a different duration of days. Misoprostol 200 mcg and chlorhexidine gel were stock outs from the six studied hospitals at the time of the visit. During the last 1 year of the study period, 3 (50%) of hospitals had stock out for dexamethasone injection or alternative injectable steroid items. In this study the average days of stocked out of the hospitals with the average duration of 21.64 days.

The hospitals have mentioned the reason for the stock out of the MNCH Drugs included expiry and inadequate supply from resupply points. From the six hospitals respondents have reported that the inadequate resupply was the main cause of stock out. Accordingly, the inadequate supply at resupply point was identified 20 (90.90%) of stock out from the six hospitals. 2 (9.10%) of the report was expiry as the cause of stock out (Table 10).

Table 8: MNCH Drugs stock outs and the reasons for stock outs in Jimma City and Jimma zone October 2020

S. No	List of products	Stock Out on the day of visit	Stock Out for the past 1 year (%)	Reason for stock out	
				Expiry (%)	Inadequate quantity resupply (%)
1	Oxytocin 10 units/ml	0	0(0)	0(0)	0(0)
2	Magnesium sulphate 50%/20 ml	2	0(0)	1(16.67)	1(16.67)
3	Misoprostol 200 mcg tab	6	1(16.67)	1(16.67)	5(83.33)
4	Calcium gluconate	0	0(0)	0(0)	0(0)
5	Dexamethasone injection or alternative injectable steroid	3	1(16.67)	0(0)	3(50)
6	Chlorhexidine gel	6	3(50)	0(0)	6(100)

7	Gentamicin injection	4	0(0)	0(0)	4(66.67)
8	Ampicillin or benzyl penicillin injection/procaine pen or alternative	0	0(0)	0(0)	0(0)
9	Ceftriaxone	1	0(0)	0(0)	1(16.67)
10	ORS	0	0(0)	0(0)	0(0)
11	Zinc 20 mg dispersible tab	0	0(0)	0(0)	0(0)
12	Amoxicillin 250 mg dispersible	0	0(0)	0(0)	0(0)
13	Amoxicillin 125 mg suspension	0	0(0)	0(0)	0(0)
Subtotal		22(28.20%)	5	2(9.10%)	20(90.9%)

5.3.3. Ordering and receiving of MNCH Drugs

From the six assessed hospitals, 3(50%) studied hospitals how much to order was determined by a pharmacy head. But the supply gets from the supplier was not enough in quantity. Accordingly, the six public hospitals were prepared and sent every two months their orders to EPSA-Jimma hub for resupply (figuer 3).

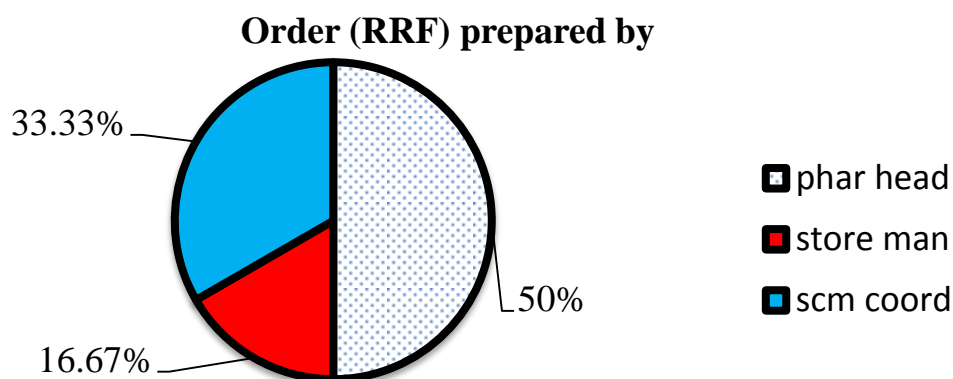


Figure 3: Professionals prepared ordering items to hospitals in Jimma City and Jimma zone October 2020

Regarding the emergency order, 4 (66.67%) of the studied hospitals placed one or two times in the past 6 months orders the items. Two (33.3%) of hospitals have also placed an emergency order above two times within the past 6 months of period (Table 11).

Table 9: Emergency orders of MNCH Drugs in Jimma City and Jimma zone October 2020

Emergency orders have placed in the past 6 months	Frequency	Percent
None	0	0
One to 2	4	66.67
Above 2	2	33.33
Subtotal	6	100

From the six selected public hospitals, 4 (66.7%) of the hospitals have received their orders within one to two months of period after sending the RRF. The ordering of MNCH drugs with the reporting and requesting form to resupply and the receiving items were done in model 19 (receiving vouchers) of the hospitals (Figure 4).

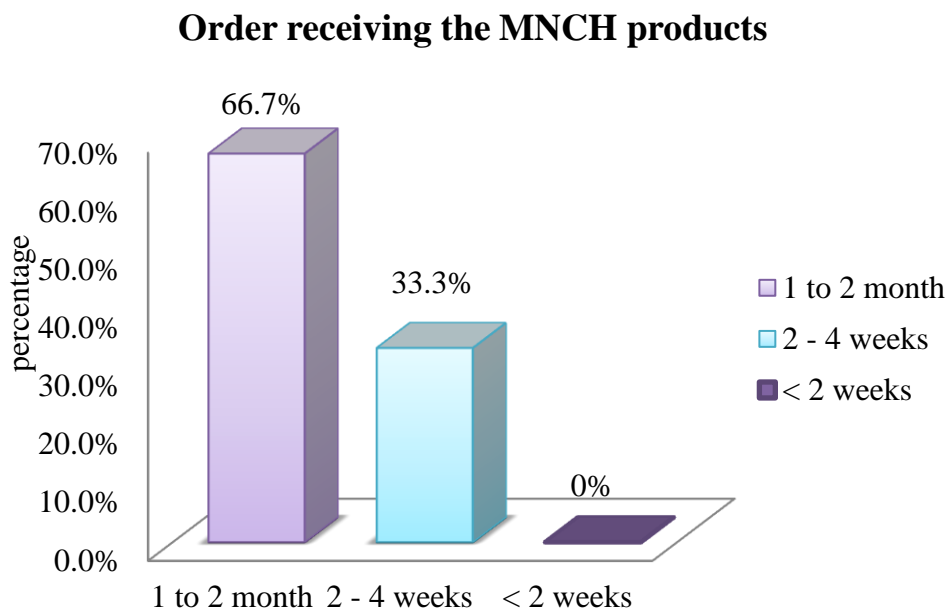


Figure 4: Percentage of received ordered drugs in studied hospitals of Jimma City and zone October 2020

5.3.4. MNCH Drugs Wastage rate in the selected hospitals

The wastage of studied MNCH drugs in the selected public hospitals was calculated using the percent of wasted (unusable) MNCH drug quantity divided by usable + unusable stock. The total amount of usable calcium gluconate item was 156 and usable + unusable stock was 186 from this the calcium gluconate was 16.12% wasted. Magnesium sulphate 50%/20 ml was 7.9% wasted within the past 6 months of the study. The overall wastage rate was 12.03% of MNCH drugs were found to be wasted. The reasons for wastages of these MNCH drugs were explored and found to be receiving bulk products, receiving of near expiry products and fail to practice FEFO (Table 12).

Table 10: Wasted MNCH drugs in hospitals of Jimma Zone and Jimma City, October 2020

S. No	List of products	Hospital (n=6)			
		unusable	Usable	+ unusable usable	%wasted
1	Magnesium sulphate 50%/20 ml	10	120	130	7.69
2	Misoprostol 200 mcg tab	25	230	255	9.8
3	Calcium gluconate	30	156	186	16.12
4	ORS	638	4200	4838	13.18
5	Ampicillin or benzyl penicillin injection /procaine pen or alternative	1000	5400	6400	15.6
6	Zinc 20 mg dispersible tab	480	4428	4908	9.78

The value of the wasted MNCH drug was calculated based on the unit cost obtained from model 19 (receiving vouchers) of hospitals within the past 1 year during the study period. Accordingly, from the six hospitals a total of 8370.72 ETB was lost. The wasted value was found to be high with calcium gluconate 597.9 (16.13%) and followed by ampicillin or benzyl

penicillin injection 2480 (15.62%) so on in hospitals. From the total received values in the past 1 year, 8370.72 (11.74%) was wasted in a selected public hospital (Tables14).

Table 11: The values of wasted MNCH drugs in selected public hospitals of Jimma City and Jimma zone October 2020

Description of wasted MNCH drugs	Hospital (n=6)					
	Unit	Unit cost (ETB)	Wasted Quantity	Total cost Wasted (ETB)	Total cost received in last 1 year ETB	% of wasted cost(ETB)
Magnesium sulphate 50%/20 ml	Amp	45.95	10	459.50	5973.5	7.69
Misoprostol 200 mcg tab	Kit	132	25	3300	33660	9.80
Calcium gluconate	Amp	19.93	30	597.9	3706.98	16.13
ORS	Sachet	2.14	638	1365.32	10353.32	13.18
Ampicillin or benzyl penicillin injection procaine pen or alternative	Vial	2.48	1000	2480	15872	15.62
Zinc 20 mg dispersible tab	Tab	0.35	480	168	1717.8	9.78
Subtotal cost (ETB)				8370.72	71283.6	11.74

5.3.5. The physical inventory of MNCH Drugs

Most of the studied public hospitals conducted physical inventory was annually (once per year) 3 (50%) of the hospitals. This shows that the studied hospitals used different time frames to accomplish physical inventory (Figure 5).

The physical inventory of MNCH drugs

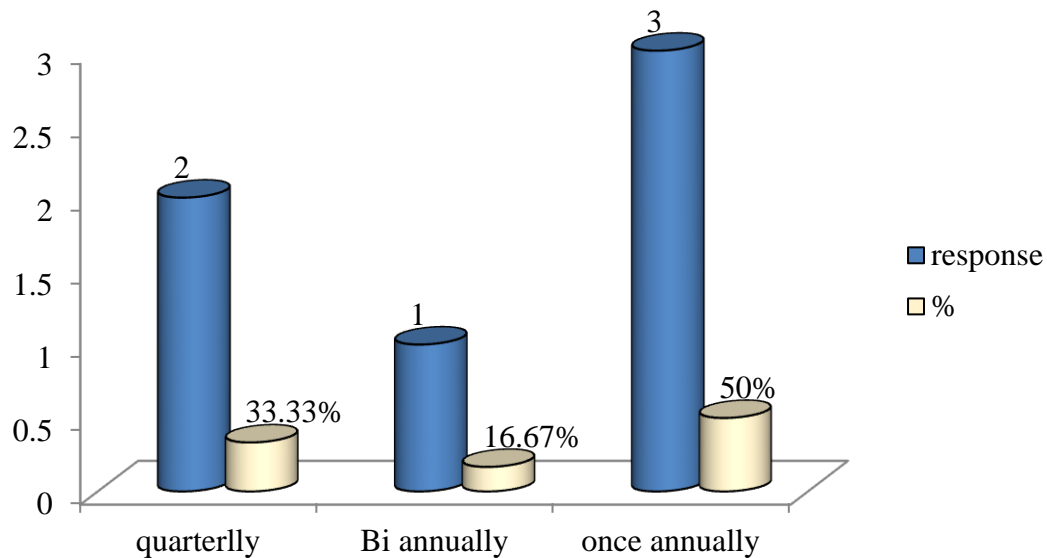


Figure 5: physical inventory of MNCH Drugs in selected hospitals, Jimma City and Jimma Zone October 2020

5.4. Storage conditions of hospitals

From the total of six hospitals five (83.33%) of the assessed hospitals has fulfilled the minimum acceptable storage condition (>80%) according to IPLS SOP. And the remaining 1(16.67%) of hospitals has not fulfilled the minimum acceptable storage condition. The average storage conditions fulfilled by the studied public hospitals were 65 (83.33%). Storage conditions fulfilled 100% from the six hospitals include: storeroom is maintained in good condition, protection from direct sunlight, security of the storage with lock and accessibility to only authorized personnel. 2(33.33%) of the studied hospitals expired and damaged products were not separated from the usable stock. The least fulfilled criteria were security of free from harmful insects and rodents and placing products 30 cm away from walls. The questioner was prepared Yes/No for all the six hospitals then coded for Yes (1) and for No (2) to analyze the percentage (Table 15).

Table 12: Adherence of the selected public hospitals to storage guidelines, Jimma City and Jimma

S.No	Questions	Code	Comment
		Classification	
01	MNCH drugs are arranged & organized according to a logical categorization.	Yes 1	5 (83.3%)
		No 2	1 (16.7%)
02	Are unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from	Yes 1	4 (66.7%)
		No 2	2 (33.3%)
03	MNCH Drugs are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible.	Yes 1	4 (66.7%)
		No 2	2 (33.3%)
04	Products are stored and organized in a manner which facilitates use of first-to-expire, first out (FEFO).	Yes 1	5 (83.3%)
		No 2	1 (16.7%)
05	Products are protected from direct sunlight and high heat at all times of the day/during all seasons.	Yes 1	6 (100%)
		No 2	0 (0%)
06	The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well organized).	Yes 1	6 (100%)
		No 2	0 (0%)
07	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized	Yes 1	6 (100%)
		No 2	0 (0%)
08	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents	Yes 1	3 (50%)
		No 2	3 (50%)
09	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are	Yes 1	6 (100%)
		No 2	0 (0%)
10	Products are stacked at least 10 cm off the floor.	Yes 1	6 (100%)
		No 2	0 (0%)
11	Products are stacked at least 30 cm away from the walls and other stacks.	Yes 1	2 (33.3%)
		No 2	4 (66.7%)
12	Products are stacked no more than 2.5 meters high.	Yes 1	6 (100%)
		No 2	0 (0%)
13	Products are stored at the appropriate temperature during all seasons according to product temperature specifications.	Yes 1	6 (100%)
		No 2	0 (0%)
Subtotal			65 (83.33)

5. 5. Qualitative result

The findings of qualitative study were reviewed carefully and categorized into five themes using a thematic approach. Finally, the information obtained was summarized and presented with narration as follows.

5.5.1. warehousing and storage management

In most of the studied public hospitals warehouse management was supported by Dagu. The major activities include receiving, issuing, transfer in/out, inventory control and waste disposal. One of the Pharmacy heads reported that

“... The main activities performed in the central store include receiving, issuing, transferring in, transferring out pharmaceuticals, inventory control and expiry and damage separation, report preparation and involved in requisitions. Dagu has facilitated inventory management and utilization of information.”

Other tasks of the store are timely preparation of requisitions and reporting form bimonthly to EPSA branches. One of the store managers informed us that,

“...Requesting and reporting format completeness and timeliness was very important in the availability of pharmaceuticals. We prepare RRF both electronically and manually and send it to the EPSA Jimma hub.

Inventory control system was the stock in hospitals can able to hold the least amount of inventory in hospitals warehouses. Which type of inventory control system is used to keep inventories in a desired state. One of the store managers informed us that,

‘...They use a periodic inventory systems to control. But they do not track inventory on a daily basis due to shortage of pharmacist; rather, they allow organizations to know the beginning and ending inventory levels during a certain period of time.’

5.5.2. Inventory management practice challenges

The challenges that related to internal facilities

Availability of the MNCH drugs

The availability of the MNCH drugs both at the studied hospitals and the supplier side were observed challenges. One of the pharmacy heads reported that

“...the availability of MNCH drugs was inconsistent. What we receive from EPSA was not according to what we requested. The quality of RRF reports generated was also a factor for the unavailability of these drugs.”

Personnel and Capacity Building-Related Challenges

Qualified pharmacy professionals were required for the successfulness and effectiveness public hospitals and specifically for the pharmacy services. The shortage of pharmacy professionals and staff commitment was challenges raised by most of the interviews. The unavailability of continuous professionals' development triggered the challenges. One of the pharmacy heads informed us:

“... One of the challenges we face at the pharmacy service was shortage of pharmacy personnel in the market. On top of this, the commitment of the practicing professionals was low.”

On-job training, training on IPLS, storage management, DTC and experience sharing with good performing institutions are received in your hospitals. One of the store managers informed us that:

“...They believe training in such activities was improving this knowledge gap, but our hospital manager was not have willing to send us for training, because of absence of professionals to cover the job.”

Administrative Related Challenges

The attention of the higher managers gave to the pharmacy service was weak or strong. Budget scarcity was one of complain raised by the interviewees. Delayed procurement due to unable to provide vehicles timely and the stocks got short from the suppliers' side this is because of the administration of the hospitals cannot differentiate the vital drugs from the stationeries and other services. One of the interviewees stated that:

“... The hospital offers very low attention for pharmacy; less priority provided for utilizing the vehicles in the procurement schedules of the pharmacy. The allocated budget is also low. For program drugs or RRF must waiting the EPSA or suppliers’ until to be refilling (resupply) the MNCH life-saving drugs to hospitals.”

The Challenges That Related to External Factors Commitment of the suppliers

Multiple stakeholders are involved in MNCH drugs management: EPSA, MOH, RHB pharmacy core process owners, facility store managers, and partners. Areas of expertise include MNCH drug quantification and forecasting, procurement, storage and distribution, and supply chain management and decision-making. One of the interviewees informed us:

“... Insufficient MNCH drugs were supplied by EPSA Jimma Branch. Late delivery of the drugs was also problems we encountered.”

5.5.3. Possible solutions of the inventory management challenge

The possible solutions for the identified inventory management challenges were also explored during the in-depth face-to-face interview. Most of the respondents believe that the inventory management problems would be solved by the higher managers of the hospitals and also at the individual levels of the professionals. The top managers are responsible for make decisive actions for malpractices under their leadership.

The budget allocated to the procurement of drugs should also get attention from the government side. Timely fulfilling human power to the pharmacy service should also fixed form the public hospital level.

The ultimate goal of a supply chain system is to ensure product availability at all times and minimize wastage rate of the product. This study recommended all public hospitals must separate the wasted products from the usable stock. On behalf of that the expired and damaged products must be disposed by the role of FMHACA.

Preparing the cold room for hospital and procuring the medical refrigerators should get attention. This requires additional budget; therefore, the hospitals should work with partners to fill the gap. Connecting the backup generator to all medical stores to secure the product’s safety and efficacy should also have to get priority.

Arranging off-site and on-site on-job trainings are also another solution. The EPSA has launched IPLS electronic version. Interested people should be registered and secure a certificate of recognition/completion. Implementing IPLS as prescribed as a standard should get emphasis.

6. Discussions

This study focused on the availability of the life-saving MNCH drugs and inventory management practices in the public hospitals. In the public hospital, MNCH drugs are strategic area requiring significant attention and effective management in the health system of the country. Strengthening inventory management of pharmaceuticals was expected to improve stock status information including stock availability, stock out duration and storage condition at hospital level.

Availability of standard logistics recording and reporting tools/formats and proper use of these tools have a substantial role in the implementation of effective and efficient logistics management information systems (36). The study showed that, the availability of automated recording tools (computer Dagu 2) was 100% while its utilization was only 5 (83.33%) in the studied public hospitals. The 100% availability of automated recording tools in this study was because of the delivery of at least one computer for the purpose of the Dagu 2 program by the US aided DELIVER projects (26). However, the utilization was below the standard due to lack of computer skills and inability to maintain the disabled computers as reported by the respondent. Lack of trained human power was one of the challenges identified in this study where 1 (16.67%) of the staff's working under store managers were not received training on Dagu 2 (IPLS).

The LMIS reporting and recording formats were well used at hospitals as the result showed that 5(83.33%) of hospitals were using IFRR with schedule for reports and resupply of MNCH drugs to the units. In the all studied hospitals, RRF was utilized for reporting the MNCH drugs to suppliers (EPSA). But the accuracy of the RRF was only 396 (84.61%). The study finding is in between the assessment conducted by SIAPS in Cameroon and Burundi, where in the accuracy of their reports were 75% & 90%, respectively (49).

Logistics tool record updating and its accuracy was an important indicator in the management of pharmaceuticals. Logistics records (bin cards) need to be updated in order to convey reliable information about the stock status in the store (50). Good inventory management assures the updating of all bin cards for the products managed with no discrepancy between physical count and record on bin cards. The current study showed that the utilization of bin cards was 91.02%; and 83.33% of them were updated. It is higher than the national data for IPLS implementation

(33.5%) and below the standard (100%) (47). The reason for variation with the national data may be due to methodology difference and time in which the study was conducted; the negligence and low staff commitment may be reasons for lower achieving from the standard.

According to the present study, all hospitals assessed had controlled their stock using an established max/min inventory control system (25). However, they are in the challenge of under stockings and over stockings of products. This study showed that, the overall, availability of MNCH drugs were 59 (75.64%) in studied public hospitals; which was below the expected 100% availability of essential drugs. But the finding figure was lower than what is expected. The availability of the essential MNCH drugs, oxytocin was available in 5 (83.33%) of hospitals; Magnesium Sulphate was available in 50% of studied hospitals. These findings were comparable with study done showed that overall, availability priority RMNCH drugs and drugs were available in less than 80% at the time of the survey (39). It is better than the result of the National Health Facility Assessment on Reproductive Health Drugs and Services (51, 52). The possible reason for this may be due to the initiatives set by government to reduce maternal and newborn morbidity and mortality to improve maternal health and time frame in which the study was conducted. Shortage of MNCH drugs might be associated with the reporting system of hospitals which seriously affect forecasting at national level. Therefore, to prevent these types of interruption needs efficient supply chain (53).

The current study from the selected six public hospitals MNCH drugs, 22 items (28.20%) of the items were stocked out at least once within the past 1 year with a different duration of times. So the finding showed that there was a serious interruption of MNCH drugs in the supply chain and was an indicative of the current supply chain was not strong enough to fill the gaps. 6 (100%) of the studied hospitals had stock out of Misoprostol 200 mcg and chlorhexidine gel on the day of the visit which is very important for maternal and newborn baby. In this study the average days of stocked out of the hospitals with the average duration of 21.64 days. The current finding is also greater than to a study conducted by Gurm and Ibrahim in the east Shewa zone, in which the average stock-out duration was 35.31 days (43). Shortage of MNCH drugs might be associated with the reporting system of hospitals which seriously affect forecasting at national level. Therefore, to prevent these types of interruption needs efficient inventory management plan needs.

Wastage rate is one of the indicators that measures inventory management performance in hospital. Poor inventory management in public hospitals results in wastage of financial resources. Because of poor inventory management, stocks becoming obsolete and expired in the store causing wastages of products. This means medicines were expired without noticed by anybody (54). In this study the overall wastage rate was 12.03% which is 6 times higher than the nationally set standard (47). Failed to follow FEFO procedures, delivery of near expiry by PFSA and receiving bulk were the reasons for expiry. The difference from the standard may be attributed to poor adherence to the Federal Hospitals Pharmacy directive (55) and lower commitment of the store managers.

The value of the wasted MNCH drug was calculated based on the unit cost obtained from model 19 (receiving vouchers) of hospitals. Accordingly, from the six hospitals a total of 8370.72 ETB was lost. From the total received values in the past 1 year, 8370.72 (11.74%) was wasted in a selected public hospital. Wastage rate is one of the indicators that measures inventory management performance in the hospitals. Redistribution of products from one hospital to another is an important task to reduce wastage of MNCH drugs by expiration before their use. In the case of short shelf life and limited supply, the ability to efficiently redistribute products with full accountability will save the life of patients and resources. However, none of the hospitals assessed had practiced the activities of redistribution.

The purpose of storage is to issue high-quality drugs and ensure little or no loss is caused by damage or expiry. In order to preserve the integrity of the products stored, the storage condition for pharmaceutical products should comply with the recommended good storage practices. In the present study, the storage condition of MNCH drugs was assessed using a predefined good pharmacy storage practices described in LIAT (56). To supply clients with high-quality products, each facility must have safe, protected, and well-organized storage areas that were preventing damage. Almost all of the selected hospitals in Jimma zone lack adequate storage space. When we result discussion, the overall storage condition of hospitals achieves storage condition >80% were only 4 (66.67%), hospitals had fulfilled the criteria of good pharmacy storage practice (57).

The finding is different with the national survey result 80% of hospitals meets the storage criteria and also this result is not a line with the standard operating procedure manual (48). This assessment revealed that the storage condition of the studied hospitals was not adequate so it

leads to inefficient handling and use of drugs. About 4(66.67%) of the hospitals are separate expired items from useable stock, 3(50%) of the hospitals stored visually free from harmful insects and rodents, 5(83.33%) of the hospitals fulfilled both Pharmaceutical arranged well ready for distribution and organized in manner which facilitates use of first to expire, first out (FEFO), 6(100%) of hospitals were fulfilled storage area is secured with a lock and key. But only 2(33.33%) of hospitals had products are stacked at least 30 cm away from the walls and other stacks and 6(100%) of hospitals had products are stored at the appropriate temperature during all seasons according to product temperature specifications. And the overall storage condition fulfilled among the studied hospitals was 83.33%; and is similar with the national standard value (47). It is found to be higher as compared to Lesotho (57.43%) (58).

7. Conclusions

From this study, we can conclude that inventory management practices of MNCH drugs in hospitals were poor characterized by several factors, including report inaccuracy, poor record updating practices, frequent stock outs and resource wastages. The main causes of poor inventory management practices were shortages of man power that run to burden of high workload. The challenges associated with inventory management include, stock out at the supplier side and lack of budget at hospitals. The store men were unable to accomplish their inventory management activities timely and accurately since multiple tasks were covered by a single pharmacist. Fail to followed FEFO procedures and near expiry products delivered by EPSA were led to expiry. This expiry was the cause of stock outs and wastage of resources resulted from poor inventory management practices. The study conducted hospitals have good storage condition practices.

8. Recommendations

Based on the findings of this assessment the following recommendation can be forwarded to public hospitals in Jimma City and Jimma Zone

- There should need a continuous improvement plan that addresses the gaps seen on LMIS, stock handling, and in inventory management activities which should be accompanied by on-job training for store managers to build the capacity of professionals.
- EPSA shall not deliver near expiry products in excess amount to hospitals. The agency should also improve its supply capacity to increase quantities as most of the hospitals reported that the cause of stock out was due to inadequate supply from EPSA.
- The public hospitals should conduct stock status analysis on a routine basis.
- Facility managers shall increase their commitment towards their profession to ensure quality product security for their customers.
- The Public hospitals should adhere to the appropriate storage guideline.

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Annexes

Annex-1- List of life-saving MNCH drugs to be assessed

S. No	Name of the product	Use for
1s	Oxytocin 10 units/ml	Mother
2	Magnesium sulphate 50%/20 ml	Mother
3	Misoprostol 200 mcg tab	Mother
4	Calcium gluconate	Mother
5	Dexamethasone injection or alternative injectable steroid	Neonatal/ Child and Mother
6	Chlorhexidine gel	Mother/ Child
7	-Gentamicin injection	Neonatal/ Child and Mother
8	- Ampicillin or benzyl penicillin injection/procaine pen or alternative	Neonatal/ Child and Mother
9	-Ceftriaxone	Neonatal/ Child and Mother
10	ORS	Neonatal/ Child
11	Zinc 20 mg dispersible tab	Neonatal/ Child
12	Amoxicillin 250 mg dispersible tab	Child
13	Amoxicillin 125 mg suspension	Child/ Neonatal

Annex-2- List of indicators used to measure MNCH drugs Inventory management practice & LMI'S

1. Inventory accuracy rate = $\frac{\text{\# of items where stock record count equals physical stock count}}{\text{total number of items counted}} * 100$

2. Accuracy in stock record keeping = $\frac{(\text{stock record count} - \text{physical stock count})}{\text{physical stock count}} * 100$

3. Facility LMIS report reporting Rates = $\frac{\text{\# of HFs submitting LMIS report by a certain date}}{\text{Total number of facilities required to report}} \times 100$

4. Average stock-out duration in a health facility (days) = $\frac{\text{Sum of stock-out days}}{\text{Total number of tracer items}}$

5. Stock out Rates = $\frac{\text{\# of storage facilities assessed that experienced a stock out of pharmaceuticals}}{\text{total no.of facilities assessed}} * 100$

6. Percentage of facilities that maintain acceptable storage conditions =

$$\frac{\text{\# of stores fulfilled 80% of storage condition}}{\text{Total \# of stores or warehouses visited}} \times 100$$

7. % fulfillment of the storage conditions =

$$\frac{\text{No.of 'yes' responses}}{\text{Total \# of storage conditions considered for each facility}} \times 100$$

8. Stock wastage due to expiration or damage = $\frac{\text{unusable physical stock}}{\text{usable} + \text{unusable physical stock count}} * 100$

9. Value of unusable stock = $\frac{\text{value of wasted units per product}}{\text{value of total units received of the same product}} * 100$

Appendix: Respondent information sheet quantitative data collection

My name is Wondwosen Kumsa my colleague is school of pharmacy. I am a postgraduate student in PSCM at Jimma University and I am conducting a research study on Assessment of inventory management practice of maternal, new born and child health life-saving drugs in selected public health facility in Jimma zone and I would like to ask you a few questions about maternal, new born and child health drugs. I would like to take your time to respond to our structured questionnaire and it was taking approximately 15 minutes. So this type of research can be used to assess the current MNCH drugs and it was providing an input for future improvement. All response was to be kept confidential that means your response was only being shared with evaluation team members and we were assured that any information we include in our report does not want to and you may end the interview at any time. May I continue?

If the respondent agrees to continue, ask if he/she has any questions. Respond questions as appropriate and then ask the questions.

Wondwosen Kumsa e-mail: wondekum@yahoo.com Tell: +251911747105

Annex 3: MNCH drugs questionnaire and observation check list

Data collection tool

General Information

Date: _____

Name of facility: _____

Town: _____ woreda: _____

First ask to speak to head of the pharmacy. After explaining myself asks the following questions, and then visit the warehouse, service dispensary unit. If you are referred to another staff member keep telling the purpose of the visit before data collection.

S. No	Questions	Code Classification	Comment
A. General Information			
01	Title of person interviewed		
02	A number of years and months you have worked at this		
03	Educational back ground		
04	Who is the responsible person for MNCH drugs?		
05	Who determines this facility's resupply quantity?		
B. LMIS formats and its use in the past one year			
01	Is there LMIS system in your facility?	Yes 1	
02	Are the facility using Internal Report and Requisition Form	Yes 1	
03	Are the unit that manage MNCH has regular schedule for report and request?	Yes 1 No 2	
04	At the store Bin Cards (BC) are managed or available?	Yes 1	
05	At the store Bin Cards (BC) are updated?	Yes 1	
06	Is the facility has regular report and requisition time/schedule for MNCH drugs?	Yes 1 No 2	

07	Is the facility use report and requisition form (RRF) for MNCH drugs?	Yes 1 No 2	
08	To whom the hospitals send their request?	RHB 1 EPSA 2	
09	From where are the facility is supplied with MNCH drugs?	RHB 1 EPSA 2	
10	Do the hospitals get the drugs as per the report and request sent?	Yes 1 No 2	

Annex 4: Inventory management practice

1. Does the hospital have a set minimum stock level for MNCH drugs at which orders need to be placed?

A. Yes

C. Don't know/not sure

B. No

2. Does the hospital have a set maximum stock level for MNCH drugs above which the inventory level should not go?

A. Yes

C. Don't know/not sure

B. No

3. Who determines how much to order?

A. Pharmacist

B. Higher level authorities

C. Other (specify) _____

4. Which data elements do you use to calculate how much to order?

A. Average monthly consumption

B. Stock remaining (stock on hand)

C. Other (specify) _____

D. Don't know/not sure

5. Where does this facility send its order for resupply?

A. Jimma EPSA hub

B. Central EPSA

C. Other (specify) _____

6. How often do you place orders?

A. Monthly

B. Bimonthly

C. Quarterly

D. Other (specify) _____

7. When was the last time you sent an order/report for products from this facility?

A. Within the last month

C. 3 months ago

B. 2 months ago

8. How many emergency orders have you placed in the last 2 months?

- A. None
- B. 1
- C. 2
- D Other (specify) _____

9. On average, approximately how long does it take between ordering and receiving products?

- A. Weeks to 1 month
- B. between 1 and 2 months
- C. More than 2 months

10. Are there MNCH drugs that you always stock out before resupply?

- A. Yes
- B. No

11. If yes to question 10, list the drugs you stock out of the most frequently.

- 1. _____
- 2. _____
- 3. _____
- 4. _____

12. What are the reasons for stock out?

- 1. _____
- 2. _____
- 3. _____
- 4. _____

13. Is there expired or damaged MNCH product?

- A. Yes
- B. No

14. What are the reasons for expiry?

- 1. _____
- 2. _____

15. Do you always have an over stoke of MNCH drugs before resupply?

- A. Yes
- B. No

16. If yes to question 15 list the MNCH drugs you have an over stoke of most frequently.

- 1. _____
- 2. _____
- 3. _____
- 4. _____

17. How do you arrange your products?

- A. By FIFO
- B. By LIFO

18. How often is a physical inventory of MNCH drugs conducted in the central medical stores?

- A. Every month
- B. Every two months
- C. Every three months
- D. Others _____

Annex 5: Storage conditions

This is based on visual inspection of the storage facility; note any relevant observations in the comments column. To qualify as “yes,” all products and cartons must meet the criteria for each item.

S.No	Questions	Code Classification	Comment
01	MNCH drugs are arranged & organized according to a logical categorization.	Yes 1	
		No 2	
02	Are unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from	Yes 1	
		No 2	
03	MNCH Drugs are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible.	Yes 1	
		No 2	
04	Products are stored & organized in a manner which facilitates use of first-to-expire, first out (FEFO).	Yes 1	
		No 2	
05	Products are protected from direct sunlight and high heat at all times of the day/during all seasons.	Yes 1	
		No 2	
06	The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well organized).	Yes 1	
		No 2	
07	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized	Yes 1	
		No 2	
08	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings or insects].)	Yes 1	
		No 2	
09	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are	Yes 1	
		No 2	
10	Products are stacked at least 10 cm off the floor.	Yes 1	
		No 2	
11	Products are stacked at least 30 cm away from the walls and other stacks.	Yes 1	
		No 2	
12	Products are stacked no more than 2.5 meters high.	Yes 1	
		No 2	
13	Products are stored at the appropriate temperature during all seasons according to product temperature specifications.	Yes 1	
		No 2	

Annex 6: Store stock status data for life saving MNCH drugs (for the past 1 year and day of visit)

Product	Unit	Managed at facility Y/N	BC Available Y/N	BC Updated Y/N	Stock out most recent 1 year Y/N	Number of Stock out	Total number of stock out days	Stock out today Y/N	SOH today (Quantity)	AMC (Number of months taking)	Availability of expired MNCH drugs Y/N
Oxytocin 10 units/ml	Amp										
Magnesium sulphate 50%/20 ml	Amp										
Misoprostol 200 mcg tab	Tab										
Calcium gluconate	Amp										
Dexamethasone injection or alternative injectable steroid	Amp										
Chlorhexidine gel	Tube										
Injectable Antibiotics:											
-Gentamicin injection	Amp										
- Ampicillin or benzyl penicillin injection	Vial										
-Ceftriaxone	Vial										
ORS	Sach										
Zinc 20 mg dispersible tab	Tab										
Amoxicillin 250mg dispersible tab	Tab										
Amoxicillin 125 mg suspension	Bottl										

Annex 7: Availability of 13 priority life-saving MNCH drugs

SN	Medicine Description	At the time of visit Store		Stock-out duration (in days) at store		Reason for stock-out at the time of survey
		Yes	No	Past 1 year	Past one month	
1	Oxytocin 10 units/ml					
2	Magnesium sulphate 50%/20 ml					
3	Misoprostol 200 mcg tab					
4	Calcium gluconate					
5	Dexamethasone injection or alternative injectable steroid					
6	Chlorhexidine gel					
	Injectable Antibiotics:					
7	-Gentamicin injection					
8	- Ampicillin or benzyl penicillin injection					
9	-Ceftriaxone					
10	ORS					
11	Zinc 20 mg dispersible tab					

12	Amoxicillin 250 mg dispersible tab					
13	Amoxicillin 125 mg suspension					

Select one reason below for stock-out at the time of survey and insert the number et the space

1. Delays on the part of main source institution to resupply this SDP
2. Delays on the part warehouse to resupply this SDP
3. Delays by this SDP to request for supply
4. The item is not available from source of supply
5. Low or no client demand
6. Lack of information about the item
7. Expired
8. Any other reason (please specify)

Annex 8: In-depth interview health professionals

Respondent information sheets qualitative interview data collection

My name is Wondwosen Kumsa, my colleague is school of pharmacy. I am a postgraduate student in PSCM at Jimma University and I am conducting a research study on Assessment of inventory management practice of maternal, new born and child health life-saving drugs in selected public health facility in Jimma zone and I would like to ask you a few questions about maternal, new born and child health drugs. I would like to take your time to respond to our interview questions and it was taking approximately 45 minutes. So this type of research can be used to assess the current MNCH drugs and it was providing an input for future improvement. All response was be kept confidential that means your response was only being shared with evaluation team members and we were assured that any information we include in our report does not want to and you may end the interview at any time. May I continue?

If the respondent agrees to continue, ask if he/she has any questions. Respond questions as appropriate and then ask the questions.

Wondwosen Kumsa e-mail: wondekum@yahoo.com Tell: +251911747105

How do you see the inventory management practice of your hospital? What about LMIS condition at your hospital? How they being are practiced? _____

What are the challenges associated with inventory management?

What are the possible solutions? What measures were taken to alleviate the challenges?

What are the opportunities the hospital does not utilized to improve the inventory management of lab commodities? _____

Annex 9: List of hospitals of the Jimma zone

S.No	Name of facility
1	JUMC
2	Shenen Gibe General Hospital
3	Agaro General Hospital
4	Limu General Hospital
5	Seka Primary Hospital
6	Gatera Primary Hospital
7	Nada Primary Hospital