ASSESSMENT OF AVAILABILITY, PRICE, EXPIRY, STOCK-OUTS AND STORAGE CONDITIONS FOR KEY MEDICINES IN THE PUBLIC, NGO AND PRIVATE PHARMACIES IN MOSHI

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By

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A Dissertation Submitted 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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CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled *Assessment of availability, price, expiry, stock-outs and storage conditions for key medicines in the public, NGO and private pharmacies in Moshi* 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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Prof. Appolinary A. R. Kamuhabwa

(Supervisor)

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Date

DECLARATION AND COPYRIGHT

I, **Om Hiteshchandra Joshi**, declare that this **dissertation** is my original work and that it has not been presented nor will it be presented to any other University for a similar or any other degree award.

Signature ………………………………………… Date ……………………………

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DEDICATIONS

I would like to dedicate this dissertation work to my Supervisor, Prof. Kamuhabwa, Academic advisor, Dr. Malele, and last but not the least, my ever loving Parents and Sisters.

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LIST OF ACRONYMS

MSDS	Material safety data sheets
MSD	Medical Stores Department
FEFO	First expiry first out
FIFO	First in first out
TFDA	Tanzania food and drugs authority
MNH	Muhimbili National Hospital
ALu	Artemether - Lumefantrine
MUHAS	Muhimbili University of Health and Allied Sciences
NGO	Non government organization
NCR	National capital region
SPSS	Statistical package for social sciences
DSPRUD	Delhi society for the promotion of rational use of drugs
IEDP	India essential drugs program
EDL	Essential drug list
RTRC	Regional reduced resource collaboration for Pharmaceutical management

WHO	World Health organization
PI	Principal Investigator
MOH	Ministry of Health
INN	International non proprietary name
PHF	Public health facility
LDC	Least developed countries
IRP	International reference prices
HAI	Health action International
NEMLIT	National Essential Medicine List for Tanzania
MOHSW	Ministry of Health and Social Welfare
NGO	Non Governmental Organization- Profit and non-profit

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ABSTRACT

Background

Despite significant progress in increasing access to essential medicines in low- and middle income countries during the past decades, many of the health services used by the poor still lack adequate supplies of basic medicines. Drug shortages and medicine prices continue to undermine the performance of health systems throughout the developing world. It was important to carry out this study in Moshi as previous studies had not covered this town, and hence results of this study would assist in comparing and complimenting the previous studies.

Objective

Assessment of availability, price, expiry, stock-outs and storage conditions for key medicines in the public, NGO and private pharmacies in Moshi

Methodology

The survey was conducted in public, NGO and private pharmacies in Moshi town using the WHO Operational Package for Monitoring and Assessing the Pharmaceutical Situation in Countries (2007 version). The package contained tools necessary for the survey (modified to suit our local pharmaceutical system). The indicators to measure the degree to which public, NGO and private retail facilities are achieving the strategic pharmaceutical objectives of improved availability, reasonable price and appropriate storage conditions of medicines were used. These included: availability of key medicines in public, NGO and private pharmacies, price of key medicines in public, NGO and private pharmacies, presence of expired medicines

in public, NGO and private pharmacies, adequacy of storage conditions and handling of medicines in public, NGO and private pharmacies.

Results

The survey revealed that only one (1) of the public health facilities had less than 30% of the 33 selected key medicines available at the pharmacy while ten (10) public health facilities had availability of medicines ranging from 30% to 80%. In the private retail pharmacies, four (4) had availability of medicines ranging from 50% to 80% while eleven (11) pharmacies had availability of medicines of more than 80%. In the NGO facilities, seven (7) facilities had more than 80% of availability of key medicines while three (3) facilities had availabilities between 50% and 80%.

Excluding four (4) public health facilities and one (1) private pharmacy which happened to have one expired medicine each on their shelves, all other thirty two (32) facilities did not have expired medicines on their dispensing shelves.

Prices in the NGO's were approximately 1.87 times higher than those in the public health facilities. Prices in the NGO's were approximately 1.36 times higher than in the private retail pharmacies. Prices in the private retail pharmacies were approximately 1.48 times higher than those in the public health facilities. The median stock-out days per year was 117 days (ranging from 0 to 135 days) for medicines in the public health facilities. Five facilities out of the eleven surveyed did not have proper records to enable calculation of stock-out days of medicines for at least six months.

The average percentage storage condition scores in the main drug stores of Public health facilities, NGO health facilities and private retail pharmacies were 44.5%, 45.8% and 69% respectively while that in the Dispensing rooms was 52.6%, 70.8% and 89% respectively.

Conclusion

The low overall availability of medicines in the public health facilities forces the population to purchase prescribed medicines from the private sectors where they are available, but are expensive.

Frequent and lengthy stock-out periods of essential medicines in the public health facilities also raises concerns about the functionality of the current Integrated Logistics System (ILS) adopted by the MOHSW, forecasting of the medicine requirements and appropriate delivery of medicines to the end users by the Medical Stores Department (MSD) Tanzania.

Adequate storage conditions and handling of medicines in the Main drug stores of public and NGO health facilities were dissatisfactory while that in the Dispensing rooms were satisfactory in both kinds of health facilities. As for the private retail pharmacies, the average storage condition in the Main drug stores was satisfactory while that in the Dispensing rooms was very satisfactory.

Price of medicines in the public sector where cheapest amongst all other sectors while price fluctuations were observed in all sectors. Expired medicines happened to be more of a problem in the public health facilities and this raises concerns over appropriate regulation and inspection by the MOHSW.

Recommendations

Key medicines should be given priority during selection and procurement. Pharmacy and Therapeutic committees should prepare and update the list regularly based on the primary, secondary and tertiary health facility levels. Facilities should strengthen Drug Revolving Fund program through NHIF at the hospitals in order to sustain constant availability of essential medicines. While lowering price in the private and NGO sector is a long term goal, a new financing approach at the hospitals by using Drug Revolving Funds through the NHIF might be a solution.

There is need for improvement in policies on medicine pricing and individual medicine prices where there is evidence of excessive prices. A system of MRP (Maximum retail price), as that used in other countries like India, can be beneficial whereby all the private medicine outlets cannot sell a particular medicine above that price. In that way, price fluctuations, vast differences in price and affordability to end users will improve. Prices on medicines and availability should be regularly and widely disseminated. Surveillance on availability, cost and price components should regularly be conducted by the relevant authorities so as to develop reliable information on medicine prices and availability to be used by the government, insurance funds and health facilities.

CHAPTER ONE

1.0 INTRODUCTION

Patients that have access to adequate and cost effective drugs at the time of need are more likely to be happy with the treatment they receive. When such drugs are not available or ineffective after use, patients will go elsewhere, even if they have to pay high prices to private providers, to get the care they think they need. The term "access'' to medicines can have four dimensions: (i) Physical availability- defined by the relationship between the type and the quantity of product needed, and the type and the quantity of product provided. (ii) Affordability – defined by the relationship between the prices of the products and user's ability to pay for them (iii) Geographic accessibility (iv) Accessibility (social cultural access) cross linked with safe, efficacious, quality and cost-effectiveness. The availability of affordable and effective drugs is one of the most clearly visible indicators of the quality of health services. Patients satisfaction with the drugs received is a key determinant of utilization of health services and return visits in the health facilities. Patients may choose not to go to health facilities if the medicines they need are unavailable (1).

It is said that most leading causes of death and disability in developing countries can be prevented, treated, or alleviated with cost-effective essential medicines. Despite this fact, millions of people do not have access to essential medicines, and for those who do have access, incorrect use of medicines limits their effectiveness. Differences in access to medicines can lead to differences in the use of services and, consequently, in health outcomes (2).

Efforts have been made in improving access to essential medicines in developing countries during the past few years. However, many of the health services used by the poor still lack adequate supplies of basic medicines. Drug shortages and quality problems continue to undermine the performance of health systems throughout the developing world. Many countries, including Tanzania, are in what appears to be an inescapable situation in which improved economic status can only be achieved by improved health status and vice versa (3). This assessment appears to be correct for the least developed countries (LDCs), as does the conclusion that this difficult situation will only be overcome by a large scale injection of international funding and other resources over many years (4,5).

As mentioned above, affordability refers to the relationship between the price of medicines and individuals ability to pay for them. In developing countries, most medicines are paid for out-of-pocket by individual patients rather than through social security systems. High prices are therefore a barrier to use of medicines and health products. The concept of ability to pay for medicines presents many difficulties whereby using the wage of the lowest-paid government worker, instead of some other measure of disposable income for comparison, is not universally supported, and a question is posed about using the average wage of a laborer. However, the measure is used for developing an index and that this wage is an official marker for which it would be relatively easy to obtain data (6).

As far as poor quality and expired medicines are concerned, these kinds of medicines affect the lives of patients and nations alike. Patients who use these medicines remain ill longer and

spend more time in health facilities, thereby increasing the burden to the health care system. When public health systems use poor-quality medicines, consumer confidence in public health services is undermined. Households may turn to private medicine retailers and, ultimately, spend a larger proportion of their income on medicines (7).

Good medicine quality also depends, in part, on proper storage practices. Methods that protect product integrity through handling and changes in temperature are needed throughout the distribution chain in order to maintain the quality and stability of medicines. Medicines and related supplies are costly, limited and valuable and so they need proper care to avoid deterioration. If they deteriorate, they may lose their potency, have the wrong effects on patients, and may produce incorrect results. Good storage practice involves more than maintaining adequate facilities (9,10). It is equally important to develop proper procedures for receiving the goods, labeling them appropriately, proper inventory management, and security of the pharmaceuticals. On the other hand, it is important to control the conditions that affect the quality and stability of drug products. This is especially crucial for products requiring low temperature storage (9,10,11). In most cases, drug products should be stored under normal storage conditions: dry, well-ventilated premises and avoid intense light (10). This study enabled us to understand the storage conditions of medicines, including refrigeration, and whether or not the conditions comply with the guidelines for good storage practices.

Storage conditions should be monitored for temperature weekly or, if possible, daily, and records should be kept accordingly. The thermometer and hygrometer, used for monitoring the temperature, should be calibrated at defined intervals, according to standard operating

procedures (SOP). As far as refrigeration of medicines is concerned, household refrigerators are not suitable for storing medicine products because they lack the precise electronic control necessary to maintain a typical temperature range of between 2°C and 8°C. Use of commercially available refrigerators designed for medicine products is recommended instead (10,11). The public and private health facilities visited in Moshi were checked for the availability of refrigerators designed for medicine products and whether or not they have proper temperature controls.

In developing countries like Tanzania, high cost of medicines with proven advantages, out-of-pocket payment of medicines due to lack of highly functional health insurance and inadequately publicly subsidized services limits the availability of essential medicines in the hard to reach areas (11). Unavailability of medicines in the health facilities, presence of high prices of medicines in the market and improper storage conditions of medicines had necessitated the need to conduct this survey.

1.1 The situation in Moshi

Moshi is the administrative, commercial and tourist centre of Kilimanjaro Region and the entire North East Tanzania. According to the latest list provided by the Moshi Municipal Council, the town has a total of 37 health facilities (including Government, Private, Parastatal and NGO) out of which there are 4 hospitals, 6 Health Centers, and 27 Dispensaries. Moshi municipality also has 15 retail pharmacies around the town centre according to the latest list provided by the Pharmacy council.

1.2 Problem statement

Availability of key medicines is a big and frustrating issue for the patients because even if the diagnosis is correct, if the health facilities do not have the medicines required for treating the correctly diagnosed conditions, then the patients have to go and look for the medicines elsewhere. This is very frustrating and not acceptable (12). At the end of the day, either the patients end up not buying the medicines, as they are more costly, or buy half doses, consequently increasing the cases of resistance as well as treatment failures (13).

Presence of expired medicines in the health facilities is another setback, which when consumed, can lead to adverse effects that can cause further treatment failures and development of resistance.

Storage conditions and handling of medicines are also issues of uncertainty encountered in the health facilities and pharmacies leading to ineffective medicines which can cause treatment failures and diminish the faith of patients in our health systems which are already struggling (14). In this survey, a descriptive cross-sectional study was done to assess the prevailing shortcomings of the pharmaceutical management situation in Moshi, Tanzania. Tools contained in the WHO Operational package for monitoring and assessing the pharmaceutical situation in countries (2007 version) were used to assess the pharmaceutical management in this study.

1.7 Rationale

The purpose of this survey was to assess the availability, price, presence of expired medicines, and storage conditions of medicines in the public, NGO and private facilities in Moshi in order to help the policy makers and managers improve pharmaceutical services as well as get an insight on the stock out duration of medicines in the public health facilities. The main objective was to collect baseline information from available facility data sets, which would provide a clear picture of the institutional problems. Findings from this study would be used to assess strategies and priorities required and hence come up with better ways to improve the availability, prices of medicines, and storage conditions of medicines as well as reduce stock-outs in the public health facilities.

1.8 Objectives

1.8.1 Broad Objective

Assessment of availability, price, expiry, stock-outs and storage conditions for key medicines in the public, NGO and private pharmacies in Moshi

1.8.2 Specific Objectives

i. To assess the availability of key medicines in public health facilities, NGO health facilities and private retail pharmacies

ii. To assess the price of key medicines in public health facilities, NGO health facilities and private retail pharmacies

iii. To determine the presence of expired medicines in public and private sectors

iv. To assess the adequacy of storage conditions and handling of medicines in public health facilities, NGO health facilities and private pharmacies

v. To determine the average stock out duration of medicines in the public health facilities

CHAPTER TWO

LITERATURE REVIEW

Generally it is accepted that government health expenditures should disproportionately benefit the poor. And yet, in most developing countries the opposite is the case (15). To the extent that need is greater among poor and among rural communities, this reflects an equitable distribution. Some of the results are unlike an analysis in Asia that showed that the distribution of public healthcare is pro-rich in most developing countries (16).

Concerning the prices and affordability of medicines, a survey in 36 low- and middle-income countries, under guidance of WHO and Health Action International (HAI), showed that patients across the six WHO regions had to pay 9 - 25 times the International reference price (IRP), derived from the MSH price indicator guide for selected medicines in the private market (17).

In 2003, a study conducted in Rajasthan, India showed that essential generic medicines were seldom available in public health facilities and that stock outs of medicines was greater (17%) in the public health facilities in comparison to the NGO's (3%). On the other hand, only 45% of the essential medicines were available in the health centers and hospitals (18).

A study was conducted in Ethiopia in 2003 (19) to assess whether the target outcomes of the pharmaceutical sector (i.e. access, quality assurance and rational drug use) have been achieved and also to determine whether the country has the necessary structures and mechanisms in place for improving its pharmaceutical sector. This study showed that on average, the score for

storage conditions were 6 (55 %) and 8 (73 %) on a scale of 0-11 in public health facilities and regional drug stores, respectively. These results are equivalent to an acceptable quality of drugs (19). However, the significant variations between health facilities and regions indicated the need for handling individual cases separately. Also from the study findings, national averages for presence of expired drugs in facilities were found to be 8%, 2% and 3% in health facilities, regional drug stores and private drug retail outlets, respectively. Although the results were not alarming, the significant variation between health facilities and regions called for precaution and further investigation (19). Also in Ethiopia in 2003 (19), 8% of the public facilities had expired medicines while in Mongolia in 2009 (20) 2.7% of the public facilities had presence of expired medicines. In contrast, studies conducted in Saint Lucia in 2012 (21), and Uganda in 2008 (22) reported the absence of expired medicines in the public sector.

The Medical Store Department (MSD) which is the structure responsible for procurement and distribution at the national level in Tanzania is a semi- autonomous, public, non-for-profit organization created in 1993. It operates as a self-sustaining revolving drug fund with 8 zonal stores. Data from the study that was conducted in Tanzania in 2007 found that stock availability of twenty (20) tracer medicines was at an average of 79% at the dates of evaluation in the Zonal Stores (23). The stock out situation measured by the number of days the item has been out of stock in a year ranged between one (1) and one hundred eighty three (183) days. Lead times for delivery by sea on the average were long taking up to 8 months. In addition the time used to clear products from the port to the central warehouse was also long. Stock management techniques also were found to be weak except for traceability of batches (though this had been rated poor by the Tanzania Food and Drug Authority (TFDA) in

previous quality inspections) and the definition of minimum stock levels. This could have contributed highly on the number of expired medicines and supplies which was found to be 3.7 % of sales for the year for 2006 at the central store (23). A previous study done in Ethiopia in 2003 (19) showed that the median stock-out was 99.2 days per year. In Jamaica in 2012 (24) the situation was much better with the median stock-out of 23.1 days, while a study conducted in Saint Lucia in 2012 (21) reported median stock-out of 20.7 days per year.

A survey was done in Tanzania in 2007, and findings showed that ALU was available in more than 75% of the Public sector facilities, an indication that distribution of ALU was reaching the remote public health facilities (25). The availability of ALU in the Private and Religious health facilities was 50% and 47% respectively, and Sulphadoxine/Pyrimethamine (SP) was available in more than 50 % of health facilities in all the three sectors (25). The researchers recommended that national and international Funds to the MSD should be remitted in time to allow timely availability of the medicines at the health facilities. It was also recommended that medicines stock control especially at the health facilities should improve, systems for supervision and monitoring of medicines at the district and regional levels be put in place, prices should be monitored regularly and policies which lead to the reduction in prices should be put in place so as to improve affordability and distribution of medicines.

For the successful launching of any program for the betterment of the people three things are warranted: political will, effective administrative support and a dedicated independent organization, preferably non-governmental (NGO).This holds true for providing quality drugs both in the hospitals and dispensaries run by the government and the private sector (26)

Interventional studies that focused on building pharmaceutical management skills have been conducted in Tanzania, Rwanda, Kenya and Uganda in 2006 (27). The baseline surveys in these studies showed that pharmaceutical management skills are limited among pharmaceutical personnel in terms of quantifying needs for medications and ordering, receiving and storing medications appropriately; recording medications inventories accurately; distributing medications for use appropriately; and advising patients on how to use medications appropriately. The Regional Technical Resource Collaboration for Pharmaceutical Management (RTRC) was established to help address the problem of skills and shortage in pharmaceutical management in East Africa, but still little outcome has been observed (27).

Existing data in Nigeria do not link service utilization to the value of benefits received or to payments that are made for different interventions by different population groups. There are concerns that public health interventions, which may not be reaching poor and marginalized populations have amongst others things led investigators to examine the coverage of public health interventions among persons with differing socioeconomic status (28).

In developing countries, expenses for medicines contribute to 20-60% of the health budget, compared to only 10-20% in developed countries (29), whereby Tanzania with 23.4% is placed rather at the lower end (23). Furthermore, a large proportion of the medicines have to be paid by the patients through out-of-pocket expenses in low- and middle income

countries (30)(31). Public per capita spending for health varies considerably, from 0.08 USD to 139.76 USD within SSA (32). Data from the World Health Report 2006 for

Tanzania showed that per capita total expenditure on health amounted to 12 USD in 2003 (public per capita spending approx. 7 USD). Private health expenditures contributed 44.6% of total health expenditures. Out of these, 81.1% were out-of-pocket expenses (33).

Tanzania introduced a patient cost-sharing (user-fee) scheme in the public sector in 1994; exemptions apply to pregnant women, children under five years of age, the elderly above 60 years and other justified cases. However, the user fee rates are not fixed - some facilities charge flat rates, others varying prices for medicines and services. And the end-consumer medicine price has been found to be on average twice as high as the public sector procurement price (12).

In Tanzania, Community Health Funds at district level have been introduced (42 out of 114 districts covered in 2004), and the National Health Insurance scheme for civil servants was launched in 2001. The majority of the population, however, is not covered by any health insurance yet (12).

The country survey conducted in 2004 on availability and affordability of medicines in Tanzania revealed that availability of key essential medicines in NGO and retail facilities was significantly higher than in the public sector. However, medicine prices that patients were charged were more than twice as high in private and NGO facilities than in public facilities. Medicines in NGO facilities were even slightly more expensive than in the private retail sector. Similar results were obtained in a study carried out in Tanzania (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) in 2004 (34), 2007 (25) and 2009 (35) where the

private sector was reported to be more expensive than the public sector. The lowest paid government worker, who, however, earns more than the majority of the population, had to spend on average 1.4 days wages to pay the public sector user fees for a monthly asthma therapy. Since there is no price regulation for medicines in Tanzania, end-consumer prices vary significantly between but also within all three sectors (from facility to facility), sometimes by many multiples (12).

The situation in Tanzania is similar to that in other developing countries, especially in SSA, where health sector reforms – inflicted by the World Bank – promoted user fees and involvement of private-for-profit providers since the late 1980s. A review of studies in low- and middle-income countries showed that medical expenses impose a substantial burden on private households which may lead to impoverishment, especially when combined with a sickness-related loss of income. The economic costs of illness represent often more than 10% of the household income, and accumulated expenses during an acute illness lead – due to absence of health-insurance systems – to risky "coping strategies" like borrowing money or selling assets (24,25).

A country assessment on access to medicines in Tanzania (17), which was conducted in 2001, concluded that MSD, though it contributes significantly to provision of medicines in Tanzania, would come to its capacity limit in the near future. Whereas MSD procures medicines at highly competitive prices and has a good distribution capacity, inventory management appears

to be insufficient with frequent under- and overstocking leading to out-of-stock situations as well as expiry of medicines.

Price is one of the factors that hinders access to medicines in Tanzania (25). In this regard, the Ministry of Health and Social Welfare in collaboration with the World Health Organization (WHO) and Health Action International (HAI) Africa have been conducting surveys twice a year to monitor medicine prices. The first price monitoring survey was conducted in November – December 2006. The outcome of the survey showed a slight increase of availability of the medicines as compared to the results of the survey of the medicine prices in Tanzania conducted in 2004. The price monitoring conducted in June – July 2007 (25) highlighting availability as well as price variation in three sectors namely, the Public, Private and Mission sectors. Prices of forty key medicines found on the current National Essential Medicines List for Tanzania (NEMLIT) were monitored. The survey took place at 92 rural and urban health facilities in four regions namely Dar Es Salaam, Mwanza, Mbeya and Mtwara. The health facilities surveyed included 30 facilities in the Public sector, 32 in the Private sector and 30 in the Mission sector. This study complemented the results of the previous studies conducted in the PHF's and sees whether there are changes in the availability and price of key medicines from the NEMLIT. Furthermore, it checked whether there are stock outs, expired medicines, adequate records and proper storage conditions of pharmaceuticals in the respective health facilities.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The survey was conducted in public, NGO and private health facilities in Moshi using the *WHO Operational Package for Monitoring and Assessing the Pharmaceutical Situation in Countries* (2007 version) (37). The package contains tools necessary for the survey. Moshi town has a total of 37 health facilities out of which there are 4 hospitals, 6 Health Centers, and 27 Dispensaries. Moshi municipality also has 15 retail pharmacies around the town centre according to the latest list provided by the Pharmacy council.

Moshi town was selected for the study because it is an area not covered by the Ministry of Health during their price and affordability studies being carried out since 2004 (38).

Eleven (11) public health facilities, eleven (11) NGO's, and fifteen (15) private Retail Pharmacies were surveyed. The names of these sites were as depicted in the table 1 and table 2 below.

Table 1: List of the Public and NGO facilities surveyed in Moshi

SN	Public Health Facilities	Non Governmental Organizations
1	Rau Dispensary	Maryland Health Centre
2	Msaranga Dispensary	Hindu Mandal Dispensary
3	Kilimanjaro Christian Medical Centre	Jaffery Dispensary
4	Chuo Cha Polisi Dispensary (CCP)	YMCA Dispensary
5	Mji Mpya Dispensary	Al-Ehsa Kaloleni Dispensary
6	Pasua Health Centre	Moshi Upendo Health Centre
7	Njoro Dispensary	Kishamba Dispensary
8	Majengo Health Centre	Kilimanjaro First Health
9	Kiboriloni Dispensary	Moshi Health Centre
10	Mawenzi Hospital	Papri Medical Centre
11	Bondeni Dispensary	Siima Health Centre

Table 2: List of the Private retail pharmacies surveyed in Moshi

Private Retail Pharmacies			
1.	Pamoja Pharmacy	9.	Pharmasource Pharmacy
2.	Good Samaritan Pharmacy	10.	DS Pharmacy
3.	Pharmacy Afrique	11.	Mount Kibo Pharmacy
4.	The Moshi Plaza Pharmacy	12.	Sasa Pharmacy
5.	Kilimani Pharmacy	13.	Third Millenium Pharmacy
6.	Kilimanjaro Pharmacy 2011	14.	Asda Pharmacy
7.	The Moshi Pharmacy	15.	Msafiri Chemist
8.	Kemi Pharmacy		

3.2 Study design

Descriptive cross sectional design was used to conduct this study. Data collecting tools/ survey forms were used to assess the prevailing pharmaceutical situation in the public, NGO and private pharmacies.

3.3 Study Period

Study was conducted for an approximate period of three months from March 2013 to May 2013.

3.4 Study participants

This study involved a total of 22 health facilities at their outpatient pharmacy department (private, NGO and public) and 15 community retail pharmacies. In each of the health facilities or retail pharmacies, 1-2 medicine dispensers were interviewed. Data collection tools were used in order to get all the information required to achieve the objectives of the study (Annex I).

3.5 Sampling technique

A minimum of 12 health facilities (six private and six public) with outpatient pharmacies should be visited according to the WHO guidelines for facility sampling (34,35). Moshi town has a total of 37 private and public health facilities (including dispensaries) and 15 Community retail pharmacies. The outpatient pharmacy and the Pharmacy store department were visited in each of the respective health facility and the community pharmacies were visited separately. In total, 22 health facilities and all the 15 community retail pharmacies were visited and these were selected through simple random sampling.

3. 6 Sample size

The sample size for this study was 22 health facilities (11 Public and 11 NGO's), and all 15 retail community pharmacies found in Moshi town.

3.7 Data Collection

The public, NGO and private pharmacies' dispensing rooms and pharmacy stores were approached on the day of the visit.

The **survey form 1** (Annex I) was used to get an insight on the availability of key medicines from the NEMLIT used to treat common conditions and expired medicines in the public, NGO and private retail pharmacies as well as stock-out duration of medicines in the public health facilities.

This form was used to provide information on the availability of key medicines, percentage of expired medicines and stock-out days of medicines.

A list of 33 selected key medicines from the NEMLT (40) was prepared from a list of key medicines used by the MOH in the previous studies carried out in Tanzania in 2004 (38). The selected medicines are those that are used to treat common conditions (41) and are based on the lowest health care facility where the medicine may be available. The outpatient pharmacy/dispensing units were asked about their availability and whether or not there are medicines that have expired. The public health facilities with proper records had their ledgers checked for stock-out days for the medicines that they have. The details were recorded accordingly in the survey forms and calculations were made to get the percentage of available and expired medicines respectively.

3.8 Data Management and Analysis

All collected data and completed forms were checked on daily basis by the principal investigator. If any important information was missing, a follow-up by revisiting or telephone call was made to obtain any remaining information. The collected data were again counter-checked for their clarity and validity. The coded data were analyzed using Statistical Package for Social Sciences (Version 20.0) computer analysis software.

Measure of the central tendency and dispersion were analyzed and reported by using descriptive statistics. A P-value of less than 0.05 was considered as statistically significant, at the 95% confidence interval. Median test was used to calculate the p-values for the difference in median prices across the facilities and Chi-square Test was used to calculate the p-values for the difference in availability of individual medicines across the facilities.

3.9 Calculation of average percentage availability

Percentage calculated by dividing the number of medicines in stock on the day of the survey by the number of medicines that should be available, multiplied by 100. The overall availability of key medicines is reported as the percentage of stock availability of the medicines in the facilities on the day of data collection.

The availability of some of the commonly used medicines for which the Chi-square Tests between the 3 different kinds of facilities gave a significant result, further multiple comparisons were made through Bonferroni Adjustments (42). Since three (3) further comparisons were made, the Bonferroni adjusted P-Value was $0.05/3 = 0.0166$.

3.10 Calculation of average percentage expiry

Percentage calculated by dividing the total number of expired medicines by the total number of medicines in stock and multiplying by 100.

3.11 Calculations for Stock-Out Evaluation

Stock out duration was calculated by back revision of the ledger that indicated which medicines had records covering at least six months within the previous twelve months. The equivalent number of stock-out days per year for each medicine was computed by multiplying the number by 365 and dividing it by the review period. The total number of stock-out days per year was computed for each medicine. The average number of stock-out days was finally calculated by dividing the total number of stock-out days by the number of medicines reviewed.

The overall number of stock-out days for medicines in the public health facilities is reported as "the median stock-out days of medicines per year in the facilities on the day of data collection".

The **survey form 2** (Annex II) was used to get information on the prices of key medicines that the patient pays out-of- pocket for the said medicines.

The key indicator in this form was:

Price of key medicines

The pharmaceutical personnel were asked about the selling prices of the respective medicines and data was recorded accordingly. The prices were counter-checked through the price list if it was available on the day of the visit.

For each available medicine, determine the lowest price in the local currency paid out-of-pocket by a patient for the identified preparation and unit. The lowest priced brand or generic equivalent medicine was used. Indicate "0" if medicines were given for free.

3.12 Price criteria evaluation

Indicators include:

- Median price of each medicine in local currency
- Variation in price across pharmacies

Median price: is a type of average value that splits a series of value in half when the series is put in ascending order. This is likely to be a more valuable approach for estimating actual future prices when there is a skewed distribution.

Median Test was used to calculate the P-values for the difference in median prices across the facilities and some of the commonly used medicines which showed significant results were further analysed following Bonferroni adjustment (42). Since three (3) further comparisons were made, the adjusted P-Value was $0.05/3 = 0.0166$.

Median local unit price: unit prices from survey samples were pooled and median prices calculated using the SPSS software.

The **survey form 3** (Annex III) gives insight on the storage conditions of medicines at the public, NGO and private pharmacy dispensing unit and main stores whereby a set of 9 questions were answered and a score was given based on the observed conditions.
The indicator covered in this form was:

Adequate storage conditions and handling of medicines

Adequate storage conditions and handling of medicines checklist is another tool that was used to assess factors that can possibly affect the quality and efficacy of the medicines stored in the selected health facilities (43). Referring to the WHO indicators, nine (9) questions were adopted in the checklist, and the average score was calculated from each column. (i.e. from drug store and dispensing room).The following score chart was used (Table 3);

Table 3: Score Chart for Storage conditions

Percentage (%)	Score (for storage conditions)
75-100	Very satisfactory
50-74	Satisfactory
25-49	Dissatisfactory
0-24	Very dissatisfactory

3.13 Calculations for Storage condition scores

For each facility: Calculate the score for the storeroom by dividing the sum of true statements by 9 and multiplying by 100. Calculate the score for the dispensing area by dividing the sum of true statements by 9 and multiplying by 100.

3.14 Study variables

The variables of the study were as follows:

1. Availability of key medicines in the given dosage form and strength: Each survey medicine with the specific dosage form and strength

2. Price of the medicine: The lowest price paid out-of-pocket by a customer/patient for a selected medicine

3. Storage conditions for medicines in the selected health facilities

4. Median stock-out days of medicines per year in the facilities on the day of data collection.

3.15 Pre-testing of the Data collection tool

Pre-testing of the data collection tools for their validity and appropriateness was conducted in Dar-Es-Salaam in one private health facility and one private retail pharmacy. Thereafter, pre-tested tools were revised and amended for data collection.

3.16 Inclusion and Exclusion Criteria

Inclusion criteria:

The following health facilities were included:

1) Health facilities treating outpatients and with pharmacy or dispensary units

2) Pharmaceutical personnel who agree to participate in the study

Exclusion criteria:

The following will be excluded:

1) Health facilities not treating outpatients and/or with no pharmacy or dispensary units

2) Pharmaceutical personnel who disagree to participate in the study

3.17 *Study Limitations*

This study was done in Moshi town, which is an urban area. Therefore the findings from the study may differ from the general pharmaceutical management practice in the rural areas. Availability of medicines at the health facilities and pharmacies was assessed in a one day survey. Consequently, some facilities may usually have a product in stock but it happened that on the day of the survey it was out of stock. To address this shortcoming, stock ledgers/bin cards were checked in the public health facilities to determine for stock-out days in the last six months.

3.18 Ethical Considerations

Ethical clearance was sought from ethical clearance board (IRB) of the Muhimbili University of Health and Allied Sciences (MUHAS). Study participants were informed on the purposes of the study, and they were asked if they were willing to participate in the study. Written consent (Appendix III) was then obtained from the study participants. No names of study participants was recorded in the data collection tools and data was entered into the computer for analysis using code numbers assigned to each survey form.

Confidentiality was observed regarding the information given or prevailing in the pharmacy/dispensing units of the respective public health facilities.

Permission to conduct the study in the selected health facilities was sought from the Municipal Medical Officers In-charge.

CHAPTER FOUR

RESULTS

4.1 Availability of key medicines

4.1.1 Availability of key medicines in the public health facilities

The survey revealed that one (1) of the public health facility had a very low (9%) availability of medicines while five (5) public health facilities had availability of medicines ranging from 30% to 49% and the remaining five (5) facilities had availability ranging between 50% and 80%. This means that one facility had a very low availability of medicines, while 5 facilities had low availability and the remaining 5 facilities had fairly high availability of medicines (Table 4). However, as far as individual medicines were concerned, there were a few medicines which had high availabilities in the public health facilities; ALu tablets, Amoxicillin 250mg capsules, Albendazole 400mg tablets and Metronidazole 200mg tablets each had an availability of 91%, followed by Erythromycin 250mg tablets, Diclofenac 50mg tablets and Doxycycline 100mg capsules each available at 82% in the public sector (Table 8).

Table 4: Availability of medicines in the Public health facilities

Level of availability	Number	Percentage (%)
Less than 30% (very low)	1	9%
30%-49% (low)	5	45.5%
50%-80% (fairly high)	5	45.5%
Greater than 80% (high)	0	0
Total	11	100%

4.1.2 Availability of key medicines in the private pharmacies

The availability of key medicines in the private retail pharmacies ranged from 50% to more than 80% whereby 26.7% of facilities had availability of medicines ranging from 50% to 80% while 73.3% of facilities had availability of medicines of more than 80% (Table 5).

Table 5: Availability of medicines in the Private retail Pharmacies

Level of availability	Number	Percentage (%)
Less than 30% (very low)	0	0%
30%-49% (low)	0	0%
50%-80% (fairly high)	4	26.7%
Greater than 80% (high)	11	73.3%
Total	15	100%

4.1.3 Availability of medicines in the NGO's

In the NGO's, seven (7) facilities had more than 80% of availability of key medicines while three (3) facilities had fairly high availabilities (50%-80%) and one (1) facility had low availability of medicines (30%-49%).
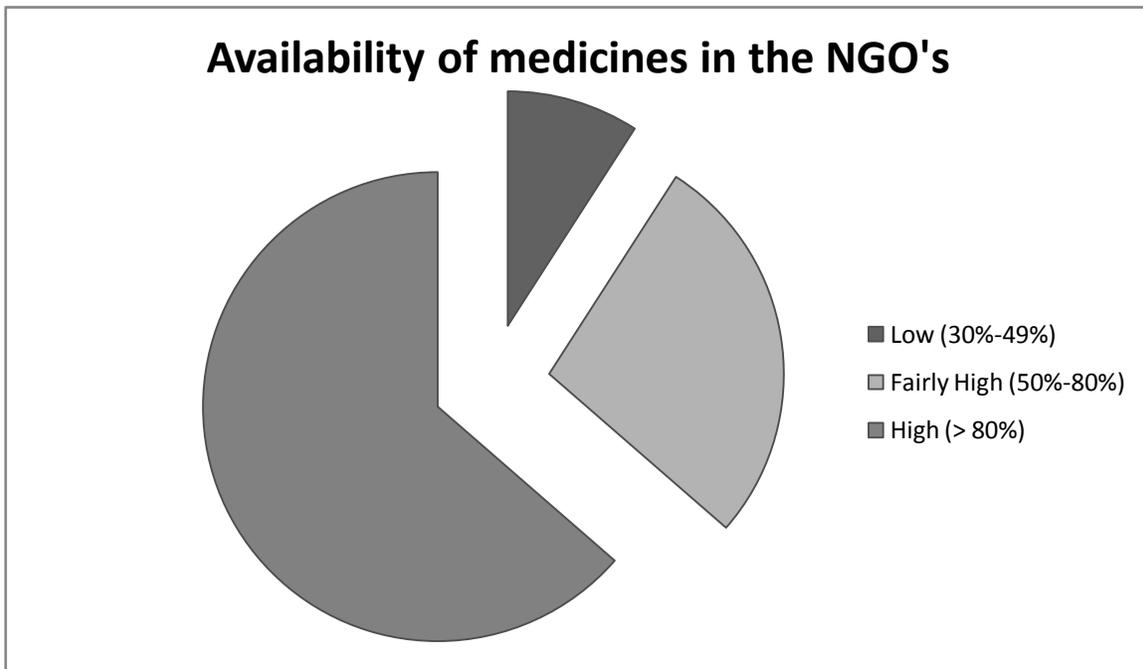
Figure 1: Availability of Medicines in the NGO's

4.1.4 Availability of individual medicines

In the public health facilities, two medicines namely: Gentamycin eye/ear drops and ranitidine tablets were totally absent while ranitidine availability in the private sector was also low (30%-49%). The availability of the following medicines was found to be very low (less than 30%) in the public sector; Atenolol 50mg tablets, Nifedipine 20mg retard tablets, Furosemide 40mg tablets, Metformin 500mg tablets, Glibenclimide 5mg tablets, Omeprazole 20mg capsules, Tramadol 50mg capsules, Amitriptyline 25mg tablets, and Furosemide 10mg/ml injection. Comparatively, most of the medicines were found to be highly available in the private sector especially medicines like Nifedipine 20mg retard tablets, Diclofenac 50mg tablets, Metformin 500mg tablets, Glibenclimide 5mg tablets, Amoxicillin 250mg capsules, Albendazole 400mg tablets, Co-trimoxazole 480mg tablets, Metronidazole 200mg tablets, Phenobarbitone 30mg tablets, Ciprofloxacin 500mg tablets, Fluconazole 150mg tablets, Erythromycin 250mg tablets, Omeprazole 20mg capsules, Tramadol 50mg capsules, Doxycycline 100mg capsules all had 100% availability in the private retail pharmacies. The level of availability of individual medicines is elaborated in the table below.

Table 6: Availability of Individual Medicines

Level of availability	NGO's (n=33)	Public health facilities (n=33)	Private pharmacies (n=33)
High (>80%)	Amoxicillin caps, ORS, Albendazole tabs, Co-trimoxazole tabs, Metronidazole tabs, Phenobarbitone tabs, Gentamycin drops, Ciprofloxacin tabs, , Diazepam tabs, Fluconazole caps, Nifedipine tabs, Furosemide tabs, Metformin tabs, Diclofenac tabs, Tramadol caps, Diclofenac inj, Doxycycline caps, Benzanthine penicillin inj, Salbutamol tabs, Quinine inj, Hydrocortisone inj, Gentamycin inj	Artemether-Lumefantrine tabs, Amoxicillin caps, Albendazole tabs, Co-trimoxazole tabs, Metronidazole tabs, Erythromycin tabs, Diclofenac tabs, Doxycycline caps, Ferrous sulphate tabs	Artemether-Lumefantrine tabs, Amoxicillin caps, ORS, Albendazole tabs, Co-trimoxazole tabs, Metronidazole tabs, Phenobarbitone tabs, Gentamycin drops, Ciprofloxacin tabs, Ceftriaxone inj, Diazepam tabs, Fluconazole caps, Nifedipine tabs, Atenolol tabs, Propranolol tabs, Furosemide tabs, Metformin tabs, Glibenclimide tabs, Omeprazole caps, Erythromycin tabs, Diclofenac tabs, Tramadol caps, Diclofenac inj, Doxycycline caps, Benzanthine penicillin

			inj, Salbutamol tabs
Fairly high (50%-80%)	Artemether-Lumefantrine tabs, Ferrous sulphate tabs, Furosemide inj, Ceftriaxone inj, Atenolol tabs, Glibenclimide tabs, Omeprazole caps, Erythromycin tabs	ORS, Phenobarbitone tabs, Ciprofloxacin tabs, Fluconazole tabs/caps, Benzanthine penicillin inj, Quinine inj, Salbutamol tabs	Ferrous sulphate tabs, Amitriptyline tabs, Ranitidine tabs, Quinine inj, Hydrocortisone inj, Gentamycin inj
Low (30%-49%)	Amitriptyline tabs, Propranolol tabs	Ceftriaxone inj, Diazepam tabs, Propranolol tabs, Diclofenac inj, Hydrocortisone inj, Gentamycin inj	Furosemide Inj
Very low (<30%)	Ranitidine tabs	Nifedipine tabs, Atenolol tabs, Furosemide tabs, Metformin tabs, Glibenclimide tabs, Omeprazole caps, Tramadol caps, Amitriptyline tabs, Furosemide inj	
Absent		Gentamycin eye/ear drops, Ranitidine tabs	

Table 7: Percentage availability of medicines across all sectors

Medicine Name	Percentage Availability (%)			P-Value
	Public facility	NGO	Private Pharmacy	
ALu tabs	91%	46%	93%	0.007
Amoxicillin 250mg cap	91%	100%	100%	0.297
Metronidazole 200mg tab	91%	100%	100%	0.297
Phenobarbitone 30mg tab	55%	64%	100%	0.015
Ciprofloxacin 500mg tab	73%	91%	100%	0.084
Ceftriaxone inj 1g	45%	73%	93%	0.025
Atenolol 50mg tab	18%	73%	93%	<0.0001
Metformin 500mg tab	18%	91%	100%	<0.0001
Erythromycin 250mg tab	82%	73%	100%	0.115
Glibenclimide 5mg tab	9%	64%	100%	<0.0001
ORS sachet	73%	91%	93%	0.277
Albendazole 400mg tab	91%	100%	100%	0.297
Ferrous Sulphate tab	82%	55%	53%	0.276
Co-trimoxazole 480mg tab	82%	82%	100%	0.217
Gentamycin eye/ear drops	0%	82%	87%	<0.0001
Diazepam 5mg tab	36%	91%	93%	0.001
Fluconazole150mg tab/cap	45%	82%	100%	0.004

Nifedipine 20mg retard tab	18%	73%	100%	<0.0001
Propranolol 40mg tab	36%	36%	87%	0.010
Furosemide 40mg tab	9%	82%	93%	<0.0001
Omeprazole 20mg cap	18%	73%	100%	<0.0001
Diclofenac 50mg tab	82%	100%	100%	0.082
Tramadol 50mg cap	9%	82%	100%	<0.0001
Amitriptyline 25mg tab	27%	45%	67%	0.135
Ranitidine 150mg tab	0%	9%	53%	0.003
Salbutamol 4mg tab	55%	82%	93%	0.057
Diclofenac 25mg/ml inj	36%	100%	87%	0.001
Furosemide 10mg/ml inj	9%	73%	47%	0.010
Doxycycline 100mg cap	82%	91%	100%	0.242
Benzyl penicillin inj 5MU	73%	91%	80%	0.548
Quinine 300mg/ml inj	64%	82%	67%	0.598
Hydrocortisone 100mgvial	45%	91%	67%	0.074
Gentamycin 80mg/ml inj	45%	82%	60%	0.208

P-Value < 0.05 = statistically significant difference between the availability of individual

medicine and the kind of facility.

Further comparisons of the commonly used medicines with significant results from the above

table were performed following Bonferroni adjustment as showed in the table below;

Table 8: Availability of commonly used medicines following comparisons between sectors

Medicine name	Public Health facility V/S NGO (P-Values)	Public health facility V/S Private Pharmacy (P-Values)	Private Pharmacy V/S NGO (P-Values)
ALu	0.022	0.819	0.007
Nifedipine 20mg tabs	0.003	<0.0001	0.086
Atenolol 50mg tabs	0.010	<0.0001	0.150
Metformin 500mg tab	0.001	<0.0001	0.234
Glibenclimide 5mgtab	0.008	<0.0001	0.011
Propranolol 40mg tab	1.0	0.008	0.008
Furosemide 40mg tab	0.001	<0.0001	0.364

P-value < 0.0166 = statistically significant difference between the availability of individual medicine and the kind of facility.

As shown above, there is a statistically significant difference in the availability of ALu and Propranolol tablets between the NGO's and private retail pharmacies sector. As for Nifedipine, Atenolol, Metformin, Glibenclimide and Furosemide tablets, there is a statistically significant difference in their availability between the public health facilities and NGO's as it is between the public health facilities and private retail pharmacies.

4.2 Percentage of expired medicines

Excluding four (4) public health facilities (36.4%) and one (1) private pharmacy (6.7%) which happened to have one expired medicine each, all other thirty two (32) facilities did not have expired medicines on their dispensing shelves. Many had expired medicines but were kept separate from the un-expired medicines and safely in a box waiting for formal reporting. The private pharmacies report the expired medicines to the relevant regulating authority, Tanzania Food and Drugs Authority (TFDA), and await formal disposal procedures. As for the public **sector,** medicines that are close to expiry are sent to other facilities where there is a faster movement of that particular medicine. Mostly these medicines were sent to Pasua health centre which happened to be the mother-facility of the other facilities.

The private retail pharmacies and NGO's were very vigilant about the expired medicines due to the unannounced inspections carried out by TFDA and Pharmacy Council.

As for disposing the expired medicines, all the public health facilities report the expired medicines to the Pharmacist in the Municipal Council who then collects the medicines from the respective facilities. The fate of the medicines from that point onwards was, however, not investigated further.

4.3 Adequate storage conditions and handling of medicines

4.3.1 Storage conditions in the Private retail Pharmacies

During study visits to the selected health facilities, all the 37 facilities had their Main drug stores and dispensing rooms assessed using a checklist. Results show that percentage average scores for all Main drug stores for private pharmacies in Moshi was 68.6%, which, according to the knowledge score chart (Table 3), is Satisfactory. Mount Kibo Pharmacy had the highest score of 89% while Kemi Pharmacy had the lowest score of 44% as depicted in the table below.

As far as systematic arrangement of medicines in the main drug store is concerned, 92.8% of the pharmacies had arranged their main drug store medicines in a pharmacological order while 7.2% had arranged the medicines in an alphabetical order.

Table 9: Storage Conditions in the Main Drug Stores of Private Pharmacies

Main Drug Store	% Average Scores	Score Status
Pamoja Pharmacy	78	Very Satisfactory
Good Samaritan Pharmacy	67	Satisfactory
Pharmacy Afrique	56	Dissatisfactory
The Moshi Plaza Pharmacy	67	Satisfactory
Kilimani Pharmacy	78	Very Satisfactory
Kilimanjaro Pharmacy 2011	78	Very Satisfactory
The Moshi Pharmacy	67	Satisfactory
Kemi Pharmacy	44	Dissatisfactory
Pharmasource Pharmacy	67	Satisfactory
DS Pharmacy	67	Satisfactory
Mount Kibo Pharmacy	89	Very Satisfactory
Sasa Pharmacy	No Store	N/A
Third Millenium Pharmacy	No store	N/A
Asda Pharmacy	78	Very Satisfactory
Msafiri Chemist	56	Satisfactory
Average Score	**68.6%**	**Satisfactory**

The Dispensing rooms of the pharmacies were also assessed whereby the average percentage score of all the pharmacies was 89% which is considered very satisfactory. As for the systematic medicine arrangement in the dispensing rooms, 53.3% of the pharmacies had arranged their dispensing medicines in Pharmacological order while 46.7% of the pharmacies had arranged their medicines in both, alphabetical and pharmacological order.

As for the dispensing tools, 7 pharmacies out of the 15 surveyed did not have dispensing tools while 3 pharmacies had evidence of pests in the area. Drugs were stored on the floor in 5 pharmacies. One pharmacy had expired medicine on the shelf.

4.3.2 Storage conditions in the Public Health facilities

In the public health facilities, the average percentage scores for the dispensing room in all the facilities was 52.6% as shown in the table below. This was considered satisfactory. However, certain facilities like Njoro Dispensary and Bondeni Dispensary had their average scores of 33% which was considered Dissatisfactory as depicted in the table below.

Table 10: Storage Conditions in the Dispensing rooms of Public Health Facilities

Dispensing Room	% Average Score	Score Status
Msaranga Dispensary	67	Satisfactory
Rau Dispensary	67	Satisfactory
KCMC Hospital	56	Satisfactory
CCP Dispensary	44	Dissatisfactory
Mji Mpya Dispensary	56	Satisfactory
Pasua Health Centre	56	Satisfactory
Njoro Dispensary	33	Dissatisfactory
Majengo Health Centre	56	Satisfactory
Kiboroloni Dispensary	67	Satisfactory
Mawenzi Hospital	44	Dissatisfactory
Bondeni Dispensary	33	Dissatisfactory
Average Score	**52.6%**	**Satisfactory**

Only 3 public health facilities out of 11 had their main drug stores arranging medicines in a pharmacological order while the rest had the medicines randomly placed. As for the dispensing rooms, none (0%) of the public health facilities had arranged their medicines in any kind of order in their respective dispensing areas.

None of the public health facilities (0%) had a cold storage with a temperature chart in their main drug stores while 10 out 11 public facilities did not have dispensing tools. Only Mawenzi hospital had a tablet counting tray.

There was evidence of pests in the area for 6 public facilities. Meanwhile, 4 facilities had expired medicines together with the unexpired stock in one place. Out of the 11 public facilities, 2 facilities were storing drugs directly on the floor.

The average percentage score in the Main drug stores of all the public health facilities was 44.5% which is considered Dissatisfactory, whereby the highest was KCMC hospital with 78% and the lowest was CCP Dispensary, Pasua Health Centre and Njoro Dispensary all scoring a mere 22% each.

4.3.3 Storage conditions in the NGO sector

As for the Private health facilities, the average percentage score in the Main drug stores of all the facilities was 45.8% which is considered dissatisfactory as illustrated in the table **11** below. The highest score was that of Hindu Mandal Dispensary with 67% and the lowest was 22% shared amongst Al Ehsa Kaloleni Dispensary and Kilimanjaro First Health each. Three facilities did not have main drug stores and were keeping a limited stock in the dispensing rooms only.

Table 11: Storage Conditions in the Main Drug Stores of NGO's

Dispensing Room	% Average Score	Score Status
Maryland Health Centre	No store	N/A
Hindu Mandal Dispensary	67	Satisfactory
Jaffery Dispensary	67	Satisfactory
YMCA Dispensary	44	Dissatisfactory
Al Ehsa Dispensary	22	Very Dissatisfactory
Moshi Upendo Health Centre	56	Satisfactory
Kishamba Dispensary	No store	N/A
Kilimanjaro First Health	22	Very Dissatisfactory
Moshi Health Centre	No store	N/A
Papri Medical Centre	56	Satisfactory
Siima Health Centre	33	Dissatisfactory
Average Score	**45.8%**	**Dissatisfactory**

As for the dispensing rooms, the average percentage score for all the NGO's was 71% which is satisfactory. However, 9 facilities out the surveyed 11 did not have dispensing tools in their pharmacies and 5 facilities had evidence of pests in the area. As far as storing drugs on the floor is concerned, 4 facilities were found to be culprits as depicted in the photos below;
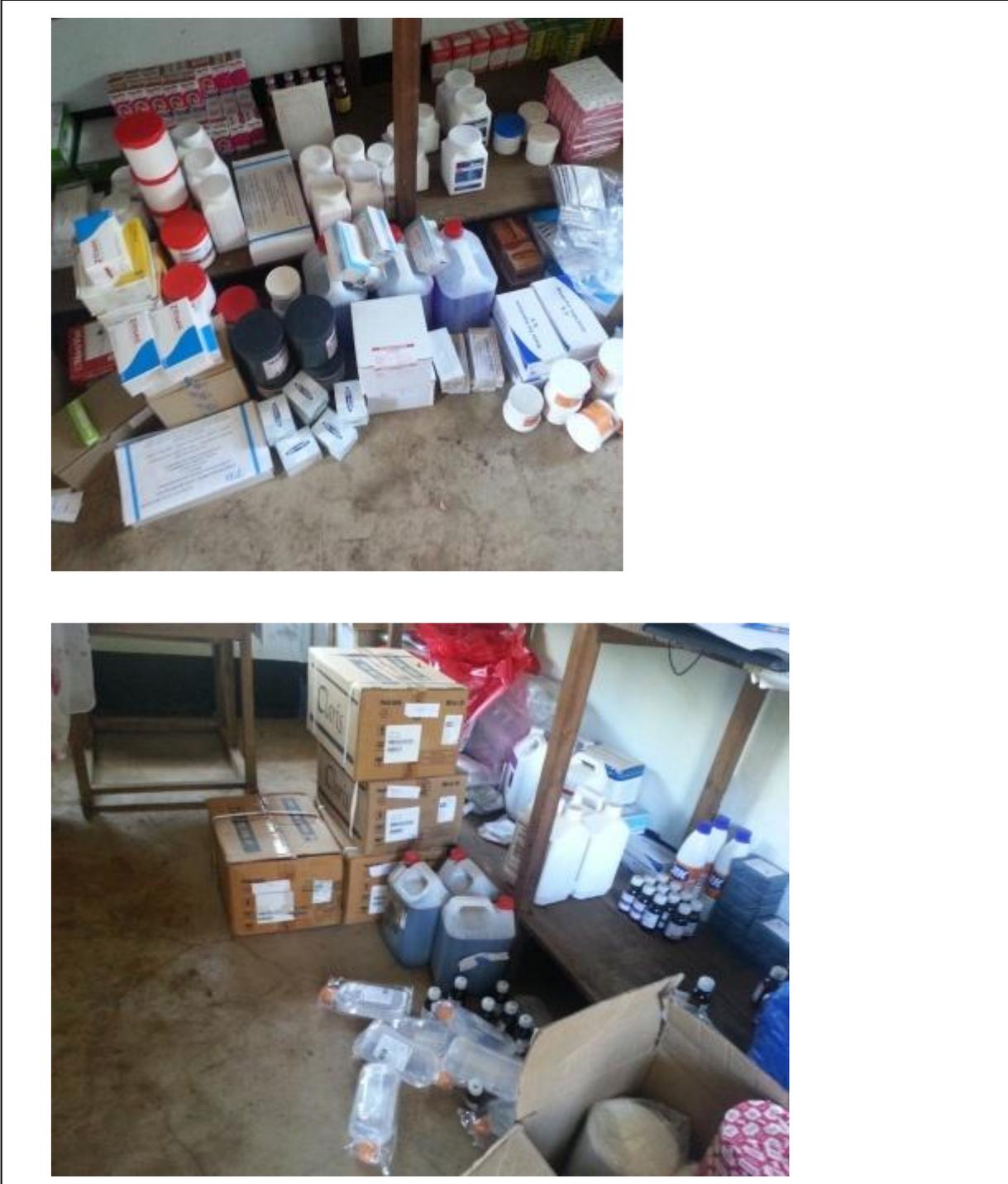
Figure 2: Photos showing medicines stored on the floor in the health facilities

The average percentage storage condition scores in the main drug stores and the dispensing rooms of the three different kinds of facilities are summarized in the following figures below;

	Public Health Facilities	NGO's	Private Retail Pharmacies
■ Average Storage Condition Scores in the Main Drug Stores (%)	44.5	45.8	68.6
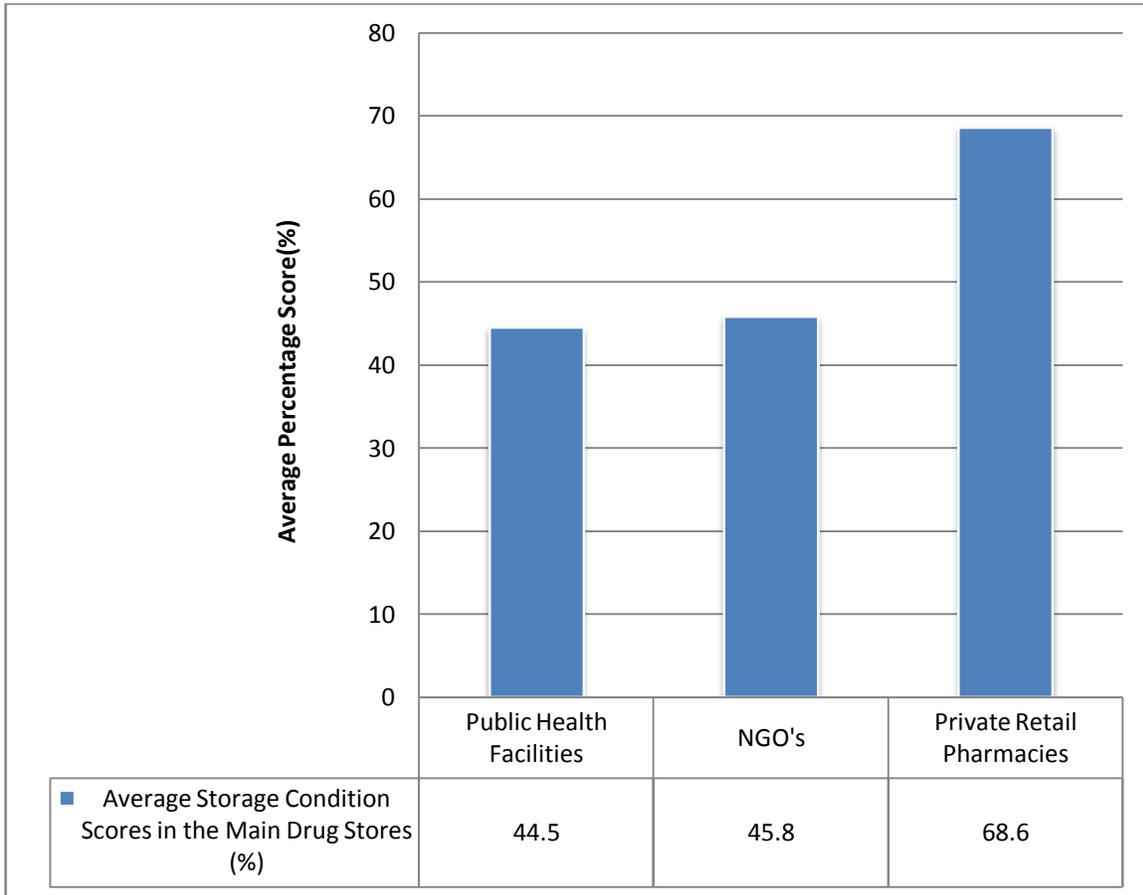
Figure 3: Average Storage Condition Scores in the Main Drug Stores
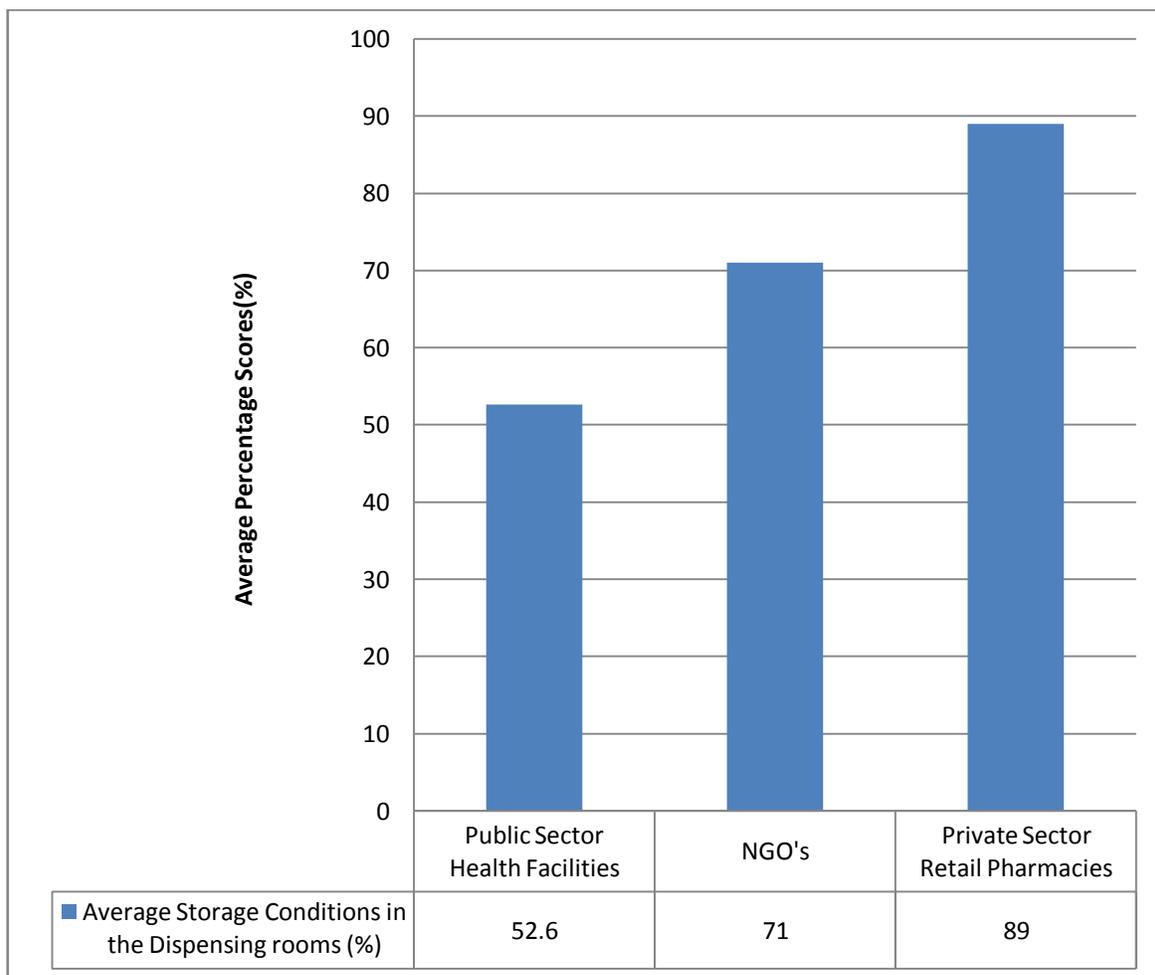
Figure 4: Average Storage Condition Scores in the Dispensing Rooms

Below is the summary of the storage conditions in the three different kinds of sectors whereby the storage conditions in the main drug stores of the public and NGO facilities were dissatisfactory while the private pharmacies had satisfactory scores. The dispensing rooms of the public and NGO facilities had satisfactory storage conditions while the private pharmacies had very satisfactory storage conditions. The minimum score in the Main drug stores of public

health facilities, NGO's and private pharmacies was 22%, 22% and 44% respectively while

the maximum score was 78%, 67% and 89% respectively.

Table 12: Summary of the storage conditions in the different kinds of facilities

Storage Condition	Mean Score %	% (Minimum/ Maximum) Score	Av. 25th Percentile	Av. 75th Percentile	Av. 95% Confidence Interval
Main drug store of Public health facilities	44.5	22/78	22	58.7	(33.7-57)
Dispensing room of Public health facilities	52.6	33/67	44	67	(45.3-59.9)
Main drug store of NGO facilities	45.8	22/67	24.8	64.2	(33.3-57.3)
Dispensing room of NGO facilities	71	45/100	56	78	(62-80)
Main drug store of Private Pharmacies	68.6	44/89	61.5	78	(62.5-74.6)
Dispensing room of Private Pharmacies	89	67/100	78	100	(83.9-93.4)

4.4 Medicine Prices

Key findings: For similar pairs of medicines surveyed (n=10)

Prices in the NGO's were approximately 1.87 times higher than prices in the public health

facilities. Prices in the NGO's were approximately 1.36 times higher than in the private retail

pharmacies. Prices in the private retail pharmacies were approximately 1.48 times higher than in the public health facilities.

Table 13: Median Prices of all the 33 medicines in all the three different kinds of facilities

Medicine Name	Median price of medicine in Private pharmacies (Tsh)	Median price of medicine in NGO facilities (Tsh)	Median price of medicine in public health pharmacies (Tsh)	P-Value
ALu tabs	63	104	21	0.001
Amoxicillin 250mg cap	50	67	50	0.031
Metronidazole 200mg tab	40	50	30	0.333
Phenobarbitone 30mg tab	50	27.5	20	0.031
Ciprofloxacin 500mg tab	150	200	150	0.112
Ceftriaxone inj 1g	2000	3750	1750	0.141
Atenolol 50mg tab	100	150	95	0.915
Metformin 500mg tab	100	150	95	0.005
Erythromycin 250mg tab	100	133	80	0.003
Glibenclimide 5mg tab	100	125	115	0.038
ORS sachet	500	300	300	0.187
Albendazole 400mg tab	500	500	500	0.277
Ferrous Sulphate tab	50	100	20	0.001

Co-trimoxazole 480mg tab	50	50	35	0.721
Gentamycin eye/ear drops	1000	2000	1150	0.119
Diazepam 5mg tab	50	50	25	0.418
Fluconazole 150mg tab/cap	600	800	150	0.428
Nifedipine 20mg retard tab	150	200	100	0.019
Propranolol 40mg tab	50	50	50	0.863
Furosemide 40mg tab	50	45	20	0.050
Omeprazole 20mg cap	100	100	100	0.069
Diclofenac 50mg tab	50	50	50	0.032
Tramadol 50mg cap	200	225	250	0.587
Amitriptyline 25mg tab	50	100	45	0.031
Ranitidine 150mg tab	100	175	195	0.457
Salbutamol 4mg tab	30	20	20	0.050
Diclofenac 25mg/ml inj	500	1000	1000	<0.0001
Furosemide 10mg/ml inj	800	1000	650	0.043
Doxycycline 100mg cap	100	150	100	0.105
Benzyl penicillin inj 5MU	1000	1750	750	0.001
Quinine 300mg/ml inj	500	1500	600	0.006
Hydrocortisone 100mg vial	1000	2000	900	<0.0001
Gentamycin 80mg/ml inj	500	1000	500	0.011

P-Value < 0.05 = statistically significant difference between the median unit price of medicines and the kind of facility.

Some of the commonly used medicines with significant results in the Median test were further analysed following Bonferroni adjustment as shown in the table below;

Table 14: Comparison of median prices of commonly used medicines between facilities

Medicine name	Public Health facility V/S Private Health facility (P-Values)	Public health facility V/S Private Pharmacy (P-Values)	Private Pharmacy V/S Private Health facility (P-Values)
ALu	0.002	0.007	0.361
Amoxicillin 250mg caps	0.635	1.00	0.022
Erythromycin 250mg tabs	0.004	0.238	0.043
Metformin 500mg tabs	0.497	1.00	0.009
Glibenclimide 5mgtab	1.00	0.097	0.033
Nifedipine 20mg tab	0.007	0.635	0.010
Furosemide 40mg tab	0.282	1.00	0.121
Quinine 300mg/ml Inj	<0.0001	0.070	0.005

P-Value < 0.0166 = statistically significant difference between the median unit price of medicines and the kind of facility.

There was a statistically significant difference in the price of ALu between the public and NGO facilities as well as between the public health facilities and private pharmacies. As for Erythromycin tablets, Nifedipine tablets and Quinine Injection, there was a statistically

significant difference in their prices between public and NGO facilities while there was a statistically significant difference in the prices of Metformin tablets and Quinine injection between the NGO facilities and private pharmacies.

Out of all the medicine prices in the three different kinds of health service providers, there were four (4) medicines whose median prices were the same in all kinds of private and public pharmacies. These medicines were Albendazole 400mg tab, Propranolol 40mg tab, Omeprazole 20mg cap and Diclofenac 50mg tab.

The price of ALu remained considerably constant in the public health facilities but varied in the NGO's and pharmacies. However, most fluctuations were observed in the NGO's as far as prices are concerned.

The prices in the NGO facilities were similar to the prices in the private pharmacies in that they were higher than in the public sector.

In many public health facilities, the price lists were not updated. Some happened to be following the old price list while others decided to increase the prices themselves, not following the price list. In short, there were discrepancies between the prices in the price lists and the actual price charged to the end users.

4.5 Stock-out period of medicines in the Public Sector

The median stock-out days per year was 117 days (ranging from 0 days for Mji Mpya Dispensary to 135 days for Kiboroloni Dispensary) for medicines in the public health facilities

(Table 16 and Figure 5). Five facilities out of the eleven surveyed did not have proper records to enable calculation of stock-out days of medicines for at least six months.

Table 15: Stock-out data in the public health facilities

Sector	Median Stock-out days	(Minimum/Maximum) Days	25th Percentile Days	75th Percentile Days	95% Confidence Interval
Public Health facilities	117	0/135	78.8	126.8	(52.5-129.5)

	Mji Mpya Dispensary	Kiboroloni Dispensary	Msaranga Dispensary	Njoro Dispensary	Rau Dispensary	Majengo Health Centre
■ Average Stock-Out days Per Year	0	135	121	124	113	105
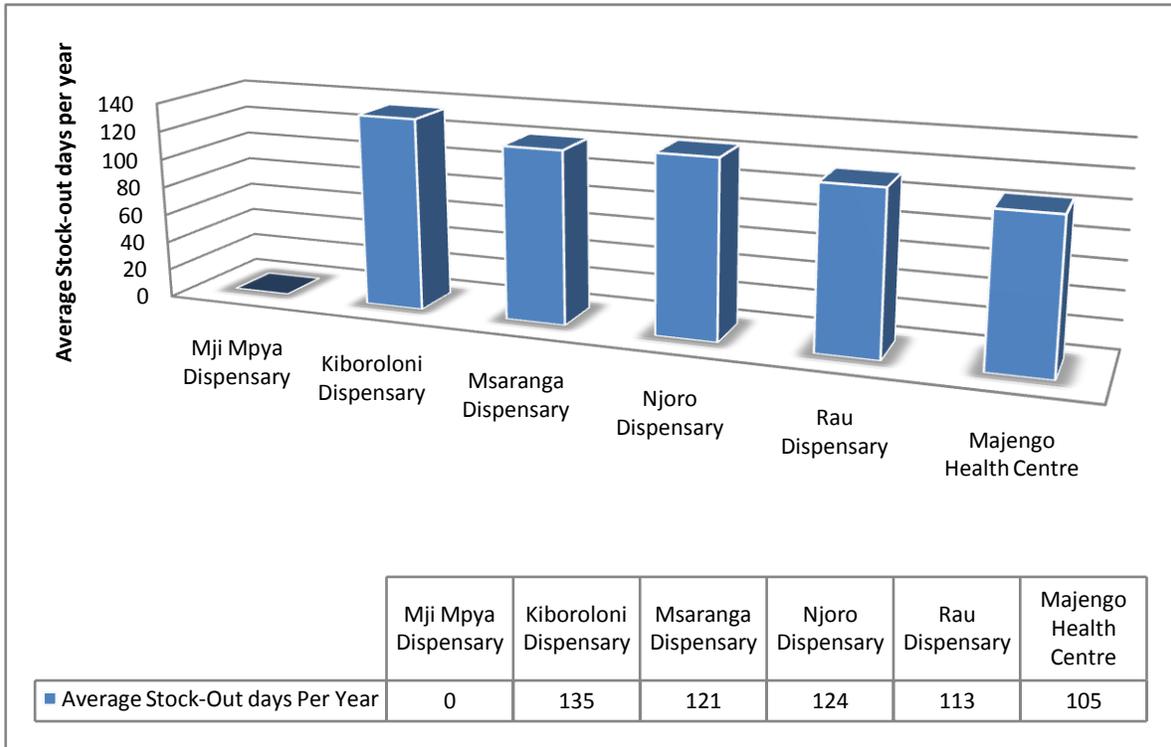
Figure 5: Variation of Stock-out days of medicines per year in the Public Health Facilities

CHAPTER FIVE

DISCUSSION

The low availability of key medicines in the public health facilities, as depicted through the results of this study, is one of the reasons why there might be reduced confidence of patients in the public health systems, in particular the pharmacies, because most of the medicines prescribed are hardly available. Consequently, the attention is drawn to the private sector where these medicines are available but at higher price. In this survey, the overall availability of medicines in the public health facilities was 47.9%, which is not satisfactory and quite less than the overall availabilities in the studies done in Ethiopia in 2003 (19), Jamaica in 2012 (24), Mongolia in 2009 (20), Saint Lucia in 2012 (21), and Sudan in 2007 (44). Nevertheless, the availability of medicines depicted in this survey is a little higher than a previous study done in Uganda in 2008 (22). ALu, the first line drug for the treatment of uncomplicated Malaria, which is the number one killer disease in Tanzania, had an availability of 91% in the public health facilities which is similar to other studies done in Tanzania (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) in 2007 (25) and 2009 (35) where ALu was available in more than 75% of public health facilities.

In this study, medicines were more available in the NGO facilities and private retail pharmacies as compared to the public health facilities. This can be compared to the previous studies carried out in Tanzania (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) through the MOHSW in 2008 and 2009 whereby the overall availability of medicines in the public health facilities was 61% and 65% respectively (35). In a similar study carried out in

Uganda, the overall medicine availability in the public health facilities was 50% in 2009 (45) and 59% in 2010 (46).

In the NGO facilities, the overall availability of medicines was satisfactory whereby thirty out of thirty three medicines had availability of more than 50%. The lower availability of medicines in the NGO facilities in comparison to the private retail pharmacies could be attributed to the specific kinds of treatments that the facilities are capable of offering to their patients and the kinds of patients that they usually get at their respective facilities. It is understandable that there is no reason to keep those kinds of medicines that are hardly used in the facilities in contrast to the private retail pharmacies who rely on walk-in patients for their business, with different kinds of prescriptions and range of medical conditions from various facilities. This can be compared to the study carried out in Uganda where the overall availability of medicines in the private sector was 85% in 2009 (45) and 84% in 2010 (46). In our study and those conducted in Uganda, the availability of the majority of the medicines is greater than 80% (45,46). This is an indication of the command that the private sector holds in contrast to the public sector which is usually faced with shortage and frequent stock-outs of medicines. Stock-out of medicines in the private sector is very minimal due to the stiff market in which they have to be very competitive and make sure that essential medicines are available at their disposal throughout. Failure of which will make them lose their customers, temporarily or permanently.

As for the private retail pharmacies, the study has revealed that 96.9% of medicines had availability of more than 50%. This is comparable to the 58.5% of medicines being available

in more than 50% of facilities in a survey done here in Tanzania in 2009 (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) whereby 24.4% of the medicines were highly available (>75%) (35). Similar studies carried out in Ethiopia in 2008 (47), Saint Lucia in 2012 (21), and Sudan in 2007 (44) have all shown that private pharmacies have got higher availabilities of medicines as compared to their public counterparts. As observed, there is almost three fold increase in the medicines that are highly available in excess of 75% in the private pharmacies. This could be attributed to the financial gains in the sale of medicines that the private sector has comprehended over the years and the importance of the availability of the medicines to actually realize the sales and make consequent profits.

The availability of ALu was highest in the private retail pharmacies with 93.3% availability followed by public health facilities with 91% availability. Availability of ALu was very low (45.4%) in the NGO health facilities. In the previous study carried out in Tanzania in 2009 in five regions (Dar-Es-Salaam, Mwanza, Mbeya, Morogoro and Mtwara), ALu had an availability of 75% in the public health facilities and 45% in the private retail pharmacies and ADDOs (35). The likely reason for the higher availability of ALu in the public health facilities is the subsidized price (500/- Tshs) at which it is sold. Naturally, many patients will buy ALu from the public health facilities. Subsequently, NGO health facilities are unlikely to stock adequate ALu as it is not a fast moving item. One of the reasons for the slow movement of ALu in the private health facilities could be that the patient is not ready to spend more time and money (to see a doctor/pay for laboratory investigations) in the NGO's while the anti-malarial is readily available at the private retail pharmacies with no added costs of consultation or laboratory investigations. Despite the high availability of ALu in the public

health facilities and private retail pharmacies, it is still not satisfactory considering that Malaria is the number one killer disease in Tanzania. Its availability should be nothing less than 100% (35).

With regards to the availability of Oral rehydration salts (ORS), the public sector had 72.7% availability while NGO facilities and Private retail pharmacies had ORS availability of 91% and 93.3% respectively. This can be related to the previous study carried out in Tanzania in 2009 (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) where the availability was 84% and 88% in the public health facilities and private retail pharmacies and ADDOs respectively (35).

The availability of anti-diabetics, metformin 500mg and glibenclimide 5mg, was very low in the public sector in contrast to the private sector whereby metformin 500mg tablets had an availability of 18.2% in the public sector. This showed that anti-diabetics were seldom available in the public sector and hence efforts should be made to make them available to the needful patients in this sector. Similar results were also obtained in previous studies done in Tanzania in 2002 (48) and 2007 (25) .

The findings from this study also reveal that anti hypertensive's, Atenolol 50mg and Nifedipine 20mg retard tablets had very low availabilities although better than that in Afghanistan in 2002 (49), followed by NGO facilities with fairly high availability and the private retail pharmacies with very high availabilities. Metformin 50mg and Nifedipine 20mg retard tablets also had very low availabilities with both available at only 18.2% in the public health facilities. Nifedipine 20mg retard tablets were available in 38% of the public facilities

and 48% of the private pharmacies surveyed in Tanzania in 2004 while Atenolol 50mg tablets were available in 24% and 42% of the public and private pharmacies respectively (38). These results are also in line with other previous studies done in Tanzania (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) in 2007 (25) and 2009 (35) as well as Uganda in 2008 and 2009 (46,47) where the availabilities of the above mentioned anti diabetics and anti hypertensive's was considerably low in the public sector in contrast to their private counterparts. This shows that availability of these medicines has reduced over the years rather than being the opposite. Efforts should be made to change this scenario and have more public facilities keeping the important anti hypertensive's as more people are diagnosed with hypertension and diabetes and the majority of the low and middle class civilians cannot afford to buy these medicines at higher prices from the private sector.

As far as storage conditions and handling of medicines is concerned, the average score of the Main drug stores of the public health facilities in this survey was 44.5% which is considered Dissatisfactory. This score is much lower than the study carried out in Dar-Es-Salaam in 2011 (43) in the public health facilities where the average score was 64% as well as another study in Uganda where the average score was 80% (22). A similar study in Kenya in 2003 had their average of Main drug store storage conditions as 69% in the public sector and 74% in the private sector (41). Other studies done in Uganda in 2008 (22), Mongolia in 2009 (20) and Saint Lucia in 2012 (21) have all shown better results than this study as far as storage conditions of medicines are concerned. This shows that we are behind other countries as far as proper storage and handling of medicines is concerned (10).

All the health facilities' drug stores had no cold storage with temperature chart and medicines were stored directly on the floor in many facilities. Expired medicines were kept in the same area with dispensing medicines in less than half of the surveyed public facilities. In Ethiopia in 2003 (19), 8% of the public facilities had expired medicines while in Mongolia in 2009 (20) 2.7% of the public facilities had presence of expired medicines. In contrast, Saint Lucia in 2012 (21), and Uganda in 2008 (22) had 0% of expired medicines in the public sector. Likewise, the majority of the facilities did not have dispensing tools in their pharmacies and half of the surveyed facilities had evidence of pests in the area. As for the dispensing rooms, none (0%) of the public health facilities had arranged their medicines in any kind of order in their respective dispensing areas. These results are similar to a study carried out in Dar-Es-Salaam in 2011 (43) whereby most of the facilities did not have cold storage with a temperature chart and many lacked dispensing tools as well as non-arrangement of medicines in a particular order. One of the reasons that contributed to the non-arrangement of the medicines in a particular order in the public health facilities was the limited number of medicines. Few medicines are available at their disposal and a small table is kept adjacent to the dispensing window on which the limited medicines are kept.

As for the Dispensing rooms in the Public sector, the average score in this study was 52.6%, which was Satisfactory. However, in comparison to the study in Dar-Es-Salaam (2011) in public facilities, the average score was 65% while the average score in WHO Report 2003 was 55% (43).

The storage conditions and handling of medicines in the private retail pharmacies were much enhanced in this study in comparison to the other two health systems whereby their average main drug store score was 68.6% while dispensing room score was 89%, which is considered satisfactory and very Satisfactory respectively. This is similar to other studies carried out in Ethiopia in 2008 (47), Saint Lucia in 2012 (21), Uganda in 2008 (22) and Mongolia in 2009 (20), all of which reporting satisfactory storage conditions in the private drug outlets.

As for the dispensing tools, almost half of the surveyed pharmacies did not have dispensing tools while 3 pharmacies had evidence of pests in the area. Regulatory authorities should carry out frequent inspections and take necessary action to reduce/eliminate such incidences. Drugs were stored on the floor in 5 pharmacies. These results are comparable to a similar study done in Dar-Es-Salaam in 2011 in the public sector where more than half of the visited facilities had evidence of pests, were lacking dispensing tools and storing drugs on the floor (43). Presence of expired medicines on the shelves was not much of a problem discovered in this study as far as the private sector was concerned. The private retail pharmacies and NGO's were very vigilant about the expired medicines due to the unannounced inspections carried out by TFDA and Pharmacy Council. This can be compared to a study in Kenya (2007) where 13.3% of the public health facilities and 6.7% of the private retail outlets had one or more expired medicines on their shelves (41) as well as Ethiopia in 2003 (19) where 3% of the private pharmacies had expired medicines on their shelves. In contrast, studies done in similar facilities in Mongolia in 2009 (20), Uganda in 2008 (22), and Saint Lucia in 2012 (21) all did not report presence of expired medicines in their private pharmacies.

As for the Medicine prices paid out-of pocket by patients, prices in the private health facilities were approximately 1.87 times higher than prices in the public health facilities while prices in the private health facilities were approximately 1.36 times higher than the prices in the private retail pharmacies. On the other hand, prices in the private retail pharmacies were approximately 1.48 times higher than in the public health facilities. This can be compared to studies carried out in 2009 in Tanzania where the Private pharmacies and ADDOs were, in overall, 1.15 times more expensive than the public health facilities as far as medicine selling prices were concerned (35) and in Uganda, also in 2009, where the Private sector was 1.06 times more expensive than the Mission sector (45). Similar results were obtained in a study carried out in Tanzania (Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam) in 2004 (34), 2007 (25) and 2009 (35) where the private sector was deemed more expensive than the public sector.

The price of ALu was cheaper in the public health facilities as compared to the private sector like in the previous studies carried out in Tanzania in Mbeya, Mwanza, Mtwara, Morogoro and Dar-Es-Salaam in 2007 and 2009 (14,19) and Sudan in 2007 and Uganda 2008 (47,46). Price fluctuations were observed in both, the public and the private sectors as were observed in studies carried out Ethiopia in 2008 (47), Sudan in 2007 (44), and Jamaica in 2012 (24).

The study found that the median stock-out days per year of medicines in the public health facilities was 117 days. This gives an indication that one or more medicines were not available for more than three months in a year. The Stock-out situation shows that there is a need to develop immediate interventions so as to minimize frequent stock-outs of medicines in the

public health facilities. The stock-out could mean an insufficient supply to meet high demand. It is, therefore, necessary to conduct further studies to investigate the causes of frequent stock-outs of medicines. Unlike this study, recent study carried out in Tanzania in 2007 (25) did not indicate "Stock-out day's category". Inclusion of this category is essential as it provides a broad picture of the availability of medicines at a given period of time. A previous study done in Ethiopia in 2003 (19) showed that the median stock-out was 99.2 days per year, in Jamaica in 2012 (24) the situation was much better with the median stock-out of 23.1 days, while Saint Lucia in 2012 (21) was even better with only 20.7 median stock-out of days per year.

In most high income countries, health insurance covers the major part of medicines costs to the patient but, in Africa and South Asia, surveys show that medicine costs can dominate households, health spending, at over 80% of the total. That is why it is suggested that prices should be monitored regularly to facilitate informed decision and policies that lead to price reduction should be adopted so as to improve affordability (14,50).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The low overall availability of medicines in the public health facilities forces the population to purchase prescribed medicines from the private sectors where they are available, but are expensive. Availability of key medicines is a big and frustrating issue for the patients because even if the diagnosis is correct, if the health facilities do not have the medicines required for treating the correctly diagnosed conditions, then the patients have to go and look for the medicines elsewhere or not buy at all due to financial reasons.

The median stock-out days per year of medicines in the public health facilities was 117 days. This gives an indication that one or more medicines were not available for more than three months in a year. The Stock-out situation shows that there is a need to develop immediate interventions so as to minimize frequent stock-outs of medicines in the public health facilities.

Frequent and lengthy stock-out periods of essential medicines in the public health facilities also raises concerns about the functionality of the current Integrated Logistics System (ILS) adopted by the MOHSW, forecasting of the medicine requirements and appropriate delivery of medicines to the end users by the Medical Stores Department (MSD) Tanzania.

Adequate storage conditions and handling of medicines in the main drug stores of public and NGO health facilities were dissatisfactory while that in the Dispensing rooms were

satisfactory in both kinds of health facilities. As for the private pharmacies, the average storage condition in the Main drug stores was satisfactory while that in the dispensing rooms was very satisfactory. Price of medicines in the public sector were cheaper amongst all other sectors while price fluctuations were observed in all sectors. Expired medicines happened to be more of a problem in the public health facilities and this raises concerns over appropriate regulation and inspection by the MOHSW.

RECOMMENDATIONS

From the findings and implications of the study, the following are recommended;

6.1 Managerial

- Key medicines should be given priority during selection and procurement. Pharmacy and Therapeutic committee should prepare and update the list regularly based on the primary, secondary and tertiary health facility levels

- Facilities should strengthen Drug Revolving Fund program through NHIF at the hospitals in order to sustain constant availability of essential medicine. While lowering prices in the private sector is a long term goal, a new financing approach at the hospitals by using Drug Revolving Funds through the NHIF might be a solution.

- MOHSW, in collaboration with Health Management Team (HMT) or Health Center management team and other stakeholders should evaluate and repair the drug stores and dispensing rooms' facilities, to meet the national and international standard requirements.

- MOHSW should review the guidelines for Disposal of expired pharmaceutical products so as to make the procedures user friendly to all stakeholders

6.2 Regulations, Laws and Policies

- There is need for improvement in policies on medicine pricing and individual medicine prices where there is evidence of excessive prices. A system of MRP (Maximum retail price), as that used in other countries like India, can be beneficial whereby all the private medicine outlets cannot sell a particular medicine above that price. In that way, price fluctuations, vast differences in price and affordability to end users will improve.

- Manufacturers and Pharmacies should strive to ensure availability of alternative medicines that are produced locally and affordable to the majority of people in the community. The manufacturers and pharmacy owners must adapt the WHO essential medicine policy when ensuring the availability of alternative medicines or when medicines are locally produced. This makes medicines affordable to the majority of the people in the community.

- MOHSW should enforce the existing laws to the health management teams in each health facilities to enable constant availability of essential medicines at more than 75% in all health facilities.

- Stock control especially in public health facilities should be improved.

6.3 Education

- Surveillance on availability, cost and price components should regularly be conducted by the relevant authorities so as to develop reliable information on medicine price and availability to be used by the government, insurance funds and health facilities.

6.4 International

- There is a need to develop international and nation-wide regulatory authorities to monitor medicine prices to increase access. This can be targeted at the supply of pharmaceuticals (manufacturers) or the demand (wholesaler, retailer, doctor and patient)

- WHO, UNICEF, Global partners and other stakeholders should provide technical and financial assistance which can enable a sustainable source of medicine the developing countries

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ANNEXES

ANNEX I

Survey form 1:   **Public health facility/NGO/Private pharmacy**

Indicator: **Availability of key medicines**

Percentage medicines expired

Days out of stock

Facility …………………………………   **Date.………………**

Key medicines to treat common conditions	In Stock Yes=1, No=0 [B]	Days out of stock [C]							Expired medicines on shelves [D]
		M1 last month	M 2	M 3	M 4	M 5	M 6	Total days out of stock	
1. Artemether-Lumefantrine (ALu) 20/120									
2. Amoxicillin caps/tabs 250mg									
3. ORS									
4. Albendazole 400mg tabs									
5. Ferrous Sulphate tab 200mg									
6. Co-trimoxazole tab 480mg									
7.Metronidazole tab 200mg									
8. Phenobarbitone tab 30mg									
9. Gentamycin eye/ear drops									
10. Ciprofloxacin tab 500mg									
11. Ceftriaxone inj 1g powder									
12. Diazepam tab 5mg									
13. Fluconazole cap/tab 150mg/200mg									
14. Nifedipine retard 20mg									
15. Atenolol tab 50mg									
16. Propranolol tab 40mg									
17. Furosemide tab 40mg									
18. Metformin tab 500mg									
19. Glibenclimide tab 5mg									
20. Omeprazole cap 20mg									
21. Erythromycin tab 250mg									

22. Diclofenac tab 50mg										
23. Tramadol cap/tab 50mg										
24. Amitriptyline tab 25mg										
25. Ranitidine tab 150mg										
26. Salbutamol tab 4mg										
27. Diclofenac Inj 75mg/3ml										
28. Furosemide Inj 20mg/2ml										
29. Doxycyline cap 100mg										
30. Benzyl penicillin inj 5MU										
31. Quinine inj 300mg/ml										
32. Hydrocortisone inj 100mg/vial										
33. Gentamycin inj 80mg/ml										
	$[B^1]$ = Sum of B =									$[D^1]$ = Sum of D =
	$[B^2]$ = % in stock = $B^1 \div 33 * 100$ =									$[D^2]$ = % expired = $D^1 \div B^1 * 100$ =

Notes:

[B] Mark "1" if stock is available in the facility on the day of the visit if any quantity of any dosage form is available. Mark "0" if the medicine is not physically available. Add the total at the bottom [B1]. Calculate the percentage in stock [B2] by dividing the total in stock [B1] by 33 and multiplying by 100.

[D] For all medicines in stock, check if expired or not. If any of the medicine has an expiry problem, mark "1" for yes. Add the total at the bottom [D1]. Calculate the percentage expired [D2] by dividing the total expired [D] by the total number of medicines in stock [D1] and multiplying by 100

ANNEX II

Indicator: **Price of key medicines**

Facility .………………………………… **Date** .………………

Key medicines to treat common conditions [A]	Lowest price paid by patient in Tshs per unit/tab/cap/vial/ampoule [B]
1. Artemether-Lumefantrine(ALu)20/120	
2. Amoxicillin caps/tabs 250mg	
3. ORS	
4. Albendazole 400mg tabs	
5. Ferrous Sulphate tab 200mg	
6. Co-trimoxazole tab 480mg	
7. Metronidazole tab 200mg	
8. Phenobarbitone tab 30mg	
9. Gentamycin eye/ear drops	
10. Ciprofloxacin tab 500mg	
11. Ceftriaxone inj 1g powder	
12. Diazepam tab 5mg	
13. Fluconazole cap 150mg/200mg	
14. Nifedipine retard 20mg	
15. Atenolol tab 50mg	
16. Propranolol tab 40mg	
17. Furosemide tab 40mg	
18. Metformin tab 500mg	
19. Glibenclimide tab 5mg	
20. Omeprazole cap 20mg	
21. Erythromycin tab 250mg	
22. Diclofenac tab 50mg	
23. Tramadol cap/tab 50mg	
24. Amitriptyline tab 25mg	
25. Ranitidine tab 150mg	
26. Salbutamol tab 4mg	
27. Diclofenac Inj 75mg/3ml	
28. Furosemide Inj 20mg/2ml	
29. Doxycyline cap 100mg	
30. Benzyl penicillin inj 5MU	
31. Quinine inj 300mg/ml	

32. Hydrocortisone inj 100mg/vial	
33. Gentamycin inj 80mg/ml	

Notes:

[A] At the national level, identify a commonly dispensed preparation and unit for each key medicine and preprint these on the survey form.

[B] For each available medicine, determine the lowest price in the local currency paid out-of-pocket by a patient for the identified preparation and unit. The lowest priced brand or generic equivalent medicine should be used. If there are flat charges paid for each medicine given to patients, this amount should be recorded as the price of the medicine. Indicate "0" if medicines are given free.

ANNEX III

Indicator: **Adequate storage conditions and handling of medicines**

Facility …………………………………………… **Date** ………………

Checklist	Storeroom True =1, False =0 [A]	Dispensing area/Room True=1, False=0 [B]
1.There is a method in place to control temperature(such as a roof and ceiling with space between them in hot climates)		
2. There are windows that can be opened or there are air vents.		
3. No direct sunlight can enter the area (window panes are painted or there are curtains/blinds to protect against the sun)		
4. Area is free from moisture (leaking ceiling, roof, drains, taps, etc.)		
5. Drugs are not stored directly on the floor		
6. In the facility there is a cold storage with a temperature chart.		
7. Drugs are stored in a systematic way (such as alphabetical, pharmacological or first expiry-first out.		
8. There is no evidence of pests in the area and/or staff doesn't report any pests.		
9. There are dispensing tools and they are in use.		
10. Expired medicines are well kept in a separate section away from the unexpired medicines for dispensing.		
	$[A^1]$ = Sum of A =	$[B^1]$ = Sum of B =
	$[A^2]$ = Score of $A^1 \div 9$ * 100 =	$[B^2]$ = Score = $B^1 \div 9$ * 100 =

Notes

[A] Indicate "1" if all parts of the statement are true for the storeroom and "0" if any part of it is false. Sum the total number of true statements [A1]. Calculate the score for the storeroom [A2] by dividing the sum of true statements [A1] by 9 and multiplying by 100.

[B] Indicate "1" if all parts of the statement are true for the dispensing area/room and "0" if any part of it is false. Sum the total number of true statements [B1]. Calculate the score for the dispensing area [B2] by dividing the sum of true statements [B1] by 9 and multiplying by 100.

ANNEX IV

INFORMED CONSENT (English Version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

INFORMED CONSENT FORM

ID-NO. ☐☐

I am Om H. Joshi, a postgraduate student at Muhimbili University of Health and Allied Sciences (MUHAS). I am doing a survey on the assessment of availability, price and conservation conditions of selected medicines in the health facilities. The purpose of this survey is to assess the pharmaceutical situation in order to help the policy makers and managers improve pharmaceutical services.

If you agree to participate in this study, you will be asked questions.

No information from this study will be available to unauthorized individuals. All information collected will be entered in a computer system and only registration numbers will be used for identification. We don't expect any harm from this study to happen to you.

Taking part in this study is completely voluntary. You can withdraw any time without giving reasons, even if you have already given consent.

If you have any other questions regarding this study, feel free to contact me, the investigator, Om H.Joshi through telephone number 0713-824748 or email address joshi_om@hotmail.com If you have any questions or concerns about your rights as a participant in this study you could discuss them with the current chairman of the Research Ethical Committee Prof Moshi, MUHAS P.O.Box 65001, Phone 2152489 or 0754 495933.

Do you agree to participate? (*Tick the response*) ....YES ……….NO.

I, …………………………………………………………………..have read the consent form and my questions have been answered and I agree to participate in this study.

Signature of Participant…………………………………………………………..

Signature of Investigator……………………………………………………………

Date of signing consent…………………………………………

ANNEX V

INFORMED CONSENT (Swahili version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

ID-NO. ☐☐

Mimi ni Om H.Joshi, mwanafunzi wa elimu ya juu katika chuo cha Muhimbili (MUHAS). Ninafanya utafiti wa uchunguzi wa upatikanaji, bei na uhifadhi ya madawa katika vituo vya afya vya serikali. Lengo la utafiti huu ni kujua hali halisi ya vituo vyetu vya afya katika sekta ya madawa ili watu waliopewa jukumu ya kuchukua maamuzi waweze kuchukua hatua sahihi kutokana na hali yenyewe.

Kama utakubali kushiriki katika utafiti huu, utaulizwa maswali kuhusu kazi yako. Hakuna taarifa yoyote itakayotolewa kwa mtu au mamlaka yeyote kwani namba ndizo zitakazotumika kama utambulisho na hakuna madhara yoyote yatakayotokea wakati wa utafiti huu. Kushiriki katika utafiti huu ni kujitolea, na mshiriki anaweza kujitoa bila kutoa maelekezo ya aina yeyote.

Kama una maswali yeyote kuhusu utafiti huu, unaweza kuwasiliana na mimi, Om H.Joshi simu : 0713-824748 au e-mail joshi_om@hotmail.com na kama una maswali yeyote kuhusu haki zako kama mshirika wa utafiti huu, wasiliana na mwenyekiti wa kamati ya madili ya utafiti Prof. Moshi, MUHAS, P.O. Box 65001 simu 2152489 au 0754-495953.

Je unakubali kushiriki (weka alama ya tiki)   Ndio……

Hapana……..

Mimi …………………………………. nimesoma fomu ya maombi ya kushiriki na maswali zangu yame jibiwa, hivyo nakubali kushiriki kwenye utafiti huu.

Sahihi ya mshiriki ……………………………………………

Sahihi ya mtafiti ………………..……………………………

Tarehe   ………….……………………………………