PHARMACEUTICAL LOGISTICS SYSTEM PERFORMANCE OF PUBLIC HEALTH FACILITIES IN PEMBA.

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PHARMACEUTICAL LOGISTICS SYSTEM PERFORMANCE OF PUBLIC HEALTH FACILITIES IN PEMBA.

By

Hosiana Eliakimu

A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science (Pharmaceutical Management) of Muhimbili University of Health and Allied Sciences.

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CERTIFICATION

The undersigned certify that she has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled **"Pharmaceutical Logistics System Performance of Public Health Facilities in Pemba"** in partial fulfillment of the requirements for the degree of Master of Science in Pharmaceutical Management of Muhimbili University of Health and Allied Sciences.

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Dr. Kagashe, G. A.

Supervisor

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Date

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Last but not least, I would like to thank all those who could not be mentioned here, but in one way or another, contributed to the successful completion of this work. I would like to say that, the contribution you all provided is highly appreciated.

DEDICATION

This work is dedicated to my parents; Mama E. Mangowi and the Late Mzee Eliakimu I. Saria. **I LOVE YOU SOO MUCH MY PARENTS!**

ABSTRACT

Background: Inventory management is the important pillar of the pharmaceutical supply system. Problems in inventory management system generally features with ad hoc decision about order frequency and quantity, inaccurate stock records and lack of system performance monitoring and consequently shortage of pharmaceuticals in the health facilities.

Objective: The objective of this study was to assess the pharmaceutical logistics system performance in Pemba public health facilities.

Methodology: The study was a cross-sectional survey that involved twenty eight health facilities and two warehouses. Inventory keeping records over a period of one year, from January to December 2012, were reviewed. Data on storage condition and HWs' knowledge on logistics were collected using storage condition check list and questionnaire respectively. Data on medicine expiry were collected based on recorded data and physical counting.

Results: The average percent of time out of stock for all health facilities combined was 31%, at ZILS department store was 13.2% and at the Zonal Central Medical Store was14.4%. Percentage of accurate stock records was 70.6% in health facilities that were using pull supply system, 64.9% in those facilities which were using push supply system, and 47.3% in facilities which were using bulky supply system (DHs). Storage condition in 52.2% of the PHCUs was unacceptable.

Conclusion: Health facilities in Pemba, within a year, faced stock outs of a number of pharmaceutical products. Stock keeping records were also not perfectly accurate. It is recommended that training should be conducted to all health workers involved in the management of pharmaceuticals, on the basics of pharmaceutical store management with due emphasis on record keeping and specifically the proper use of store ledgers and bin cards.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CMS	Central Medical Stores
CSCMP	Council of Supply Chain Management Professionals
DHMT	District Health Management Team
DH	District Hospital
HAI	Health Action International
HF	Health Facility
HIV	Human Immunodeficiency Virus
HWs	Health Workers
IMAT	Inventory Management Assessment Tool
JSI	John Snow Inc
LIAT	Logistics Indicator Assessment Tool
LMIS	Logistics Management Information System
MPPS	Master Plan for the Pharmaceutical Sector
MSD	Medical Stores Department
MSH	Management Sciences for Health
MUHAS	Muhimbili University of Health and Allied Sciences
NDP	National Drug Policy
NGO	Non Governmental Organization
PHCC	Primary Health Care Centre
PHCU	Primary Health Care unit
RDTm	Rapid Diagnosis Test for malaria
REACH	Rural Expansion of Afghanistan's Community Health System
RGZ	Revolutionary Government of Zanzibar
SP	Sulphadoxine pyrimethamine
STG	Standard Treatment Guidelines
USAID	United States Agency for International Development

WHO	World Health Organization
ZCMS	Zonal Central Medical Store
ZEML	Zanzibar Essential Medicines List
ZILS	Zanzibar integrated logistics system
ZSGRP	Zanzibar Strategy for Growth and Reduction of Poverty

DEFINITIONS OF TERMS

Pharmaceuticals: This term is used in this document to mean medicines and other medical supplies.

Physical inventory: is a process of counting by hand the total number of units of each item in store/warehouse at any given time.

Percentage of time out of stock: is the percentage of days during a 12 month period that a pharmaceutical product was out of stock in a health facility or warehouse.

Tracer products: in this document the term has been used to mean pharmaceutical products that are essential and must be available in all health facilities. The list of tracer products has been used as a guide in conducting this study.

CHAPTER ONE

1. INTRODUCTION

 1.1 BACKGROUND

Effort by nations to ensure availability of essential medicines to those who need the medicines is historical. In 1977, WHO issued its first model list of essential medicines as per the directives of the World Health Assembly which was held in 1975 [1]. WHO has defined essential medicines as those that satisfy the priority healthcare need of a population and therefore, they are required to be available in sufficient amount at all times [2].

After the Alma ata declaration in 1978, member countries were urged to prepare national drug policy. WHO was tasked to help the countries to establish the policy, and in light of this it established a program called action program on essential drug [1].

As the Ministry of Health Zanzibar is independent from that of the Tanzania mainland, the issue of offering quality health care services to all Zanzibaris (in Pemba and Unguja) is a total responsibility of the RGZ. Essential pharmaceuticals are important integral part of a quality health care service delivery. The RCZ, through the Ministry of Health, has been taking steps to ensure essential pharmaceuticals reach all who are in need of them. The steps include;

Having a dense network of HFs both in Pemba and Unguja; 95% of residents in the whole of Zanzibar walk not more than five kilometres before reaching a health facility. Development of various documents to guide use of pharmaceuticals and development of pharmaceutical sector in general. The documents are; Zanzibar National Drug Policy (NDP) reviewed in 2006, Zanzibar Essential Medicine List (ZEML) reviewed in 2010, Standard treatment Guidelines (STG) reviewed in 2007 and Master Plan for Pharmaceutical Sector (MPPS) reviewed in 2005. And third is inclusion in both two phases of the Zanzibar Strategy for Growth and Reduction of Poverty (ZSGRP), objectives that aim towards having smooth management of procurement and supply chain for essential medicines and other supplies, as means to having

timely and adequate medicines and supplies and appropriate treatment and hence improved health service delivery [3].

In ensuring essential pharmaceuticals reach all those who need them, apart from policy and other documents, there are many other activities involved. For simplicity of understanding and explaining the activities, they have been grouped into functional components forming a cycle called pharmaceutical management cycle [2]. Figure 1 show the pharmaceutical management cycle.

Pharmaceutical management include all activities done with the aim to ensuring the timely availability and appropriate use of safe, effective, quality medicines and related products and services in any health care setting [4].
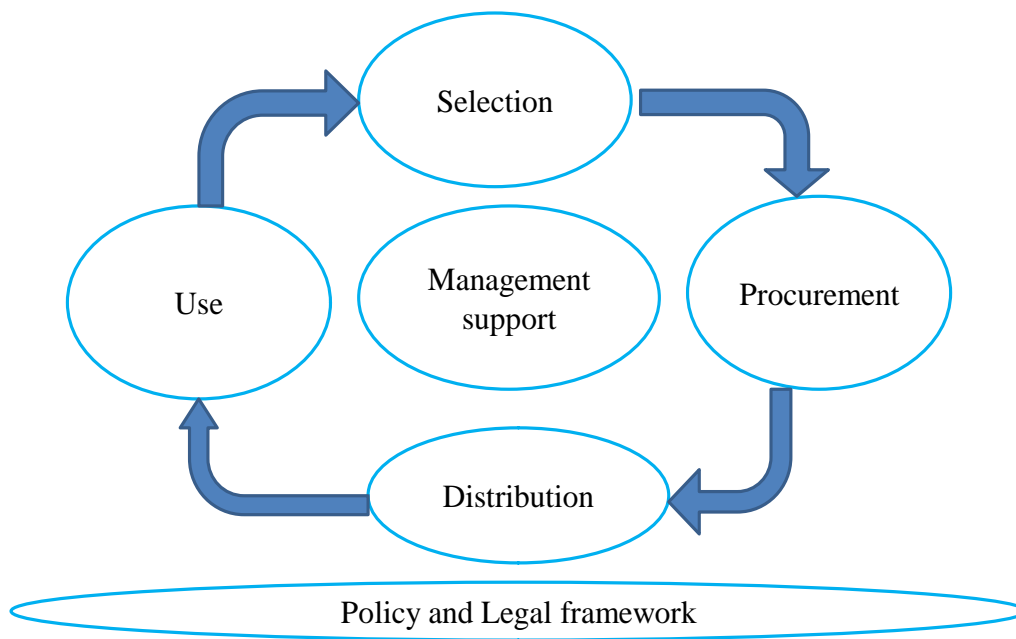
Figure 1: Pharmaceutical Management Cycle
Source: Management Sciences for Health and World Health organization.1997.

Management Support which includes human resource management, information management, financing and organization is at the centre of the cycle holding the other components of the cycle together. The entire cycle rests on a policy and legal framework meaning that all the five components of the cycle are controlled and influenced by the policy and regulatory framework in which they operate [2]. The entire pharmaceutical sector in Pemba is governed by the Zanzibar National Drug policy. The overall objective of the Zanzibar National Drug Policy is to make available to all Zanzibaris at all times, essential pharmaceutical products of quality, proven effectiveness and acceptable safety, at a price that the individuals and the community can afford [5].

Selection involves choosing a few pharmaceutical products deemed essential to meeting health care needs of individuals in a particular country or area. The limited number of items contributes to better supply, more rational use, and lower costs [2]. In the Zanzibar health care setting, selection of pharmaceuticals is done at the Ministry of Health in Unguja.

Efficient and effective procurement system is important in any health care system as it ensures availability of right quantities of good quality and safe products at reasonable prices [4]. Procurement means, the process of purchasing supplies directly from national or multinational private or public suppliers; purchasing through global agencies and procurement mechanisms or regional procurement systems; or purchasing from international procurement agents [6]. In Zanzibar, Central Medical Store is the central agency for procurement of pharmaceuticals that are to be used in public health facilities. As CMS headquarters are in Unguja most of the procurement activities for pharmaceuticals are not done in Pemba.

Distribution involves more than taking pharmaceutical from a warehouse to HFs where they are needed. It involves many activities that recur in awhile and therefore form what is known as the distribution cycle. The distribution cycle begins when pharmaceutical are dispatched by the manufacturer or supplier and ends when pharmaceutical consumption information is reported back to the procurement unit. Activities involved in the distribution cycle are; pharmaceutical procurement, port clearing, receipt and inspection, inventory control, storage,

requisition of supplies, delivery, dispensing to users and consumption reporting. Once the pharmaceuticals are in a service delivery point (health facility) the pharmaceutical management system have a role to ensure that pharmaceuticals are used rationally [2].

Activities in the pharmaceutical management cycle may take place at various levels of the health system depending on the design of the health system [2]. However, in Pemba many activities in pharmaceutical management are done centrally at the Ministry of Health and CMS headquarters in Unguja. Activities of the pharmaceutical management that are done in Pemba are the distribution activities. The distribution activities that are done in Pemba are receipt and inspection, inventory control, storage, requisition of supplies, delivery of supplies to HFs, dispensing to users and consumption reporting.

All issues related to pharmaceutical distribution in Zanzibar, and therefore Pemba, public health facilities are managed by the Central Medical Stores. The Central Medical Stores has two branches; Unguja branch (headquarters) and Zonal Medical stores in Pemba. The zonal medical store in Pemba is responsible for preparing orders (through CMS-Headquarter), storing and distribution of supplies to health facilities in Pemba.

Public health facilities in Pemba receive their supplies through three distribution systems.

The bulky system: This means that, Zonal Central medical Stores Pemba orders supplies (through CMS headquarters Unguja) from MSD at Dar Es Salaam, stores and distribute them to respective health facilities. Facilities in this group are the district hospitals in Pemba. These facilities pull their supplies from the ZCMS. Other facilities, however, may obtain supplementary supplies from the ZCMS, by sending their requests through their respective District Health management teams (DHMTs).

The kit system: Kit system has for long been used to supply pharmaceuticals to health facilities in Zanzibar. And it was until January 2011, when the government of Zanzibar through the Ministry of Health started a pilot on pull supply system in nineteen primary health care facilities of which nine are in Pemba.

The pull system: The facilities pull their requirements from CMS headquarters in Unguja. When the pilot started there was also establishment of a special unit to manage orders, storage and distribution of all the products involved in the system. The pull pilot phase started in January 2011 in nineteen primary health care facilities in the whole Zanzibar, and Pemba had nine health facilities in the pilot phase.

Figure 2 shows the flow of pharmaceuticals and information within various levels of the supply chain in Pemba.
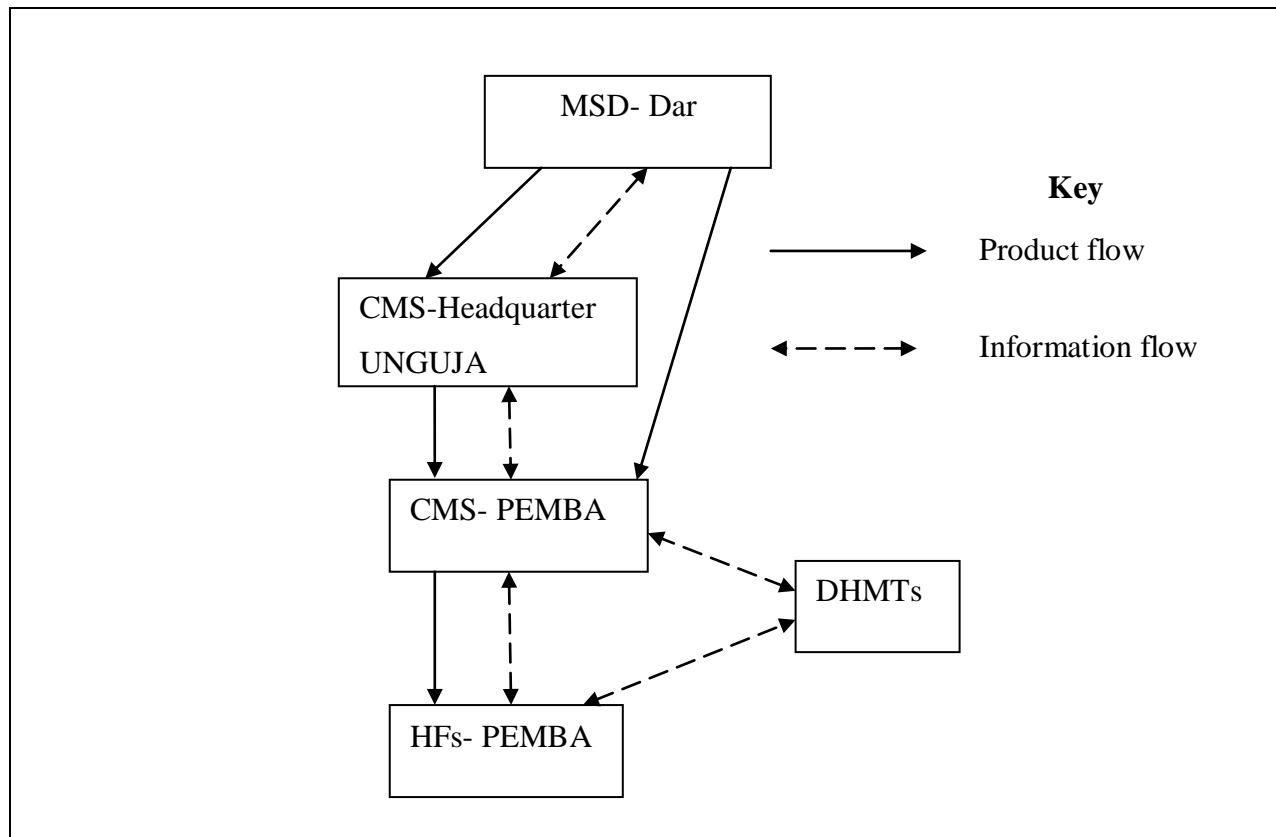
Figure 2: Flow of pharmaceuticals and information in Pemba

The distribution process as any other pharmaceutical management process involves logistics management. The Council of Supply Chain Management Professionals (CSCMP) has defined logistics as that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements [7, 8]. In other words logistics is the management of inventory, at rest or in motion [7].

Logistics plays a very important role in ensuring that supply chain satisfies customers' needs. This study focuses on the pharmaceutical logistics system performance in Pemba, concentrating on the areas of control of and storage of inventories. Inventory management is the important pillar of the pharmaceutical supply system. Problems in inventory management system generally features with ad hoc decision about order frequency and quantity, inaccurate stock records and lack of system performance monitoring and consequently shortage of pharmaceuticals in the health facilities.

In assessing the performance of the pharmaceutical system in Pemba in ensuring a constant supply of the pharmaceuticals and therefore satisfying the customer needs, the pharmaceutical logistics system performance indicators were used. The indicators are those developed by MSH and the DELIVER project. The indicators used were the average percentage of time products were out of stock, the average percent of products available on the day of visit, average percentage of stock record that correspond with the physical count and the percent of the facilities that maintained an acceptable storage condition for pharmaceuticals.

1.2. STATEMENT OF PROBLEM

In 1977, nations made a commitment to ensure availability of essential medicines in public health facilities. However, as this commitment approaches its fortieth anniversary, stock out of essential medicines still remains a chronic problem to many developing countries in general and specifically in Africa [9]. Consequences of stock ousts of essential medicines in health facilities are frustrating to both patients and prescribers. To patients this may mean they have to resort to private medicines outlets, go to traditional healers or forgo treatment. To prescribers stock outs are hurting as their clients do not get what they have judged appropriate for them. It may also lead to irrational use of medicines as prescribers may decide to prescribe what is available in a facility.

Pharmaceuticals stock shortage and stock outs are characteristics of poor pharmaceutical supply system that affects many developing countries as they suffer lack of financial resources, infrastructure, capacity and competencies [10]. Stock shortages and stock outs of pharmaceuticals are among salient features of a poorly performing pharmaceutical logistics system. These problems significantly compromise the quality of healthcare service delivery to patients.

Assessment of the supply system provides information for targeted interventions in strengthening the system [11]. Various studies have been done to assess pharmaceutical logistics systems of different countries in the world and even in Tanzania mainland. These studies have identified chronic stock outs of essential medicines as a common problem to health facilities [12]. The studies have also established the magnitude of the stock out problems in the facilities.

The Zanzibar Strategy for Growth and Reduction of Poverty (ZSGRP) -Phase II, puts that, shortage of pharmaceuticals was one of the factors that hindered realization of health goals and objectives under ZSGRP-phase I, which was implemented between 2007 and 2010 [3]. Despite been one of the factors that hampered realization of the health goals, the magnitude of

the problem of pharmaceutical stock shortage and stock outs at health facilities is not known. The logistics system performance, also, in areas of record keeping and storage is not known.

Therefore, this study aimed to assess the pharmaceutical logistics system performance in public health facilities in Pemba Island and establish the magnitude of the problems associated to the system performance.

1.3. RESEACH QUESTIONS

The following research questions triggered the idea to conduct the study.

1. What is the average stock out duration of pharmaceuticals in public health facilities in Pemba?

2. How are pharmaceutical requirements quantified in the district hospitals?

3. How are health facilities performing in reducing stock outs and expiry problems?

4. What is the logistics knowledge level of the personnel involved in the pharmaceutical management?

5. How accurate are the stock-keeping records in the health facilities?

6. How acceptable are the pharmaceutical storage conditions in the public health facilities in Pemba?

1.4. STUDY OBJECTIVES

1.4.1 Overall Objective

To assess the pharmaceutical logistics system performance in Pemba public health facilities, and contribute to the understanding of the magnitude of problems emanating from the systems' performance.

1.4.2. Specific Objectives

1. To determine the average stock out duration of pharmaceuticals in health facilities in Pemba.

2. To determine methods used by district hospitals in Pemba to quantify their pharmaceutical requirements.

3. To assess logistics knowledge of personnel involved in the pharmaceutical supplies chain management in public health facilities in Pemba.

4. To assess the quantity of expired medicines in health facilities.

5. To assess the accuracy of stock-keeping records in public health facilities.

6. To assess the general storage conditions for pharmaceuticals in the health facilities.

1.5. RATIONALE OF THE STUDY

Access to essential medicines is one of the fundamental human rights. Access to essential medicines, also, is an important component of an effective primary healthcare system [9]. Zanzibar has made a commendable stride in ensuring its citizens access the essential pharmaceuticals by having a good network of health facilities and hence more than 95% of the population leave within five kilometres or less to a health facility.

Holding stock in a pharmaceutical supply system aims at ensuring that essential medicines are available most of the time [6], and therefore promote access to essential medicines. Shortage of medicines, however, has continued to be a main barrier to access to essential medicines in the sub-Saharan Africa [13]. Unavailability of essential pharmaceuticals makes patients suffer, demoralize the health workers and consequently the entire health system loses its credibility to the community [6, 14].

One of the health goals of the ZSGRP II is to achieve improved health service delivery through having smooth management of the procurement and supply chain for essential medicines and other medical supplies [3]. This requires having in place an efficient supply system. Assessment of the pharmaceutical supply system provides data, and therefore information for targeted interventions in strengthening the system and thus making it efficient [11].

Availability of data related to health issues is a big challenge to many developing countries in general and specifically to Africa [10, 15]. This study, first, contributes to the pool of data related to health issues, and specifically on availability of medicines and medical supplies in Sub- Saharan Africa. Secondly, the study help to identify problems in the pharmaceutical logistics system in Pemba island public health facilities, and recommend possible interventions and solutions. The study will also act as trigger for the Government to undertake an in-depth assessment of the pharmaceuticals supply chain system in Zanzibar that will help to identify bottlenecks towards ensuring smooth management of procurement and supply chain for essential medicines and other supplies- one of the health goals of MKUZA II [3].

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Pharmaceutical availability in health facilities.

Medicines play an important role in public health care programs, saving lives and drawing people to health facilities, where they can also receive preventive treatment. Medicines can also help keep health care costs down [16]. Despite this important role of medicines in the health care delivery system, access to essential medicines has remained a big challenge to many populations around the world. Survey by WHO/HAI estimates that in about 40 developing countries, availability of medicines in the public sector is only one third [17].

An assessment that was done in 2008 in Bihar district - India showed that, most of the times health facilities experienced shortage of essential medicines [18]. The study revealed that the shortage in the health facilities was a result of the Central Medical Store being always in very short supply or completely out of stock of the essential medicines required by the facilities. Similar results were reported by studies that were done in Malawi and South Sudan, where shortage at the CMS were cited as the main course of shortage at the facilities [9, 19].

In efforts to curb the problem of unavailability of pharmaceuticals, some programs have made it mandatory for facilities to report on their consumption and stock on when requesting for supplies. An assessment that was done in Afghanistan to REACH grantee NGOs found that for the surveyed warehouses, on average 81% of the tracer medicines were in stock on the day of the visit and in surveyed HFs, on average 86% of the tracer medicines were in stock on the day of visit [20].

Different supply systems have also be shown to effect different level of pharmaceutical availability in health facilities [2]. A study that was done in Uganda to assess the impact of the pull system on the availability and reduction of expiry of essential medicines and medical supplies found that the average percentage days of out of stock for drugs and medical supplies were higher in push system (15.3%) as compared to pull system[21].

In Tanzania mainland studies have also shown that shortage of supplies or complete out of stock at MSD severely affects availability in health facilities. A study done in Tanzania to assess availability and management of medicines and medical equipments in primary public health care facilities showed that the facilities faced stock outs of essential medicines and medical equipments. Seventy five percent (75%) of the facilities faced stock-out of RDTm and 50%-70% of the facilities faced stock-out of Oxytocin. The study associated the problem with 1) inability of MSD to supply medicines as requested by facilities and 2) health facilities lacked capacity to order medicines correctly, including predicting medicine needs and manage stock keeping [22].

Unavailability of essential medicines is also a problem to Zanzibar. An assessment that was done in 2010 on quality of maternal and newborn health services found that 50% of the visited selected facilities had no iron or iron folate tablets and thirty seven percent of the visited facilities had no SP tablets [23].

2.2 Accuracy of stock records for inventory management.

The study that was done in Afghanistan found that 20% to 25% of the warehouses did not have up to date stock cards, did not mark dates of stock outs and did not keep the stock card with the items [20]. A study done in Tanah Papua to assess HIV/AIDS commodities showed that in general inventory management was poor, stock record keeping and subsequent data quality was poor and management of expiry dates was weak [24]. The survey in Jordan also found that the average percentage of stock records that corresponds with physical count was 38.4% [25].

In Kenya, an assessment that was done in 2006 to assess stock status and logistics system for various vertical programs found that, in general there was inadequate availability of recording and LMIS tools and poor quality of records and reporting [26].

2.3 Methods used in quantification/estimation of the pharmaceutical needs.

Poor forecasting and quantification systems have been affecting many developing countries [27]. In Jordan, an assessment that was done to assess pharmacy and inventory control in ministry of health hospitals showed that quantification of pharmaceutical needs was not done properly and this led to needs being either overestimated, resulting into surpluses and expiration of unconsumed pharmaceuticals, or underestimated, resulting in shortages. This malpractice compromises the quality of pharmaceutical services delivered to patients, and threatened the sustainability of pharmaceutical availability [25].

In the process of quantification of pharmaceutical needs, scholars have formulated some methods to be used among which are the consumption method and the morbidity method [2]. A study done in Afghanistan, to assess the pharmaceutical logistics management capacity of REACH grantee NGOs found that most visited HFs and warehouses (96%) used consumption method to quantify their needs for pharmaceuticals [20]. A survey that was done in Jordan revealed that, in the surveyed facilities, estimation of medicines requirements was not done properly and in various health centres usually there was no demand estimation done and hence drugs supplied were not in accordance with community needs [18].

2.4 Knowledge of health workers on pharmaceutical logistics system.

Knowledge of those managing the 'last mile' of the supply chain, that is, from district or zonal warehouse to the health facility to the patients is critical for the essential pharmaceuticals to the patients [14]. However some studies have shown the knowledge of some of individuals involved in the pharmaceutical supply logistics is low.

An assessment in Uganda showed that one of the factors that led to poor availability of pharmaceuticals health facilities was lack of training in pharmaceutical quantification and the system that was used to supply the pharmaceutical (pull system) [21].

A survey that was done in Dar es salaam hospitals on medicine stock out and inventory management problems in public hospitals found that, sixty five percent (65%) of the interviewed pharmaceutical health workers were unable to mention the methods used in inventory control. Sixty five percent (65%) were unable to mention the method they were using to estimate the quantities of pharmaceuticals required annually, and about twenty two percent (22%) mentioned the consumption method while twenty seven percent (27%) said they quantified the amounts of medicines depending on the funds available [28].

The above cited studies provide evidence that pharmaceutical logistics systems in many countries globally and specifically in the developing world are facing some problems in their operations. Problems of unavailability of pharmaceuticals, poor record keeping practices and therefore poor quality of data and reports are some of the problems that were evident in the cited studies.

Pemba, therefore, being in the developing country, is no wonder that its pharmaceutical logistics system might be facing similar challenges as those in other developing countries. The studies cited above provided significant knowledge on how the study in Pemba was conducted.

CHAPTER THREE

3. METHODOLOGY

3.1 Study site

Pemba Island has a land area of about 864 square kilometres. It is one of the two big islands that constitute Zanzibar, the other one is Unguja. Pemba, administratively, is divided into two regions; North Pemba and South Pemba. Each region is subdivided into two districts. North Pemba has Micheweni and Wete districts and South Pemba has Chake Chake and Mkoani districts. Each district is further subdivided into constituencies and Shehia [5]. According to the 2012 population and housing census, Pemba has a population of 406,848 people [29].

3.2 Study Design

A cross-sectional study was conducted to assess the pharmaceutical logistics system performance. Inventory records over a period of one year, from January to December 2012, were reviewed. Questionnaire and storage observation check list were used to collect information on logistics knowledge of the health workers involved in pharmaceutical management and general pharmaceutical storage condition respectively.

3.3 Study population

This study involved public health facilities in Pemba Island and health workers in these facilities who were involved in the pharmaceutical logistics management. Pemba public health services infrastructure relies on:

- A fairly dense network of Primary Health Care Units (PHCUs), that are meant to serve in principle a population of 3,000 to 5,000. Pemba has 56 Primary Health Care Units.
- Primary Health Care Centres (PHCC); commonly known as cottage hospitals, that provide inpatient care (30 beds) and some medical investigations (laboratory, X-ray), with a higher staff profile and located in places that have somewhat larger populations than those with a PHCU. Pemba has 2 PHCCs.

- District hospitals (DHs), providing second-line referral services, including basic surgery, with 80 to 120 beds. There are 3 DHs in Pemba. In the entire health service infrastructure network of Zanzibar, hitherto, DHs are only found in Pemba [30, 31].

Distribution of HFs by type and district in Pemba is as can be seen in the table 1.

Table1: Public health facilities' distribution in Pemba Island.

Region		South Pemba		North Pemba	
District		Mkoani	Chake chake	Wete	Micheweni
No. of District hospitals		1	1	1	0
Other facilities	No. Of PHCC	0	1	0	1
	No. Of PHCU+	3	4	3	3
	No. Of PHCU	11	9	14	9
Total number of facilities		15	15	18	13
Grand total facilities		61			

Pemba was selected as a study site as it has district hospitals and therefore provides a wider scope of the assessment.

3.4 Sample size and sampling process

Sample size for this study was 28 health facilities and 39 health workers. Two stores (Zonal Central Medical Store in Pemba and ZILS store within CMS headquarters in Unguja) were also involved in the study as they are sources for supplies to the health facilities.

The sample size for health facilities was achieved based on the guidelines for conducting pharmaceutical logistics indicators assessment by MSH [32]. The guideline requires that at least 20 health facilities (from four carefully selected geographical areas; districts or regions) be included in a study, five health facilities from each selected area.

Pemba has four districts and therefore all were included in the study, and the principal researcher considering the size of Pemba districts, decided to include seven health facilities from each district. The sample size was obtained randomly based on systematic sampling technique (interval method). The technique was used to obtain the seven health facilities from each district. However, for a district which has a district hospital, the hospital was the first to be included in the sample as per the guideline [32]. Calculation for the sampling interval was done as follows; for example, if a district has 12 health facilities and the required number of facilities was 6 then, the interval was obtained by dividing twelve by six. i.e. 12/6=2.

Therefore the facilities were arranged alphabetically and then one facility was picked after every other. Starting point was chooses by writing number 1 to 12 on different small pieces of paper, the papers were then rolled. Then, one piece of paper was picked randomly and the number on it was taken as a starting point. For example, if the number on the paper was 3, then the third facility was the first to be picked. Then, 3+2=5, that means the fifth facility on the list was the second to be picked. The same procedure was repeated till the required number of facilities was obtained.

The sample size for health workers was achieved based on convenience sampling technique and therefore all workers who were available in the facilities on the day of assessment were included in the study.

3.5 Inclusion and exclusion criteria
3.5.1 Inclusion criteria
For the HFs, only those which used push supply system in the whole year and those which used pull supply system in the whole year were included. All health workers involved in the management of pharmaceuticals in public health facilities were included.

3.5.2 Exclusion criteria

For the HFs, facilities in islets were excluded from the study because of budgetary constraints and weather. In case of health workers, all those not working in the selected health facilities were excluded from the study.

3.6 Pretesting of the data collection tools

Data collection tools were pretested prior to commencing the study. Pretesting was done in 3 primary health facilities in Unguja. After pre-testing, necessary modifications to the tools were made and then the study was rolled out.

3.7 Data collection

3.7.1 Data collection tools

In this survey data were collected through review of records, observation and self administered questionnaire. Tools used in the record review were;

1. List of tracer products (annex 2). This list was used to guide the review and it had thirty one items. The list was prepared based on the Zanzibar essential medicines list and it included all items that the list deemed them essential to be available in all Primary Health Care Units (PHCUs), the lowest level of healthcare provision system in Zanzibar [33].

2. Inventory data collection form (annex 3). This collected data on name of a product, unit of count of the product, record count, recent receipts and issues, adjusted total record count and physical count. This tool was used to compare stock balance reading of a stock keeping record and actual stock available on the shelf (physical count) on the day of visit.

3. Stock out data collection form (annex 4). This tool has twelve months of a year arranged in columns and was used to record number of days in each month that a product was out of stock in a particular facility. The tool provided for computation of the total number of days that a product was out of stock in a year.

4. Product expiry data collection form (annex 5). The tool collected data on product name, unit count of the product, quantity expired and date of expiry. The too was used to assess quantity of pharmaceuticals expired in the health facilities.

A tool that was used in observation data collection was the facility storage condition observation checklist (annex 6). The tool was adopted from that developed by the DELIVER project [34]. It was used to collect data on the general pharmaceutical storage condition in the health facilities.

Self administered questionnaire was used to collect data on pharmaceutical logistics knowledge of health workers involved in pharmaceutical management. Apart from questions to inquire on demographic features of the workers, there were seven questions to assess the knowledge.

3.7.2 Study variables
The survey intended to collect data to provide for the following information;
- Average percentage of time that products were out if stock in health facilities in the period of assessment (January- December 2012).
- Average percentage of products in stock on the day of visit.
- Percent of accurate stock keeping records in health facilities
- Method used to estimate pharmaceutical needs.
- Proportion of health workers with good pharmaceutical knowledge
- Percent of expired products in health facilities.
- Percentage of health facilities with the acceptable general pharmaceutical storage condition.

3.8 Data collection procedure
All data were collected by the principal investigator. Data on days out of stock were collected by review of store ledger and/or bin cards and day out of stock was counted from when a stock record was recorded zero to when the stock record showed the stock was in. Data on

availability on the day of visit was collected based on physical count of the products in the store and at the dispensing area.

Data on accuracy of stock of stock record was collected by review of store ledger and/or bin card and adjusting for recent issues and receipts that were within seven days to the day of visit and comparing with the physical counts.

Data on pharmaceutical logistics knowledge of the HWs was collected by first obtaining consent of the health workers and then giving them a self administered questionnaire which after filling they were returned to the principal investigator.

Data on storage condition was collected though observing the general storage condition in the facilities' store area and marking against the specific storage criterion on the check list.

3.9 Data management/analysis and presentation

Data collected were checked for completeness daily after field visit. Data collected using questionnaire were then entered into computer software SPSS. Data cleaning was done by running frequency tables and then analysed. Data collected using forms and checklists were entered into excel sheet. The excel sheet was used to make the required calculation.

Availability of pharmaceuticals was assessed based on average percentage of time that products were out of stock for the whole year of 2012 and percentage of products in stock on the day of assessment. Calculations for these two indicators were based on the formulas developed by the Management Sciences for Health [32, 35].

Average percentage of time out of stock of the trace products: The first step was to obtain facility specific average percentage of time out of stock of the tracer products, using the following formulas;

Average % of time that tracer products were out of stock $=$ $\dfrac{\text{Total number of stock out days for all tracer products}}{365 \text{ x Total number of tracer products in the study}}$ x 100

Thereafter, the average percent of time out of stock o of the tracer products for the facility sample was obtained using the following formula;

Average % of time that tracer products were out of stock $=$ $\dfrac{\text{Sum of average \% of time that products were out of stock for each facility}}{\text{Total number of facilities in the sample}}$

Average percentage of products in stock on the day of visit: The first step was to obtain facility specific average percentage of tracer products available on the day of assessment, using the following formula;

% of products in stock on the day of assessment $=$ $\dfrac{\text{Total number of product in stock on the day of assessment}}{\text{Total number of tracer products in the study}}$ x 100

Then, the average percent of products available on the day of visit for the facility sample was obtained as follows;

Average % of products in stock on the day of assessment for the sample of facilities $=$ $\dfrac{\text{Sum of \% of products in stock on the day of assessment for each facility}}{\text{Total number of facilities in the sample}}$

Percent of accurate stock keeping records in health facilities: first, facility specific percent of stock keeping records corresponding with physical counts was obtained as follows;

% of stock records corresponding with physical counts $=$ $\dfrac{\text{Number of stock records with no discrepancies}}{\text{Total number of records examined}}$ x 100

For the sample of health facilities, this was calculated as follows;

$$\text{Average \% of stock records corresponding with physical count for the sample of facilities} = \frac{\text{Sum of average \% for each facility}}{\text{Total number of facilities in the sample}}$$

Accordingly, the average percentage of stock records less than physical counting and that greater than physical count were calculated.

Methods used in estimating pharmaceutical needs: by use proportion of health workers mentioned a particular method used in their facility and the data collected by the facilities logistics tools viz. the daily dispensing registers and requisition voucher.

Pharmaceutical logistics knowledge: the knowledge of staff was categorised as poor, average and good. The grading was done as shown in table 2.

Table 2: Grading of the knowledge level.

Category	Knowledge level
Answered 5 to 7 questions correctly	Good
Answered 3 to 4 questions correctly	Average
Answered 0 to 2 questions correctly	Poor

Quantity of expired products in health facilities: quantities of expired items from each facility were summed up to obtain the total quantity expired for each product.

General pharmaceutical storage condition: facilities were categorized based on total scores they obtained in the storage condition checklist. Those scored 90%-100% were categorized as excellent, 70%-89% acceptable and bellow 70% as unacceptable group.

Finally, the study results have been presented using tables, bar charts and where applicable statements have been used.

3.10 Ethical consideration

Ethical clearance was obtained from the Ethical Review Committee of MUHAS. The investigator, further obtained permission from the Permanent Secretary -Ministry of Health Zanzibar, to carry out the study in public health facilities in Pemba. Finally the investigator sought permission from health facility in-charges and consent from participants before enrolling them into the study.

CHAPTER FOUR

4. RESULTS

This chapter provides a summary of the results obtained from the survey conducted in 28 public HFs in Pemba, one Zonal Central Medical Store in Pemba and the ZILS department store in Unguja. The survey was conducted from mid April to late May 2013.

4.1 Pharmaceuticals availability in public health facilities in Pemba.

In this study, availability was assessed based on; stock out duration during the twelve months of the year 2012 and availability on the day of assessment. The survey collected data on both stock on hand, stock outs on the day of visit and stock outs during the twelve months period of the year 2012.

Average percentage of time out of stock of tracer products

Stock out within the twelve months period of the year 2012 was expressed as the average percentage of time that products were out of stock in a particular facility. The study has found that all facilities (100%) visited had experienced stock out of a number of tracer products within the twelve months period of the year 2012. Figure 3 shows the average percentage of time that tracer products were out of stock in the visited facilities.
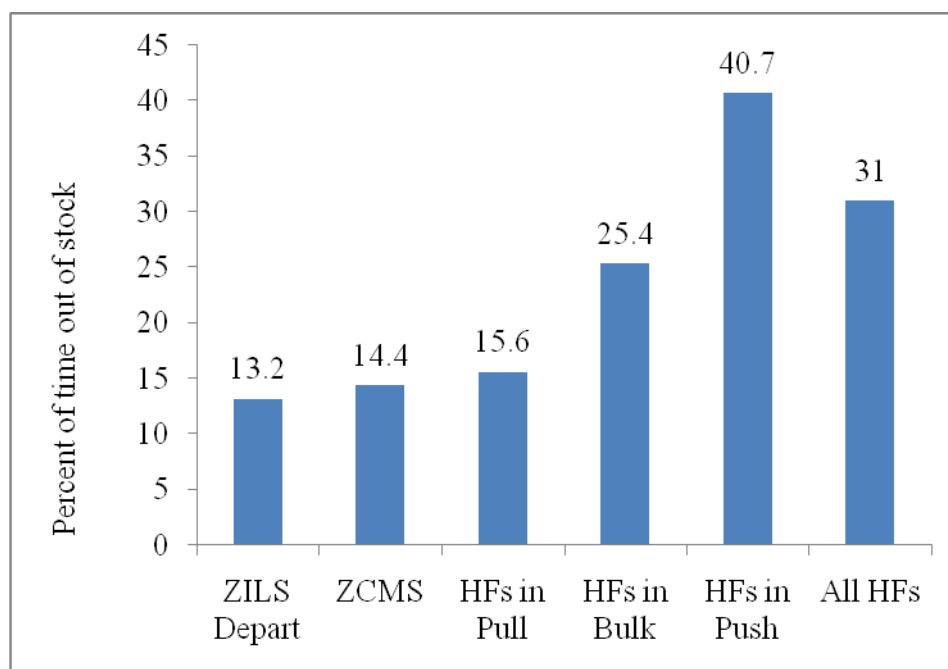
Figure 3: Average percentage of time out of stock of tracer products in the facilities

The study found that the average percent of time out of stock was 13.2% in ZILS department store and 14.4% in Zonal Central Medical Store- Pemba. The results also show that health facilities which used push system had a higher value for this indicator (40.7%) as compared to those which used pull system (15.6%). These findings show that, availability during the period under study was better in health facilities which used pull as compared to those which used push.

Percentage of tracer products available in surveyed health facilities on the day of assessment: Availability of products on the day of assessment was expressed as the percentage of tracer products available on the day of assessment in a particular facility. The study has found that all facilities (100%) visited had stock out of a number of tracer products on the day of assessment. Figure 4 shows the average percentage of tracer products that were in stock on the day of assessment in the surveyed facilities.
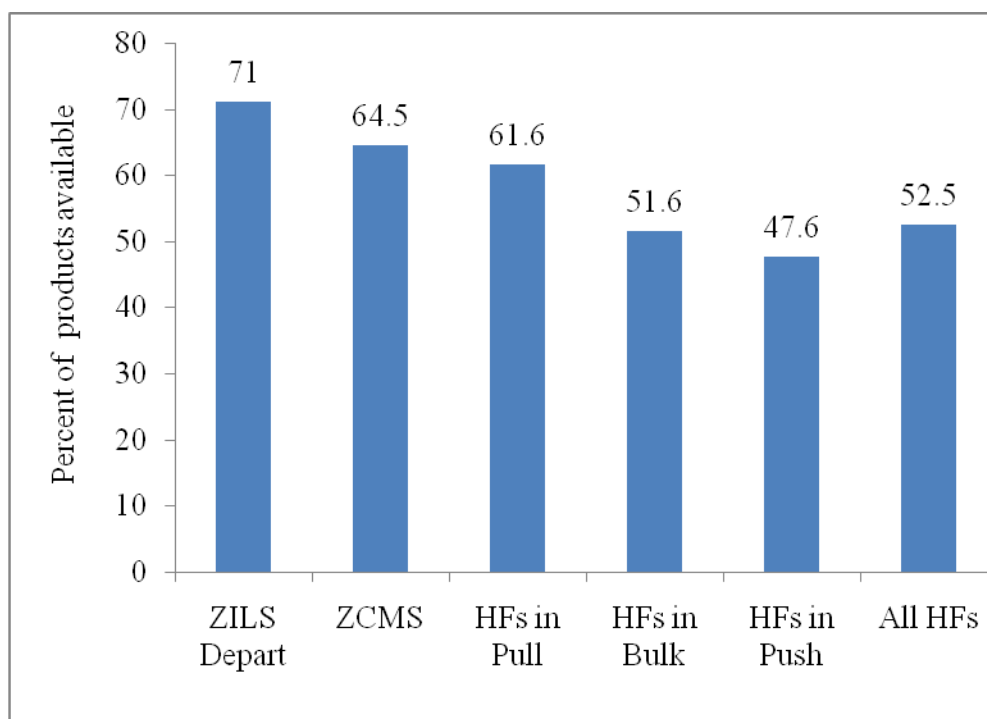
Figure 4: Average percentage of tracer products available on the day of assessment

The results show that the average percent of products available on the day of assessment was 71% in ZILS department store. Results has also shown that availability on the day of visit was better in facilities which were using pull system (61.6%) as compared to facilities which were using push system (47.6%).

4.2 Accuracy of logistics data for inventory management

The study assessed the quality of record keeping system in public health facilities in Pemba.

Percentage of stock keeping records that was accurate.

A stock record was considered accurate if after adjusting for recent issues and receipts (within 7 days) the record balanced with the physical count of the stock on the day of visit. Results show that, the ZILS department store was doing the best in the area of record keeping, compared to other facilities, as all of the stock records (100%) that were reviewed were

accurate. On the other hand HFs that were using bulky supply system (i.e. DHs), performed poorer in record keeping compared to other groups of facilities, as less than half (47.3%) of the reviewed records were accurate. Figure 5 shows the percent of accurate stock records in the visited facilities.
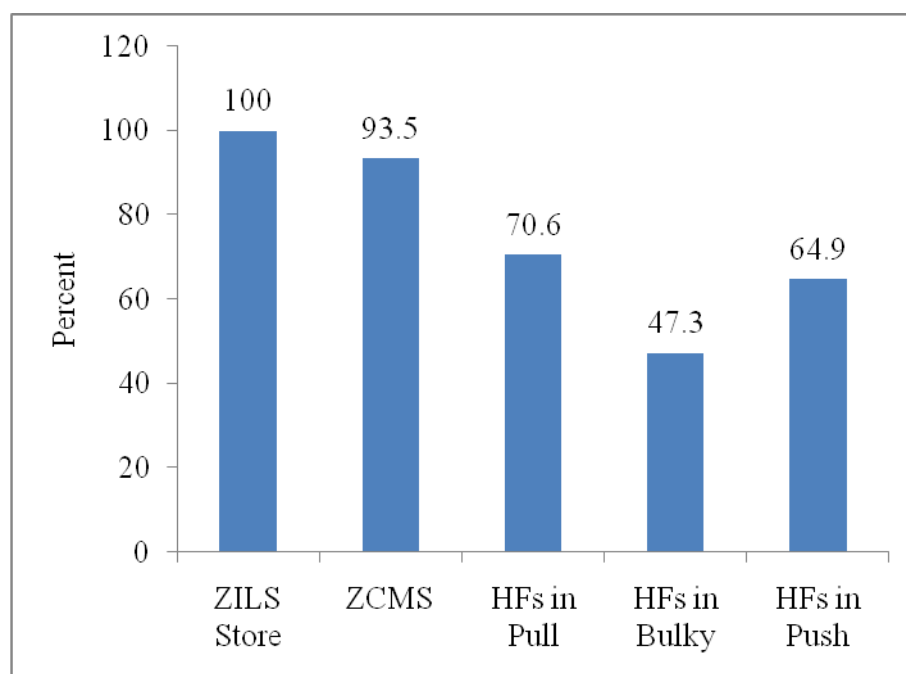
Figure 5: Percent of stock keeping records that were accurate

Percentage of stock records that is greater than physical count.

Results show that, HFs that were using bulky supply system (DHs) had on average 21.5% of records greater than physical counts. This means that, the end balance on 21.5% of the reviewed records, were more than what was actually available on the shelves in these facilities on the day of assessment. Also the findings show that these facilities had the highest value for this indicator as compared to other groups of facilities. Figure 6 shows the percent of stock records that were greater than physical counts of the stocks in the surveyed facilities.

29
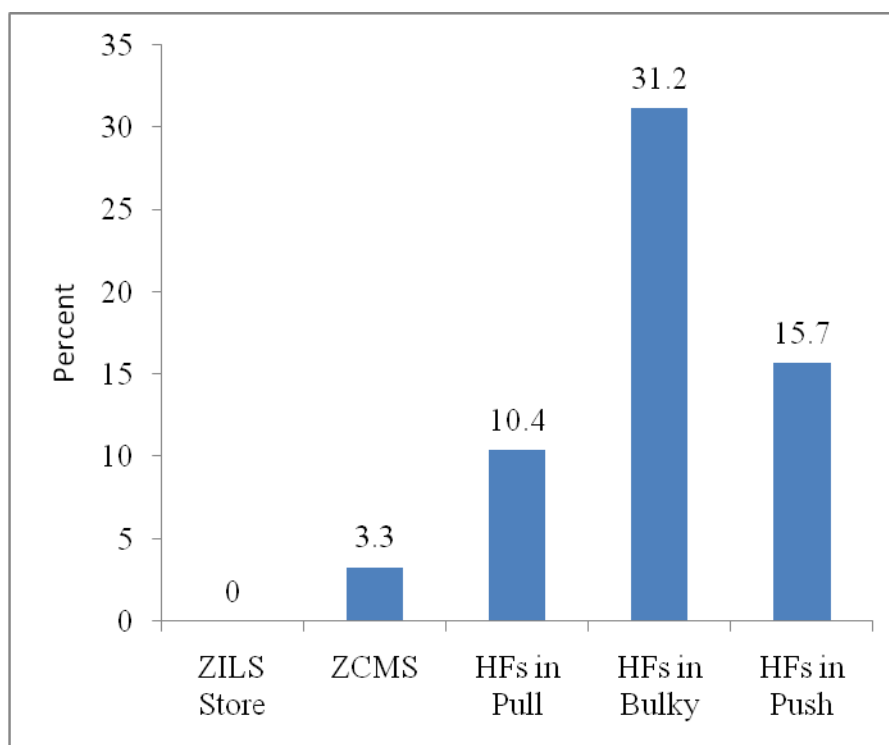
Figure 7. Percent of stock keeping records less than physical count of the stock.

4.3 Methods used by district hospitals in Pemba to quantify/estimate their pharmaceutical requirements.

All pharmaceutical health workers 11(100%), at district hospitals, who were involved in this study, when asked about what method they used to estimate their hospital pharmaceutical needs they mentioned personal judgment. All three District hospitals had stores ledgers, bin cards and all had improvised educational exercise books (counter books) to be used as a daily dispensing registers.

The ''daily dispensing registers'' had four columns;

1. Serial number
2. Description of a medicine
3. Quantity of the medicine dispensed and
4. Total quantity dispensed.

In all the three hospitals, these dispensing registers were incompletely filled, not all medicines were recorded, and the total quantity dispensed column was ever not filled.

All the three hospitals used requisition and issue voucher to request supplies from the Zonal Central Medical Store Pemba. The requisition and issue voucher used to request supplies from ZCMS was observed to have 11 Columns;

1. Code number (used as serial number column and always filled)
2. Description of a medicine (always filled)
3. Unit (always filled)
4. Balance of hand (usually not filled)
5. Quantity required (always filled)
6. Quantity issued (always filled)
7. Unit price (not filled)
8. Value (not filled)
9. Remarks (usually not filled)
10. Issue ledger folio (always filled)
11. Receiving ledger folio (always filled)

4.4 Logistics system knowledge of personnel involved in pharmaceutical supplies chain management in the surveyed facilities.

Demographic features of the respondents
Majority of the respondents were males 24 (61.5%), age of the respondents was somehow equally distributed with few respondents 5 (12.8%) aged fifty five and above. As far as profession is concerned, there was no pharmacist who was interviewed. Table 3 provides a summary of the demographic features of the respondents.

Table 3: Demographic features of respondents

Demographic features	Frequency (n= 39)	Percent (%)
Age		
25-34	13	33.3
35-44	9	23.1
45-54	12	30.8
55+	5	12.8
Sex		
Male	24	61.5
Female	15	38.5
Profession		
Pharmacist	0	0
Pharmaceutical Technician	14	35.9
Pharmaceutical Assistant	7	17.9
Nurse	17	43.6
Health Orderly	1	2.6
Work experience		
<1 year	0	0
1-5 years	16	41
6-10 years	1	2.6
>10 years	22	56.4

In assessing the logistics knowledge of personnel involved in the pharmaceutical supplies chain, the study focused on the understanding of the following criteria to assess knowledge; the supply system that the facility was using to receive pharmaceuticals, methods that can be used to estimate pharmaceutical needs in a health facility, best practice to follow when managing products in a store; last in first out (LIFO), first in first out (FIFO), and first expiry first out (FEFO). It also looked on the understanding of; the meaning of physical inventory, the importance of doing physical inventory, the meaning of safety stock and the essential data for a pharmaceuticals report for a health facility.

Supply system in a particular facility.

Results show that, 4 (10.3%) respondents did not know the supply system in which their facilities were operating, while 35(89.7%) respondents knew the supply system in which their facilities were operating.

Methods that can be used to estimate pharmaceutical needs of a facility

Results show that 18 health workers were able to mention both morbidity method and consumption method as the methods that facilities can use to estimate pharmaceutical needs. On the other hand 2 health workers could not mention any method.

Best practice in managing products in a store.

Results show that 31 respondents were able to correctly mention first expiry first out as the best practice to observe when managing pharmaceuticals in a store.

Meaning and importance of doing physical inventory

The study findings show that 15 respondents were able to correctly explain the meaning of physical inventory as the process of counting by hand all units of products available at that particular time. On the other hand 25 respondents were able mention the importance doing physical inventory as is to know the actual stock available on the shelves of a facility.

Safety stock

The study findings show that 5 respondents were able to explain on safety stock as that reserve stock kept on hand preventing against stock outs due to delayed deliveries and unprecedented increase in demand.

Essential data for a pharmaceuticals report

Results show that 29 respondents were able to mention both stock on hand, consumption rate and losses/adjustment as essential data for a pharmaceutical report of a facility. Table 4 summarizes the participant's responses to the questions.

Table 4: Summary of responses that were given by the participantss.

Response	Frequency (n=39)
Methods that can be used to estimate pharmaceutical needs of a facility	
Consumption method	10
Morbidity method	9
Consumption and morbidity methods	18
Do not know	2
Best practice in managing products in a store	
Last in first out	3
First in first out	5
First expiry first out	31
Meaning of physical inventory	
Hand counting of inventory	15
Know expired products	1
Know quantity available	15
Know requirements	1
Do not know	7
Importance of doing physical inventory	
Knows actual stock available	25
Know consumption	2
Auditor to verify stock	3
Do not know	9
Meaning of safety stock	
Medicines to treat disease outbreaks	14
Medicines for emergency situations	11
Additional supply from DHMT	2
Reserve stock to prevent out of stock	5
Do not know	7
Essential data for a pharmaceutical report	
Stock on hand	2
Rate of consumption	6
Losses/Adjustment	1
Stock on hand+ Consumption rate + Losses/Adjustment	29
Do not know	1

General assessment of logistics knowledge of the respondents shows that 17(43.6%) had good knowledge. Table 5 shows the knowledge level of health workers who were involved in pharmaceutical management. Grading was based on the knowledge scale provided on table 2.

Table 5: Pharmaceutical logistics system knowledge level of health workers involved in pharmaceutical management

Level of knowledge	Frequency	Percent
Good	17	43.6%
Average	14	35.9%
Poor	8	20.5%

The participants were also asked on what could be the reasons contributing to stock outs in their facilities. 15 (38.5%) respondents mentioned delayed delivery as a main course, 9 (23.1%) respondents said was due to discrepancies between ordered quantities and the received quantities when consignments were delivered. Figure 8 shows the reasons for stock outs as were mentioned by the respondents.
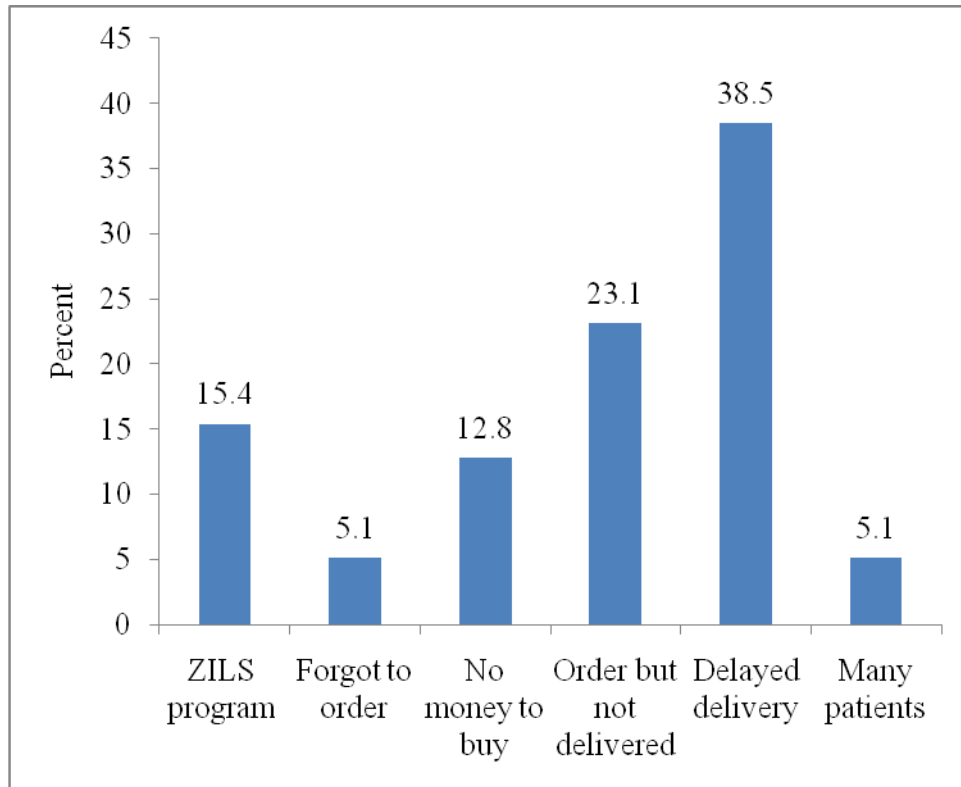
Figure 8: Reasons for stock out as mentioned by the respondents

4.5 Medicine expiry in the surveyed health facilities.

Assessment of expired products was based on recorded data and physical counting. This was possible in few facilities where records were available and the products able to be seen. Table 6 shows the expired products and the facilities in which they were found.

Table 6: List of expired medicines

Facility Name	Product expired	Unit Count	Quantity
ZILS store-Unguja	Phenoxymethylpenicillin tab	T/1000	914*
	Sulbutamol tab	T/1000	3
Vitongoji	Co-trimoxazole tab	T/1000	23
Muambe	Vitamin B complex tab	T/1000	5
Kangani	Phenoxymethyl penicillin tab	T/1000	6
Micheweni	Co-trimoxazole tab	T/1000	45
	Phenoxymethylpenicillin tab	T/1000	26
	Oral Rehydration salt	Sachets	200
Wete Hospital	Co-trimoxazole tab	T/1000	29
Shungi	Co-trimoxazole tab	T/1000	3
Abdullah Mzee Hospital	Mebendazole tab	T/1000	2
	Sulbutamol tab	T/1000	13
Kengeja	Co-trimoxazole tab	T/1000	4
	Oral Rehydration salt	Sachets	200
Wesha	Povidone iodine	Bottle	3
Mtambile	Co-trimoxazole tab	T/1000	6
	Vitamin B complex tab	T/1000	1
	Sulbutamol tab	T/1000	1
	Ferrous sulphate tab	T/1000	3
Ukunjwi	Water for injection	Ampoule	30

* These products were unusable due to being spoiled by mould

The survey results show that nine products were unusable stock in the surveyed facilities due to either expiry or be spoiled by mould. A total of 946 tins of phenoxymethylpenicillin tablets, were found to be unusable and of them 914 tins were spoiled by mould and 32 were expired.

Also, a total of 110 tins of co-trimoxazole tablets, 17 tins of sulbutamol tablets, 6 tins of vitamin B complex tablets, 3 tins of ferrous sulphate tablets, 2 tins of mebendazole, 3 bottles of povidone iodine, 400 sachets of oral rehydration salt and 30 ampoules of water for injection were found to be expired in the visited facilities. It is also observed that co-trimoxazole tablets were found to be expired in many surveyed facilities than the other products.

4.6 Pharmaceutical storage conditions in public health facilities surveyed.

The study assessed storage areas in the visited facilities, examining the level of compliance with guidelines for proper storage. PHCUs were assessed based on fourteen (14) principles while PHCCs, DHs and warehouses were assessed base on seventeen (17) principles.

For the group of PHCUs, the least satisfied conditions were; presence and accessibility of fire equipments (0% of facilities complied), appropriate storage temperature (8.7% of facilities complied) and store room maintained tidy and clean (26.1% of facilities complied). Table 7 shows the percentage of Primary Health Care Units (PHCUs) that complied with the specific storage condition criterion.

Table 7: Percentage of Primary Health Care Units (PHCUs) that complied with the specific storage condition criterion.

Storage condition criteria	Frequency (n=23)	Percent (%)
Products ready for dispensing are arranged so that identification labels and expiry dates are visible.	19	82.6
Products are arranged in a manner that facilitate FEFO, counting and general management.	19	82.6
Cartons and products are in good condition, not crushed due to mishandling	22	95.7
Facility separate damaged/expired products from usable stock and remove them from inventory	13	56.5
Products are protected from direct sunlight at all times.	21	91.3
Products are protected from water/humidity at all seasons	19	82.6
Storage area is visually free from harmful insects and rodents	16	69.6
Storage area is secured with a lock and key but accessible to authorized personnel	23	100
Products are stored at appropriate temperature at all seasons	2	8.7
Roof is always protecting sunlight/water penetration at all times	19	82.6
Store room is clean, shelves are sturdy and boxes are organized	6	26.1
Current space is sufficient for existing products and future needs	12	52.2
Fire safety equipment is available and accessible	0	0
Products are stored separately from insecticides and chemicals	23	100

For the group of PHCCs, DHs and warehouse, the least satisfied conditions were; presence and accessibility of fire equipment (only one warehouse complied), product stacks kept 30cm away from walls and other stacks (only one warehouse complied), and store room maintained tidy and clean (only one warehouse complied). Table 8 shows the number of primary health care centres, district hospitals and warehouses that complied with the specific storage condition criterion in their store room.

Table 8: Number of Primary Health Care Centres, District Hospitals and Warehouses that complied with the specific storage condition criterion.

Storage condition criteria	PHCCs & DHs (n=5)	Warehouses (n=2)
Products ready for dispensing are arranged so that identification labels and expiry dates are visible.	3	2
Products are arranged in a manner that facilitate FEFO, counting and general management.	4	2
Cartons and products are in good condition, not crushed due to mishandling	5	1
Facility separate damaged/expired products from usable stock and remove them from inventory	2	2
Products are protected from direct sunlight at all times.	5	2
Products are protected from water/humidity at all seasons	5	2
Storage area is visually free from harmful insects and rodents	5	2
Storage area is secured with a lock and key but accessible to authorized personnel	5	2
Products are stored at appropriate temperature at all seasons	3	1
Roof is always protecting sunlight/water penetration at all times	5	2
Store room is clean, shelves are sturdy and boxes are organized	0	1
Current space is sufficient for existing products and future needs	2	1
Products are stacked at least 10 cm off the floor	1	1
Products are stacked at least 30 cm away from walls/other stacks	0	1
Products are stacked no more than 2.5 meters high	5	2
Fire safety equipment is available and accessible	0	1
Products are stored separately from insecticides and chemicals	4	2

In general, the results of this study show that one of the warehouses had excellent storage condition. The results, further, show that majority of the primary health care centres and district hospitals (80%) and Primary Health Care Units (52.2%), in general, had unacceptable storage condition. Table 9 shows the number and percentage of the surveyed facilities with the acceptable general storage condition for pharmaceuticals.

Table 9: Number/percent of facilities that had acceptable storage conditions

Facility Type		Excellent (>89%)	Acceptable (70%-89%)	Unacceptable (<70%)	Total
PHCCs & DHs	n (%)	0 (0)	1 (20)	4 (80)	5
PHCUs	n (%)	0 (0)	11 (47.8)	12 (52.2)	23
Warehouse	n (%)	1 (50)	0 (0)	1 (50)	2
Total					**30**

CHAPTER FIVE

5 DISCUSSION

5.1 Availability of pharmaceuticals in the surveyed facilities.

The primary reason for holding stock in a pharmaceutical supply system is to ensure availability of essential items almost all the time [6]. Stock outs and overstocks are in any health system are important indicators of the logistics system lack of effectiveness and efficiency. Stock outs may result into unavailability of life saving medicines, disrupt course of treatment and ultimately patients and health workers may lose trust to the health system. Overstocking on the other hand puts products in increased risk of expiration or damage before they are distributed [26].

This study found that all facilities visited had experienced stock out of a number of products in the year 2012 and all had stocks of a number of products on the day of assessment. An indicator average percent of time that products are out of stock, indicate the capacity of a system to maintain constant supply of products over time by minimizing out of stock duration [35]. Average percent of time out of stock of tracer products in the surveyed health facilities combined was 31%. These results show that logistics system in Pemba was not performing well. In an ideal situation the value should be zero.

An assessment for stock status and logistics conducted in 2006, in Kenya, found that average percent of time out of stock for malaria products was 51.7% in district stores, 40% in health centres and 36% in dispensaries [26]. Also an assessment that was done in Tanzania mainland found that average percent time out of stock of some medicines in the surveyed facilities was 33.3% [11]. Another assessment which was done in Malawi found that the average percentage of time out of stock for medicines to manage malaria in the surveyed facilities was 33.3% [13]. All these studies highlight the fact that performance of many pharmaceutical logistics systems especially in sub-Saharan Africa is not good.

However, the performance of the pharmaceutical logistics system for facilities can be improved and minimize the duration of out of stock. A study that was done in Jordan to assess pharmacy and inventory control in 26 Ministry of health hospitals found that the average percent of time out of stock in those hospitals was 6% [25].

In this study availability was also assessed based on percent of tracer products available on the day of visit. Percentage of products available help to measure the effectiveness of the system in maintaining the full list of products that need to be in stock at the day of assessment [35].The study found that, the average percent of tracer products available on the day of assessment for surveyed health facilities combined was 52.5%. These findings, again, shows the performance of the system was not good as on average 48% of products were not available on the day of visit. For an ideal system availability on the day of visit should be 100%. A study done in Dar es Salaam Tanzania to assess stock out and inventory management problems in public hospitals found that average percent of tracer products available on the day of assessment in three district hospitals was about 80% [28].

In this study, groups of visited facilities were made of few numbers of facilities; that is, 9 facilities in pull supply system, 16 facilities in push supply system, 3 facilities (DHs) in bulky system, 1 zonal central medical store and 1 ZILS department store. Due to the few numbers of facilities in the groups, use of statistical test to compare the average percentage of time out of stock and average percentage of products available on the day of visit between different groups of facilities would not be able to detect difference even if the difference existed.

However the findings show that facilities in pull system seemed to perform better in reducing average percentage of time out of stock than facilities in push system. Likewise, facilities in pull system performed better regarding percentage of products available on the day of assessment than the facilities in push. On the other hand there was about 10% difference on the average percentage of time out of stock between facilities in bulky supply system and the zonal central medical store- Pemba. The store is where the facilities in bulky supply system

were pulling their supplies. The difference may mean that supplies could be available at the store for a long period of time without reaching the facilities where they were needed, the problem that was seen to affect many African countries south of Sahara [15].

5.2 Accuracy of logistics data for inventory management.

Logistics records serve as the primary framework for every logistics system. Accurate inventory keeping records are essential for proper inventory management. This survey has shown that, except for the ZILS department store-in Unguja, the problem of inaccurate stock keeping records is rampant to all facilities, irrespective of the supply system in use or facility level.

This study has shown that the accuracy of stock keeping records at the ZILS department store was 100% while that at the ZCMS in Pemba was 93.5%. The record keeping system used by ZILS store in Unguja is electronic system with a backup of manual system viz. bin cards and stores ledgers. On the other hand, record keeping system in ZCMS Pemba is purely manual with the use of bin cards and stores ledgers. This trend of facilities using electronic record keeping system to perform better than those using, purely, manual system has also been reported in a study done in Dar es Salaam Tanzania to assess stock out and inventory management problems in public hospitals. The study reported that the facility which was using electronic system in record keeping had 100% accurate stock records [28].

In health facilities, this study revealed that the problem of inaccurate stock records was also critical. District hospitals had on average 47.31% of records accurate. Although the value compares good with the international results value of 30% [25], still there is much more room for improvement. The average percentage of stock records that correspond with physical counts provides a measure of the quality of the stock record-keeping system.

The ideal target for this indicator is 100%. Record keeping in those district hospitals was purely manual and tools used were bin cards and stores ledgers. A study done in Dar es

Salaam Tanzania to assess stock out and inventory management problems in public hospitals revealed that a district hospital which was doing better had 44% of accurate stock records [28].

Inaccuracy of stock records was also seen in facilities which used the pull system and those which used push system. Due to few numbers of facilities in the groups the difference in magnitude of the problem between the two groups of facilities could not be established by statistical test. However, the salient finding is that both groups were not doing the best in record keeping. Assessments done in Jordan and Kenya have both reported problems of inaccurate record keeping [25, 26, 36]. In all facilities, increased workload was cited as a cause for delay in recording issues and receipts transactions as they became due.

Stock records serve as a key source of information that is used by health facilities in estimating their needs for pharmaceuticals. Inaccurate records pose increased risk for problems of stock outs, leaks and expiry [36]. Findings in this study about the inaccuracy of record keeping practices in health facilities, underscores the need for the Government to strengthen the record keeping system in these facilities now than ever, as the government plans to include all facilities in pull supply system.

5.3 Methods used by the district hospitals to estimate their pharmaceutical needs.

Quantification is the process that is used to estimate quantity of a product needed for the purpose of procurement [6]. All health workers interviewed in the surveyed district hospitals mentioned 'personal judgment' as the method used in their facilities to estimate pharmaceutical needs.

Use of subjective determination of order quantities is highly discouraged whether quantifying for annual, semi-annual requirement or in daily ordering pharmaceuticals. Recommended methods for annual or semi-annual estimation of requirements are consumption method, morbidity method, proxy consumption method and service level projection of budget requirements [6]. For routing ordering, recommended formulas for estimating order quantities

are; minimum-maximum stock level formula and consumption based formula. These formulas consider the following important information; average monthly consumption, lead time, safety stock , stock on hand and stock back orders. The consumption based formula is very similar to that used in annual or semi-annual estimation of needs [6].

The use of subjective estimation of order quantity in the district hospitals is evident in the tools used to capture information on consumption and to request supplies from ZCMS. In all the three hospitals, workers have improvised educational exercise books (counter books) to be used as a daily dispensing register. However the registers were not properly filled.

Daily dispensing register is an important consumption monitoring tool as it captures information on the quantity of medicines dispensed to clients/patients [37]. Daily capturing of the actual quantity dispensed to patients would ultimately render the facilities ability to calculate and estimate the average monthly consumption of various products they stock. Average monthly consumption is one of the three essential data for logistics decision making like when to order, how much to order; others are stock on hand and losses and adjustments [37]. The incomplete filing of the daily dispensing registers means that facilities do not capture enough information to provide for estimation of their monthly consumption, consequently they cannot order based on any formula except personal discretion. Failure to record properly what has been dispensed to patients was also reported is a study that was done in Malawi [13], in which there was a large discrepancy between stock records and patient register record. This kind of malpractice makes difficult to control pilferage.

The use of educational exercise books to be improvised as a record keeping tool has also been reported in an assessment which was done in South Sudan. The assessment reported that educational exercise books were used as stock record cards and patient registers [19].

The requisition and issue voucher used to request supplies from the ZCMS had eleven columns. However, the information collected in these columns are not enough to enable either

the person filling the requisition to make informed decision on how much to order or the person issuing the supplies to adjust the order accordingly. Important column for the beginning balance was missing in the voucher. The voucher fails to capture other two important data for logistics decision making, namely rate of consumption and losses and adjustment.

An assessment that was done in Afghanistan found that, when ordering, 87% of facilities sent information on stock on hand, and consumption during last period, while 67% of the facilities included information about the last order as well. The information was used by REACH to validate quantities in the orders submitted by the facilities [20]. Failure to properly monitor and report consumption has been cited as one of the major causes of weak quantification systems in many developing countries [27].

5.4 Logistics knowledge level of HWs involved in the pharmaceutical management.
A well designed, well operated and maintained supply chain management is fundamental to having a strong health system. For a system to be well operated and maintained, individuals who are using the system need to be knowledgeable. This study assessed logistics knowledge of the health workers who were involved in the pharmaceutical management.

This study found that, in general, health workers involved in pharmaceutical management had no enough knowledge in logistics. The proportion of the workers who had good knowledge was less than 50%. The limitation to the findings is that the study did not include district material managers (District Pharmacists). Their inclusion would have provided a good assessment of the peoples who manage the last step of pharmaceutical supply system (from district or organization to health facility to patients) to ensure the essential pharmaceuticals reach those who need them [14].

The findings of this study indicate that there was lack of enough understanding of the basics of pharmaceutical logistics among HWs who were involved in pharmaceutical management. Four personnel did not know the supply system which was used in their facilities to obtain the needed supplies. This finding shows that supply system in Pemba was clearly known to all

personnel involved in the management of pharmaceuticals, and consequently they may have not known their respective responsibilities. It is important for the people at the last step of the supply system to understand their responsibilities so that pharmaceutical can reach patients [14].

Results also show that four personnel did not able to mention any method used in estimation of pharmaceutical needs, while 19 personnel (48.7%) were able to mention only one method. This shows that quantification methods and procedures were not very well known to the health workers.

Furthermore, the study shows that eight health workers were not able to identify the use of 'First Expiry First Out' (FEFO) as the best practice while managing pharmaceuticals in store. Regarding the concepts of physical inventory and safety stock, this study has revealed that, these concepts were not known to majority of the personnel. The findings indicate that the basic principles were not properly followed, and products could expire simply because of failing to implement the 'FEFO' principle. Also by keeping safety stock and regularly doing physical stock could help to reduce unnecessary stock outs.

Lack of enough knowledge in the pharmaceutical logistics has also been reported in a study that was done in Dar es Salaam to assess medicines stock out and inventory management problems in public hospitals. The study found that 65% of the personnel did not know the methods used in estimating pharmaceutical needs [28].

5.5 Expiry of pharmaceuticals in the surveyed facilities.

Medicine expiry indicates inefficiency of a pharmaceutical logistics system. This study endeavoured to assess the quantity of medicines expired in the health facilities in the year 2012. However, the practice of handling expired and/or damaged products in the facilities was not common to all facilities. In the majority of the facilities, health workers admitted that some products had expired, and further claimed that, the expired products were taken by the DHMT. When asked about any documentation involved when moving the expired products, they said there was no documentation.

In those facilities where expired were able to be seen, this study has found that phenoxymethylpenicillin tablets and co-trimoxazole tablets expired in many facilities. Huge quantity of unusable stock of phenoxymethylpenicillin tablets was found in the ZILS department store. It was further availed that, the stock was removed from inventory in November 2012 as the tablets were discovered to be spoiled with mould.

In other health facilities where the unusable stock of phenoxymethylpenicillin was found a similar reason was given.

Regarding expiry of the co-trimoxazole tablets, the reason that was mentioned was that those products were delivered close to their expiry dates. Other products were said to expire due to decrease in their consumption rate. Medicines expiry has also been reported in studies that were done in Uganda and Dar es Salaam [21, 28].

5.6 General pharmaceutical storage conditions in the surveyed facilities.
Storage condition is important to maintain purity, potency, safety and effectiveness of pharmaceuticals for a longer period of time [37]. Proper storage condition, therefore, is one of the strategies to help ensure that only high quality products reach the clients.

Storage condition at Zonal Central Medical Store Pemba was not impressing. There were air conditioners but they were not working, there were not enough pallets so cartons were put directly on the floor, boxes were not organized and there was a lot of dust in the metal shelves. Fire equipments were not available and also due to small size of the warehouse, it was not possible to put stack 30cm away from the walls and other stacks. The problems of storage conditions in warehouse has also been reported in an assessment that was done in south Soudan [19].On the other hand, the ZILS department store in Unguja was a newly built warehouse and the storage condition was excellent. The warehouse was observed to be spacious with enough air conditioners, racks, metal shelves and pallets.

In health facilities, some were performing well while some hand unacceptable storage conditions. All health facilities did not have fire equipments. Regarding appropriate storage temperature only, Chake chake hospital, Kengeja , Konde , Micheweni and Bogoa had air conditioners and all were working. In Makombeni it was observed that in 2010 the facility had a thermometer in the store room and the temperature chart that was found embedded on the door showed that temperature in that room had never gone below 28^0C.also there were time that temperature reached 33^0C. This signifies that, although it is difficult to have air conditions in all health facilities, it is important to monitor the temperature in the store rooms. A study that was done in Jordan also found that there was no any hospital that monitored temperature or humidity in their pharmaceutical stores [25].

Regarding cleanliness and tidy arrangement of store room all the 2 PHCCs and 3 district hospitals failed in this criterion. There were a lot of dusts on the shelves and walls. Except for Adullah Mzee district hospital, the other district hospitals and the 2 PHCCs claimed that the smallness of the store room impaired the arrangement. The problem of cleanliness in store rooms has also been reported in studies that were done in Tanzania [12, 28]. Although shortage of space may hinder proper store arrangement, the untidiness and presence of a lot of dust on the floor, shelves and walls indicates either, shortage of housekeeping staff or failure of the management to supervise the housekeeping activities properly.

CHAPTER SIX

6.1 CONCLUSION

The study has revealed that availability of pharmaceuticals in public health facilities in Pemba was not perfect. Health facilities in Pemba had faced stock outs of a number of pharmaceutical products. Stock outs being one of indicators for a pharmaceutical logistics system performance, it therefore implied that the pharmaceutical logistics system for Pemba public health facilities was not effective.

Stock keeping records in Pemba public health facilities surveyed were not perfectly accurate. There were incidences of some stock records counts to read more than what was actually available in stock and also there were incidences of some stock records count to read less than what was actually available in stock. This practice posed increased risk for stock outs, leak and expiry of pharmaceuticals.

District hospitals in Pemba, although they pulled supplies from the Zonal Central Medical Store (ZCMS) in Pemba, did not apply the recommended methods in estimating their routine order quantities. The data these hospitals sent to ZCMS when placing orders did not acquaint the ZCMS with the necessary information that would have rendered the store capable of assessing the consumption rate at these hospitals. This practice, throws a ray of light that when ZCMS placed an order to MSD- Dar through CMS headquarters in Unguja, it did so with no enough evidence of data on consumption from the hospitals and the remaining in the pipeline within Pemba.

Knowledge of health workers on the pharmaceutical logistics was not good. Some of the health workers were not aware of the very basics of a pharmaceutical store management. Also there were expired pharmaceuticals in the facilities. However, based on the observed quantities the rate of expiry was not high. Procedures for handling expired pharmaceuticals in the facilities was not uniform to all facilities as some facilities reported that the expired pharmaceutical were been picked by DHMT.

Pharmaceutical storage condition in majority of public health facilities in Pemba was below the acceptable standard. However all health facilities had put the pharmaceuticals under lock and key and entrance to store rooms was only accessible to authorized personnel.

6.2 RECOMMENDATION

In light of the findings of this study the following are recommended;

An in-depth assessment of the pharmaceutical supply system in Zanzibar should be carried out. The assessment should among other things assess the strength and weaknesses of the pharmaceutical supply system in Zanzibar.

The Ministry of health Zanzibar should strive to introduce use of computer in inventory control in all warehouses and at least to all district hospitals. As these facilities manage relatively large number of products, use of computers in inventory management will improve the efficiency and effectiveness of inventory management and record tracking.

The Ministry of health Zanzibar should now take efforts to ensure that district hospitals have 'standard' medicine stores. These stores should be spacious enough to allow the hospitals to at least keep a stock level of three months of stock.

Training should be conducted to all health workers involved in the management of pharmaceuticals on the basics of pharmaceutical store management with due emphasis on record keeping and specifically the proper use of store ledgers and bin cards.

A requisition tool should be introduced that will be used to order supplies from Central Medical Store. The tool should have an inherent mechanism that will force one who is filling it to estimate order quantities based on past consumption.

DHMTs should carry out regular maintenance for health facilities' buildings so that to avoid minor problems like roof leakage.

Standard operating procedures on recording and handling of expired and/or damaged pharmaceutical products should be introduced in all health facilities.

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ANNEXES

ANNEX 1. LIST OF VISITED HEALTH FACILITIES

S/N	FACILITY NAME	FACILITY TYPE	DISTRICT
1.	MAKOMBENI	PHCU	MKOANI
2.	WESHA	PHCU+	CHAKE CHAKE
3.	MUAMBE	PHCU	MKOANI
4.	JADIDA	PHCU	WETE
5.	CHAKE CHAKE	DH	CHAKE CHAKE
6.	GOMBANI	PHCU	CHAKE CHAKE
7.	KANGANI	PHCU	MKOANI
8.	VITONGOJI	PHCC	CHAKE CHAKE
9.	KENGEJA	PHCU+	MKOANI
10.	KIUYU MINUNGWINI	PHCU	WETE
11.	UKUNJWI	PHCU	WETE
12.	CHWALE	PHCU	WETE
13.	MSUKA	PHCU	MICHEWENI
14.	WETE	DH	WETE
15.	KANGAGANI	PHCU	WETE
16.	KONDE	PHCU+	MICHEWENI
17.	KIUYU KIPANGA	PHCU	MICHEWENI
18.	MZAMBARAUNI	PHCU	WETE
19.	MICHEWENI	PHCC	MICHEWENI
20.	MAZIWA NG'OMBE	PHCU	MICHEWENI
21.	MAKUNDENI	PHCU	WETE
22.	MTAMBILE	PHCU	MKOANI
23.	SHUNGI	PHCU	CHAKE CHAKE
24.	BOGOA	PHCU+	MKOANI
25.	FINYA	PHCU	MICHEWENI
26.	ABDULLAH MZEE	DH	MKOANI
27.	CHONGA	PHCU	CHAKE CHAKE
28.	ZIWANI	PHCU	CHAKE CHAKE
29.	CMS	ZCMS	WETE
30	CMS	ZILS	MJINI

ANNEX 2.   LIST OF TRACER PRODUCTS

1.	Paracetamol tablet 500mg	500mg	Tablet
2.	Amoxycillin	125mg/5ml	Suspension
3.	Cotton wool		
4.	Co-trimoxazole	480mg	Tablet
5.	Oral Rehydration Salt	Sachet	Powder
6.	Cotton Absorbent Gauze		
7.	Mebendazole	100mg/500mg	Tablet
8.	Ferrous sulphate tablet		Tablet
9.	Povidone Iodine		Solution
10.	Surgical gloves		
11.	Examination gloves		
12.	Methylated spirit	70%	
13.	Metronidazole	200mg	Tablet
14.	Phenoxymethyl Penicillin	250mg	Tablet
15.	Lignocaine	2%	Injection
16.	Chlorpheniramine	4mg	Tablet
17.	Benzyl Penicillin	500,000I.U	Injection
18.	Sulphadoxine/Pyrimethamine (SP)	500mg/25mg	Tablet
19.	Compound Benzoic acid ointment		Ointment
20.	Magnesium Trisilicate compound		Tablet
21.	Sulbutamol	4mg	Tablet
22.	Vitamin B complex		Tablet
23.	Phenobarbitone	30mg	Tablet
24.	Erythromycin	250mg	Tablet
25.	Co-trimoxazole	200mg/40mg	Suspension
26.	Tetracycline eye ointment	1%	Ointment
27.	Adrenaline	1mg/ml	Injection
28.	Procaine Penicillin Forte	400,000I.U	Injection
29.	Water for Injection		
30.	Plaster Zinc Oxide	7.5cm x 5M	
31.	Suture Silk Size 2/0		

ANNEX 3. INVENTORY DATA COLLECTION FORM

Date............................Facility Name.. Facility type..............................

District................................ Data Collector.......................................

Product Name	Counting Unit	Record Count	Recent Receipts	Recent Issues	Adjusted Total Record Count	Physical Count	Comments

ANNEX 4. STOCK OUT DATA COLLECTION FORM

Date...........................Facility Name.. Facility type..............................

District............................... Data Collector...

Product Name	2012												Total Days Out of Stock
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	

ANNEX 5. PRODUCT EXPIRY DATA COLLECTION FORM

Date...........................Facility Name... Facility type..............................

District............................... Data Collector...

Product Name	Unit of count	Quantity expired	Date expired	comments

ANNEX 6. FACILITY STORAGE CONDITION OBSERVATION CHECK LIST

Date...........................Facility Name...

Facility type............................. District...............................

Data Collector...

S/n	Description	Score	Comments
1.	Products ready to distribution/dispensing are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.		
2.	Products are stored and organized in a manner that facilitate 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 (fluorescent lights in the case of condoms/gloves) and cartons are put right-side up		
4	The facility separate damaged and/or expired products from usable products and removes them from inventory.		
5	Products are protected from direct sunlight at all times of the day and during all seasons.		
6	Cartons and products are protected from water and humidity during all seasons.		
	Storage area is visually free from harmful		

7	insects and rodents. (Check the storage area for traces of 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 during all seasons according to product temperature specifications.		
10	Roof is always maintained in good condition to avoid sunlight and water penetration at all times.		
11	Storeroom is maintained in good condition (clean, all trash removed, shelves are sturdy, boxes are organized).		
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	Products are stacked at least 10 cm (4 inches) off the floor.		
14	Products are stacked at least 30 cm (1 foot) away from the walls and other stacks.		
15	Products are stacked no more than 2.5 meters (8 feet) high.		
16	Fire safety equipment is available and accessible (any item identified as been used to promote fire safety should be considered).		
17	Products are stored separately from insecticides and chemicals.		

NB: To qualify as "yes," all products and cartons must meet the criteria for each item.

ANNEX 7. QUESTIONNAIRE (English Version)

Name of the Health Facility…………………. Type of health facility………………………

District ………………………………………………………………………

Name of the Interviewer………………………… Date…………………………………

1. Age……………………

2. Sex   a) Male   b) Female

3. Professional status: a) Pharmacist

                          b) Pharmaceutical Technician

                          c) Pharmaceutical Assistant

                          d) Others (specify)…………………………………….

4. What is your position in this facility?

                          a) Head of the facility

                          b) Head of pharmacy department

                          c) Dispenser

                          d) Others (specify) …………………………………..

5. How long have you been working in your profession?

                          a) Less than one year

                          b) 1 to 5 years

                          c) 6 to 10 years

                          d) > 10 years

6. How long have you been working in this facility?

                          a) Less than one year

                          b) 1 to 5 years

                          c) 6 to 10 years

                          d) > 10 years

7. Have you attended any training on logistics management of pharmaceuticals in facilities and stores?   a) Yes   b) No

8. What is a supply system you use to acquire supplies needed in your facility?

                 a) Push system   b) Pull system

If the answer above is "a" go to question 9 and 10 and skip question 11 and 12 AND if the answer above is "b" skip question 9 and 10 and proceed to question 11

9. If is by push system, how often do you receive the supplies?

      a) Monthly   b) Quarterly   c) No specific period.

10. If you receive by push system, does the facility receive the supplies on planed schedule?

      a) Yes   b) No

11. If is by pull system, how often do you order the supplies?

      a) Monthly   b) Quarterly   c) No specific period

12. If the system is pull, how long does it take for a facility to receive supplies after placing an order? ………………………………

13. What methods can be used to estimate pharmaceutical needs in a health facility?

      a) Consumption method

      b) Morbidity method

      c) All of the above

      d) Do not know

14. When managing products in a store, what is the best practice to follow?

      a) Last in first out (LIFO)

      b) First in first out (FIFO)

      c) First expiry first out (FEFO)

      d) Do not know

15. What is physical inventory?

………………………………………………………………………………………………………

………………………………………………………………………………………………………

16. What is the importance of doing physical inventory?

………………………………………………………………………………………………………

………………………………………………………………………………………………………

17. What is safety stock?

………………………………………………………………………………………………………

………………………………………………………………………………………………………

18. What are the essential data, when writing report on pharmaceuticals for your facility?

       a) Stock on hand

       b) Consumption

       c) Loss/adjustment

       d) All of the above

       e) Do not know

19. What is the method used in your facility to estimate its pharmaceutical needs?

 a) Just personal judgment b) Others (specify) ……………………………………

20. What do you think is a course of medicines' stock outs in your facility? ………………..

 ……………………………………………………………………………………………

 …………………………………………………………………………………………….

ANNEX 8. QUESTIONNAIRE (Kiswahili Version)

Jina la Kituo cha Huduma za Afya ……………………

Aina ya kituo cha Huduma za Afya ……………………..

Wilaya ……………………………….

Jina la msahili ……………………….. Tarehe ………………………………..

1. Umri..…………………………..

2. Jinsi   a) Kike   b) Kiume

3. Taaluma   a) Famasia

                b) Fundi dawa sanifu

                c) Fundi dawa sanifu msaidizi

                d) Nyingine (Taja) …………………….

4. Cheo   a) Mkuu wa kituo

                b) Mkuu wa Idara ya famasi

                c) Mtoa dawa

                d) Nyingine (Taja) ………………………

5. Una muda gani katika taaluma yako?

                a) Chini ya mwaka moja

                b) Mwaka 1 mpaka 5

                c) Miaka 6 mpaka 10

                d) Zaidi ya miaka 10

6. Ni muda gani umefanya kazi katika kituo hiki?

                a)   Chini ya mwaka 1

                b) Mwaka 1 mpaka 5

                c) Miaka 6 mpaka 10

                d) Zaidi ya miaka 10

7. Je umewahi kuhudhuria mafunzo yoyote kuhusiana na menejimenti ya ugavi wa dawa
    na vifaa tiba?

                a) Ndio   b)Hapana

8. Ni mfumo upi hutumika kupata dawa na vifaa tiba kwa ajili ya kituo chako?

    a) Mfumo wa makasha   b) Mfumo wa kuagiza

Kama jibu hapo juu ni "a" jibu swali la 9 na10 na kisha ruka swali la 11 na 12, NA kama jibu ni "b" ruka swali la 9 na 10 na endelea swali la 11

9. Kama ni mfumo wa makasha, je kituo hupokea shehena ya dawa kila baada ya muda gani?   a) Kila mwezi

    b) Kila baada ya miezi tatu

    c) Hakuna muda maalumu

10. Kama mfumo ni wa makasha, je kituo kinapokea shehena ya dawa kwa muda uliopangwa?   a) Ndio   b) Hapana

11. Kama mfumo ni wa kuagiza, je huwa mnaagiza mara ngapi?

    a) Kila mwezi

    b) Kila baada ya miezi tatu

    c) Hakuna muda maalumu

12. Kama mfumo ni wa kuagiza, je huchukua muda gani kituo kupokea shehena ya dawa toka kutuma taarifa ya maombi? ....

13. Ni njia zipi zinazoweza kutumika kukadiria mahitaji ya dawa katika kituo?

    a) Njia ya matumizi ya kipindi kilichotangulia

    b) Njia ya kuangalia maradhi na dawa zinazotumika

    c) Zote zilizotajwa hapo juu

    d) Sijui

14. Katika kutunza dawa na vifaa tiba ndani ya bohari, ni utaratibu upi mzuri wa kufuata?

    a) Za mwisho kupokelewa, za kwanza kutoka

    b) Za kwanza kupokelewa, za kwanza kutoka

    c) Za kwanza kuisha muda wa matumizi, za kwanza kutoka

    d) Sijui

15. Nini maana ya hesabu ya mali kwa mkono?

    ....

    ....

16. Nini umuhimu wa kufanya hesabu ya mali kwa mkono? ....

....

17. Nini maana ya shehena ya ziada kwa ajili ya dharura?. ....

....

18. Ni data zipi muhimu zinazopaswa kuwepo wakati wa kuandika taarifa ya dawa na vifaa tiba kuhusu hospitali/Kituo chako?

      a) Shehena iliyopo kwa ajili ya matumizi

      b) Matumizi kwa kipindi kilichotangulia

      c) Upotevu/marekebisho

      d) Zote zilizotajwa hapo juu

      e) Sijui

19. Ni njia ipi inayotumika kufanya makadirio ya dawa na vifaa tiba vinavyohitajika katika hospitali yako?

      a) Maamuzi/makadirio binafsi

      b) Nyingine (Taja)..

20. Je unadhani ni sababu gani inayochangia ukosefu wa dawa katika kituo chako?

....

....

ANNEX 9. CONSENT FORM (English Version)

CONSENT TO PARTICIPATE IN A STUDY TITLED: PHARMACEUTICAL LOGISTICS SYSTEM PERFORMANCE OF PUBLIC HEALTH FACILITIES IN PEMBA.

Hallo!

I am HOSIANA ELIAKIMU, a Masters Student from Muhimbili University of Health and Allied Sciences (MUHAS) pursuing Master of Science in Pharmaceutical Management.

Purpose of the Study

This study aims to assess the pharmaceutical logistics system performance in Pemba public health facilities.

Participation

If you agree to join the study, you will be required to answer all the questions that will be asked by the researcher.

Confidentiality

Information obtained from you will be treated confidential and will NEVER be used for any other purpose other than this study.

Risk

No harm is expected to happen to anyone participating in this study.

Benefits

Your participation in this study will help us to understand how the pharmaceutical logistics system is performing in Pemba public health facilities and therefore suggest ways to improve it.

Who to Contact

For any question about this study, do not hesitate to contact the following:

Hosiana Eliakimu (Principal investigator)

School of Pharmacy,

Muhimbili University of Health and Allied Sciences,

P.O. Box 65001, Dar Es Salaam.

Phone: 0716-908488

OR

DR G. Kagashe (Research Supervisor)

School of Pharmacy,

Muhimbili University of Health and Allied Sciences,

P.O. Box 65013, Dar Es Salaam.

Mobile: 0713-310511

Also, if you will have questions about your rights as a participant, you may contact

Professor Mainen Moshi, Director of Research and Publications (MUHAS), P.O. Box 65001,

Dar Es Salaam. Tel: 2150302-6.

If you agree to participate in this study write the word YES _____

Signature of participant _____

Signature of principal investigator _____

Date of signed consent _____

ANNEX 10. CONSENT FORM (Kiswahili Version)

RIDHAA YA KUSHIRIKI KATIKA UTAFITI UNAOITWA: UTENDAJI WA MFUMO WA UGAVI WA DAWA NA VIFAA TIBA KATIKA HOSPITALI NA VITUO VYA AFYA VYA SERIKALI KISIWANI PEMBA.

Habari!

Mimi ni HOSIANA ELIAKIMU Mwanafunzi kutoka Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili, ninasoma Shahada ya Uzamili ya Sayansi ya Menejimenti ya Dawa na VifaaTiba.

Malengo ya utafiti huu

Utafiti huu unalengo la kutathimini utendaji wa mfumo wa ugavi wa dawa na vifaa tiba katika hospitali na vituo vya afya vya serikali kisiwani Pemba.

Kushiriki katika utafiti huu

Kama ukikubali kushiriki katika utafiti huu, basi utaombwa kujibu maswali yaliyopo katika dodoso utakalopewa na mtafiti.

Usiri wa taarifa

Taarifa zote utakazotoa katika utafiti huu zitakuwa ni siri, zitatunzwa sehemu salama na KAMWE hazitatumika kwa madhumini mengine isipokuwa yale tu yaliokusudiwa katika utafiti huu.

Madhara kutokana na kushiriki katika utafiti huu

Hakuna madhara wala hatari yoyote inayotarajiwa kumpata mtu atakayeshiriki katika utafiti huu.

Faida ya kushiriki katika utafiti huu

Kushiriki kwako katika utafiti huu kutatuwezesha kufahamu utendaji wa mfumo wa ugavi wa dawa na vifaa tiba katika hospitali na vituo vya afya vya serikali kisiwani Pemba na hivyo kutuwazesha kupendekeza njia za kuuboresha zaidi mfumo huo wa ugavi.

Mawasilioano

Ukiwa na swali lolote kuhusu utafiti huu usisite kuwasiliana na wafuatao:

Hosiana Eliakimu (Mtafiti mkuu)

Shule ya Famasia,

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili,

S.L.P 65001, Dar es salaam.

Namba ya simu ya kiganjani: 0716-908488

AU

Dkt G. Kagashe (Msimamizi wa utafiti)

Shule ya Famasia,

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili,

S.L.P 65001, Dar Es Salaam.

Namba ya simu ya kiganjani: 0713-310511

Kama ukiwa na swali au maswali kuhusu haki zako kama mshiriki katika utafiti huu, unaweza kuwasiliana na Profesa Mainen Moshi, Mkurugenzi wa Utafiti na Uchapishaji Chuo Kikuu cha Afya na Sayansi Shirikishi, S.L.P 65001, Dar Es Salaam.

Namba ya simu ya mezani ni 0222150302-6.

Kama umekubali kushiriki katika utafiti huu, basi unaombwa kuandika neno,NDIYO. _____

Sahihi ya mshiriki _____

Sahihi ya Mtafiti Mkuu _____

Tarehe ambayo ridhaa imetolewa _____