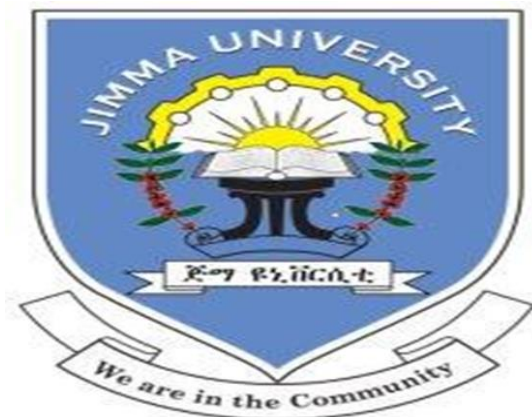


**AVAILABILITY AND AFFORDABILITY OF SELECTED
ESSENTIAL MEDICINES IN HEALTH CARE FACILITIES IN
HAWASSA TOWN, SNNPR, ETHIOPIA**



**BY:
GETNET TAFESE (B. PHARM)**

**A RESEARCH PAPER TO BE SUBMITTED TO SCHOOL OF PHARMACY,
INSTITUTE OF HEALTH, JIMMA UNIVERSITY; IN PARTIAL
FULFILLMENT FOR THE REQUIREMENTS FOR MASTER OF SCIENCES
(MSC) IN PHARMACEUTICAL SUPPLY CHAIN MANAGEMENT**

NOV, 2018

JIMMA, ETHIOPIA

JIMMA UNIVERSITY
INSTITUTE OF HEALTH SCIENCES
SCHOOL OF PHARMACY

AVAILABILITY AND AFFORDABILITY OF SELECTED ESSENTIAL MEDICINES
IN HEALTH CARE FACILITIES IN HAWASSA TOWN, SOUTHERN NATIONS,
NATIONALITIES AND PEOPLES REGIONAL STATES, ETHIOPIA

By:

GETNET TAFESE (B. Pharm)

Advisor:

GIZACHEW TILAHUN (MSc, Assistant Professor)

NOV, 2018
JIMMA, ETHIOPIA

Abstract

Background: Access to health care including access to essential medicines is one of a fundamental human right, but without attaining this goal it is impossible to achieve universal access to health. Essential medicines still remain inaccessible and unaffordable in low and middle-income countries. Ethiopia is also facing big challenge in ensuring access to essential medicines.

Objective: The general objective of this study was to assess availability, price and affordability of selected essential medicines in Hawassa town, SNNPR, Ethiopia.

Method: A facility based cross-sectional study was conducted by adapting WHO/HAI tools to measure availability, price and affordability. Data was collected on 30 selected essential medicines from 20 health care medicine outlets through record review and interview of relevant bodies. Availability was expressed using surveyed medicines on the day of data collection, and prices were expressed as median price ratio. Affordability was measured as the amount of daily wages required for the lowest paid gov't worker (1.17 USD per day) to purchase one standard treatment.

Results: The average availability of essential medicines (n=30) was 81.0 % at public sector and 83.3 % at private sector. Lowest priced medicines were sold at 2.54 and 4.09 times their international reference prices (IRP) in the public and private sectors, respectively. The lowest paid government worker is expected to work on average 0.64 and 1.07 days in order to purchase standard treatment dose of amoxicillin for pneumonia from public sector and private sector respectively.

Conclusion: The mean availability of selected essential medicines was high in both sectors. Selected medicines are unaffordable for treatment of common conditions because of high price. Thus further study is critical for intervention like price monitoring, implementation of insurance system and strengthen fee waiver.

Key words: Availability, Affordability, Access, Price of medicine, Hawassa town, Ethiopia

Acknowledgment

First and most I would like to forward my gratitude to Almighty God, then many thanks goes to my advisor Mr. Gizachew Tilahun for his commitment of delivering valuable and timely advices throughout my research development. Similarly, I would like to appreciate pharmaceutical supply chain management department, school of pharmacy, institute of health, particularly for research review board of Jimma University for the facilitation of this study. Many thanks to Hawassa city health administration staff and all individuals in the health care facilities of Hawassa town for their great contribution involved in the study.

Table of Contents

Abstract	iii
Acknowledgment	iv
Table of Contents	v
List of Figures	vii
List of Tables	viii
List of abbreviations and acronym.....	ix
1. Introduction.....	1
1.1 Background	1
1.2. Statement of the problem	2
2. Literature Review.....	6
2.1 Introduction	6
2.2 Access to Essential Medicines	7
2.3 Availability of Essential Medicines	7
2.4 Affordability of Essential Medicines	8
2.5 Access frame work	9
2.6 Significance of the study	11
3. Objective of the study	12
3.1 General objective.....	12
3.2 Specific objectives.....	12
4. Methods and materials	13
4.1 Study area and period.....	13
4.2 Study design	13
4.3 Population.....	13
4.3.1 Source population.....	13
4.3.2 Study population.....	13
4.4 Inclusion and Exclusion Criteria	14
4.4.1 Inclusion criteria.....	14
4.4.2 Exclusion criteria.....	14
4.5 Sample size determination and sampling technique	14

4.5.1 Sampling of medicine outlets	15
4.5.2 Sampling of essential medicines	16
4.6 Study variables	18
4.6.1 Dependent variable	18
4.6.2 Access frameworks	18
4.7 Data collection procedures	19
4.7.1 Data collection Instrument	19
4.7.2 Data collection method.....	19
4.8 Data Processing and Analysis	19
4.9 Data quality assurance.....	20
4.10 Ethical Consideration	20
4.11 Dissemination plan	20
4.12 Definition of terms and Operational definitions	21
5. Results.....	23
5.1 Health care facilities	23
5.2 Availability	24
5.3 Public sector patient out of pocket price	27
5.4 Private sector patient out of pocket price	27
5.6 Inter-sectoral price comparison	29
5.7 Affordability based on selected diseases	30
6. Discussion	33
7. Conclusion and Recommendation	37
7.1 Conclusion.....	37
7.2 Recommendations	38
8. Limitation of the study	39
9. References.....	40
10. Annexes.....	44
Annex 1: Information sheet and consent form	44
Annex 2: Medicine price and availability data collection form	45
Annex 3: Affordability of standard treatments collection form	47

List of Figures

Figure 1: Access framework adapted from different studies of availability, price and affordability of essential medicines.	10
---------------------------------------------------------------------------------------------------------------------------------	----

List of Tables

Table 1: Total number of public health care facilities medicine outlets, private medicine outlets in Hawassa town, SNNPR, ETHIOPIA, April 2018.....	15
Table 2: Total number of selected medicine outlets in Hawassa town, SNNPR, Ethiopia, April 2018.	16
Table 3: List of selected essential medicines in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.....	17
Table 4: Availability of selected essential medicines in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.....	25
Table 5: Level of Availability of selected essential medicines in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.	26
Table 6: Median price ratios of lowest priced medicines in the public and private sectors (n= 20) in Hawassa town, SNNPR, Ethiopia, April 2018.	28
Table 7: Median retail prices of essential medicines in relation to international reference prices in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.	29
Table 8: Affordability: number of days' wage of lowest paid government worker makes to purchase standard treatments in Hawassa town, SNNPR, Ethiopia, April 2018.....	31

List of abbreviations and acronym

C/I	Contraindications
CI	Confidence Interval
DTC	Drug and Therapeutic Committee
EM	Essential medicine
ETB	Ethiopian Birr
GAP	Global Action Plan
HAI	Health Action International
IRP	International reference price
LIAT	Logistics Indicator Assessment Tool
LMIC	Low and Middle Income Countries
LPGB	Lowest Price Generic Brand
LPGW	Lowest Paid Unskilled Government Worker
MPR	Median Price Ratio
NEML	National Essential Medicines List
NGO	Non-governmental organization
OB	Originator Brand
OTC	Over the Counter medicine
PFSA	Pharmaceutical Fund and Supply Agency
RHB	Regional health bureau
SNNPR	South Nation Nationality People Republic
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

1. Introduction

1.1 Background

Essential medicines are those that satisfy the priority health care needs of majority of the population and they are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness (1). As per world health organization (WHO) expert committee on the selection and use of essential medicines asserted, essential medicines are grounds for governments and partners to take appropriate measure to ensure that the medicines are made available and affordable. Although it is not sufficient, it is very important to ensure that the medicines are adopted from the WHO model list of essential medicines and documented on the national list of the countries according to their priority health care needs so it can guide quality use of essential medicines, good procurement and local licensing and manufacturing (6,7).

Access to health care is fundamental human right which has been well-looked-after in international accords and acknowledged by governments globally. Medicines are vital part of any healthcare system, but limited access to medicines undermine the objectives of healthcare system like equity, efficiency and health development. Hence, without equitable access to essential medicines for priority health care needs of the population the fundamental right to health cannot be fulfilled (1,2).

Access to medicines is complex concept which needs integrated effort since health services need regular availability of relevant medicines of proven safety, efficacy and quality at affordable price (2). Medicines are undeniably important means for controlling diseases which makes medicines the fundamental right of every human being and this further implies that accessibility to medicines is equally the fundamental right of every one (3).

Lack of access to essential medicines can be due to the absence of essential medicines policies, weak regulation of medicines, poor supply chain systems and out-of-pocket payments which make the medicines unaffordable. Nowadays, access to affordable essential medicines in a healthcare system has been the issue of governments and

different stakeholders. Since the 1976 Alma Ata declaration, it has become integral part of the health system dialogue (6).

Literature survey shown that the health of any population is significantly affected by the access to health care and availability/affordability of medicines (3). Recently an increasing number of public investments, policy changes and amendments have been made to improve access to essential medicines to consumers in developing countries including Ethiopia (5). It is always important to assess the extent to which these interventions are successful in achieving their aims and take appropriate measures as per the findings (8).

To establish better supply chain strategies and negotiate economical prices so as to make medicines available and affordable to clients, which improve access to Essential medicines, reliable information is needed (9).

Therefore, this study can show the availability, price and affordability of selected essential medicines for the treatment of common diseases in Hawassa town. Moreover, the result may play its role to initiate further study in the future and will provide attention to the concerned bodies for better strategy improvements.

1.2. Statement of the problem

Access to essential medicines is one of the sustainable development goal in the world. For a medicine to say accessible it must be both available physically in health care facilities and affordable for all who need it, thus accessibility of essential medicine means; the availability of the medicines at an affordable price for the population. Access to medicines implies access to Essential Medicines as defined by world health organization (WHO) (6).

Access to health care including essential medicines has been a big task predominantly in developing countries where more than half of their population lack access to essential medicines (7). Ensuring access to essential medicines is a complex matter which requires governments through their policies to keep balance between availability and affordability in consideration of meeting the priority health needs of the population. Without access to essential medicines, access to health is a fundamental human right means nothing. The

lancet commission on essential medicines policies reported, “essential medicines policies are crucial to promoting health and achieving sustainable development” targeting a goal to ensure access for all by 2030. The commission asserts affordability and pricing of essential medicines is the “major challenge” facing access to medicines, which reinforces the importance of studying the status of access to essential medicines (8).

Due to lack of access to essential medicines usually in Asia and Africa, most leading causes of death which can easily be prevented by using those medicines remain great challenge (9). According to WHO report, around one third of the population globally lacks reliable access to needed medicines and the situation is even worse in the poorest countries of Africa and Asia. (10). Despite progressive changes to improve the pharmaceutical supplies system in Ethiopia, there are evidences of poor access to essential medicines, irrational use of medicines and thus the population is facing challenges of suffering in those disease which can be prevented or treated by the availability of essential medicines in addition to wastage of resources and budget being great challenge for the country (12).

Poor availability, low affordability and high medicines prices, poor procurement capacity and stock management are important factors affecting access to essential medicines in many low- and middle-income countries (13).

A review of data from 36 low-and middle-income countries showed that in the public sector availability ranged from 29 % to 54 % and private sector patients paid 9 to 25 times international reference price (IRP) for lowest-priced generic products (14).

In Swaziland mean availability in the public sector was 68%, private sector originator brand (OB) medicines was priced 32.4 times higher than IRPs, while lowest priced generics (LPGs) were 7.32 times higher. OBs cost 473% more than LPGs (15). Study in Haiti discovered that for generic medicines, the availability in public, retail, non- profit and mixed sectors was 20%, 37%, 24% and 23% respectively whereas most of the available medicines were priced higher than the international reference price (IRP) (4).

WHO survey in Kenya showed that the median availability of the 15 basic medicines was 87%, 93% and 93% at public health facilities, faith based healthcare facilities and private

pharmacies respectively where medicine prices are high, people (especially the poor) may have to forego treatment or incur debts in order to afford the out of pocket expenses for the lifesaving medicines they need (6). The affordability of lowest priced generics both in public sector and private sector was good with standard treatment costing a days' wage or less in Kenya (11). Study in Sudan confirmed that generic medicines were the predominant products available in public and private pharmacy sectors with 39.5% and 56.6% respectively which is common in most of the studies globally, while the availability of originator brands were 1.8% in public sector pharmacies and 9.3% for private pharmacy sector (9).

In countries with having price controlling policy like Tanzania prices of medicines are identical throughout the region while the average mean of, 61.75 % (ranging from 14.29 to 94.65%) was available in public health facilities (12).

As part of low-income countries, in Ethiopia poor access to essential medicines is a common public health problem. A national survey estimated that only 70% of key essential medicines were available in the public sector and the cost of treatment of common diseases was found to be unaffordable to the majority of the Ethiopian people. Across the 34 public sector outlets study in Ethiopia (10), it has been revealed that mean availability of the survey medicines was 64%, in the private sector, the availability of the medicines was 73%. The government of Ethiopia restructured the procurement and distribution of pharmaceuticals by establishing an autonomous institution called pharmaceutical fund and supply agency, to supply safe and affordable medicines to the public health sector sustainably (18).

Affordability of medications to clients was significantly associated with age, marital status, occupational status, gross monthly income and number of economically dependent family members as per the study done in south western part of Ethiopia (13). Ethiopia being one of the poor country in Africa is with infectious diseases like TB, HIV/AIDS, STI, diarrheal diseases, pneumonia and malaria as some of the major health problems. Due to lack of access to essential medicines great number of lives are dying every year, wastage of resources and budget are among the major consequences the country encountering in the health care system. Ethiopia has developed national essential

medicine list since 1985, in 2012 the country has also published list of medicines for primary public health facilities of the country to easily avail essential medicines (9).

Given the above facts, in order to take strategic actions and negotiate cheaper prices so as to make medicines available and affordable to patients, which improve access to ED, reliable information is needed. Therefore, the goal of this study was to find out the availability and price of selected medicines as well as affordability of cost of treatment for common diseases in Hawassa town health facilities.

2. Literature Review

2.1 Introduction

Essential medicines are limited range of medicines selected to meet priority health-care needs of the population that contribute to better health care, better drug management, better use of financial resources, and thereby greater access to care. Around one third of population in the world lack access to essential medicines, it is even worse among the world's poorest countries particularly Asia and Africa. In such countries including Ethiopia up to 50% and above of the total population lacks access (16, 17). Global market indicated that medicines and health care products are costly, and difficult to get or of low quality. Modern medicines account for 20–60% of health expenditure in developing countries and up to 90% of the population purchase medicines through out-of-pocket payments (5).

In Africa, more than 70% of the population are affected by lack of essential medicine issue which were available to 30% of all public and private health facilities. Reasonably, the current state of global healthcare urged WHO and African leaders under the platform of African commission resolution on the right to health and access to needed medicines in Africa into contextualizing the 4A's of access to medicines (3). Thus, the right to health and access to needed medicines in Africa (WHO, 2000) describes as follows;

Availability was described as availability in sufficient quantities of essential medicines, including existing medicines and the development of new medicines needed for the highest attainable level of health. Accessibility was considered as physical accessibility of needed medicines to everyone without discrimination. Affordability is about economic accessibility of needed medicines to all; with information accessibility about the availability and efficacy of medicines and acceptability implies medicine supplies, being respectful of cultural norms and medical ethics.

2.2 Access to Essential Medicines

Equitable access to quality essential medicines is vital to the health and wellbeing of the individual and population, especially in developing countries since essential medicines play great role in the prevention and control of diseases (18). Medicine access relates both to affordability and availability (available stock of essential medicines in service delivery units) (19). Monitoring medicine prices is an important activity for every country to develop pricing policies that will improve both the availability and affordability of essential medicines (20). To ensure equitable access and rational use of medicines, WHO has established a number of targets in its medium-term strategic plan (2008–2013) of ensuring 80% availability of essential medicines. In many high-income countries like US and others, there are concerns about reduced medicine access for reasons including high medicine prices and copayments/ deductibles, uninsured populations, lack of transparency in medicine price components, and poor ability of negotiation on procurement prices among stakeholders (22). Yet, recent studies have shown a lack of availability of medicines in low and middle-income countries (LMICs), most common factors which can affect access to medicines could be affordability, rational use, sustainable financing and reliable supply systems (22).

2.3 Availability of Essential Medicines

Availability refers to the fact that health services including resources like medicines can also be reached both physically and in a timely manner, it constitutes the physical existence with sufficient capacity to produce the expected health care services (23).

A study with 15 medicines in the public and private sectors of 36 low and middle income countries has showed availability of 38 % and 64 % respectively. However, wide variations were observed in both sectors among the countries. Study in Uganda has shown that factors affecting availability could be inadequate government funding, non-compliance to treatment guidelines, stock outs, supplier capacity, poor record keeping, inadequate human resource capacity and others (23). Several studies which have included assessments of the availability of medicines like for acute versus chronic conditions, cardiovascular medicines in developing countries, anti-epileptics in Zambia and in Laos,

and anti-diabetic medicines in the Philippines similarly concluded that the overall availability of widely used medicines including generics was suboptimal. In contrast, some studies showed adequate medicines' availability. Studies on standardized lists of commonly used medicines in Sudan and Burkina Faso showed a satisfactory level of nearly 80% availability of the surveyed medicines. None of these studies focused exclusively on essential medicines, but there are some studies which may provide some insight on the extent of the availability of essential medicines included in the national essential medicine list in different countries. Of these studies above 75% average availability of generic medicines was reported in a national survey of essential medicines in the private sector in Sri Lanka and in the public sector and popular pharmacies in Brazil, as well as in provincial surveys on essential medicines in Ethiopia (24).

2.4 Affordability of Essential Medicines

Globally the highest budget is allocated for medicines. Gathering evidence on medicine prices and availability is critical to improve access to affordable treatment (25). The price of medicines is considered as one of the most important hindrances to access (26). In developing countries where budget allocated for medicines accounts for a relatively large portion of total healthcare costs estimated at about 20–60% of health spending, compared with 18% in developed countries (27).

There are quite a lot of international treaties, which have recognized access to medicine as a fundamental human right. Countries have a legal responsibility making essential medicines available for the priority health care needs of the population at an affordable cost. Affordability was largely dependent on the choice of therapeutic classes, types of medicines and sectors (28). Measuring the level of affordability of medicines, particularly in low- and middle-income countries (LICs and MICs), is an important, yet complex undertaking as affordability is an ambiguous concept. In developing countries, the cost of medicines accounts the largest portion of total healthcare costs. Since majority of people in developing countries do not have health insurance consequently medicines that are provided free through the public sector are often unavailable which leads to medicines often paid for out of pocket at the time of illness. It has been supported by different

studies like in Oman (29) , to increase access to essential medicines, promoting generic medicines and improving availability of medicines in the public sector is mandatory (12).

In order to enable more standardized research into medicine prices, WHO)/(HAI) have developed a standardized survey methodology to investigate medicine prices, availability, and affordability and price components in the supply chain. The WHO/HAI standardized methodology, though having been used more than a hundred times in a number of studies since 2003 in countries all over the world, has been effective in measuring price and availability data in different settings (21). In contrast many of other investigations, however, did not use a standardized methodology, which makes it difficult to compare results across studies (30).

2.5 Access frame work

From the above studies, the following access framework has been developed. Availability and affordability to essential medicines are the major study variables and the other boxes are also the different variables that can affect access to essential medicines.

Availability and affordability to essential medicines (figure 1) depends on their availability at health care facilities and affordability to the community which can be covered either by out of pocket payment and the national government may arrange different systems like insurance, fee waiver. Both availability and affordability are directly affected by price. Access to essential medicines could be limited due to the non-availability of medicines at the health care facilities and un-affordability due to lack of enough fund from national government, and uninsured client status or lack of money for out of pocket payment.

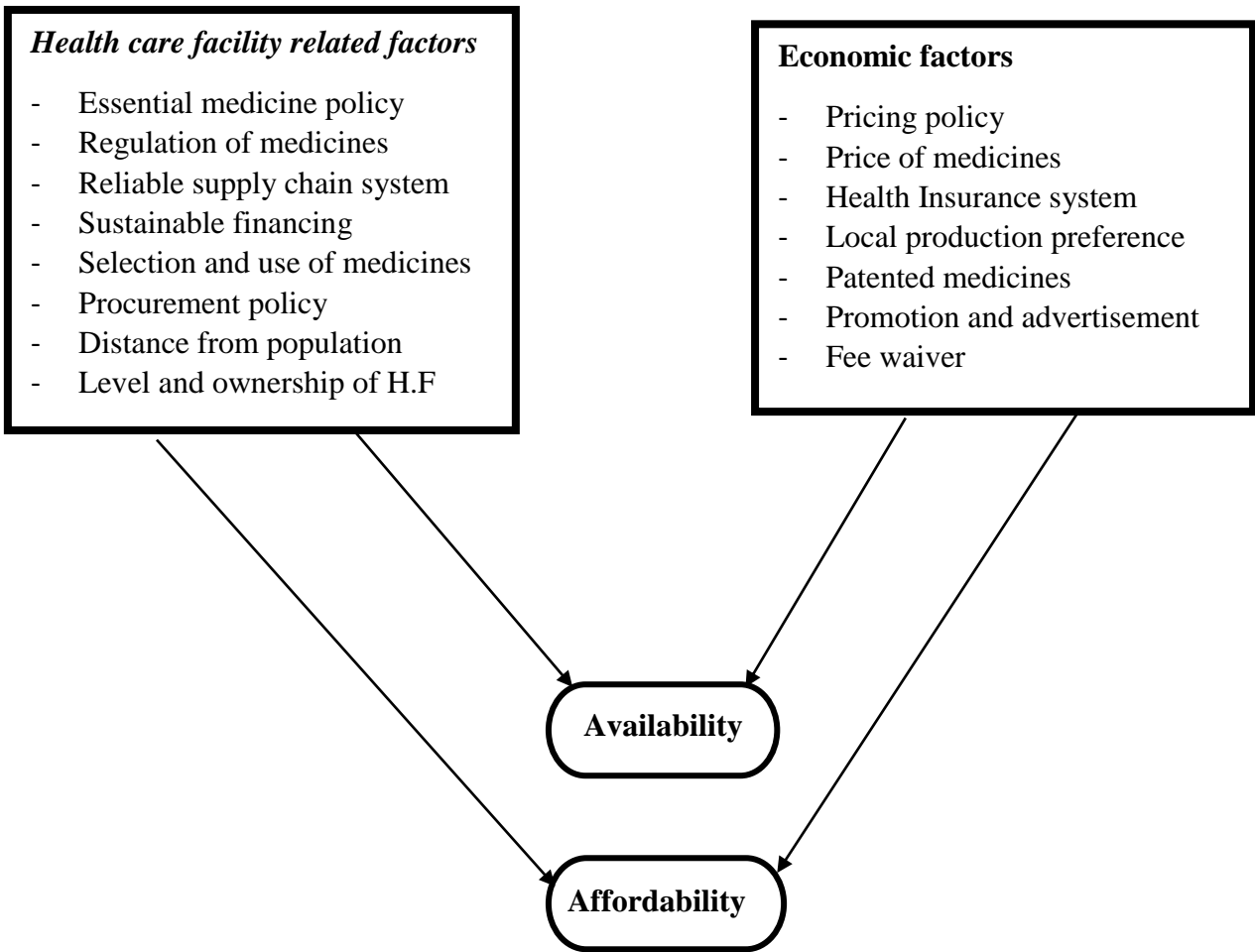


Figure 1: Access framework adapted from different studies of availability, price and affordability of essential medicines.

2.6 Significance of the study

WHO defines access to medicines as access to essential medicines. Universal access to health services can be achieved when access to essential medicines is secured. Essential medicines are crucial elements for the health care service sustainability and are helpful to reduce disease burden (6).

Lack of access to essential medicines is one of the most critical global public health problems that need great attention. Different studies estimated that by improving access to existing essential medicines, every year about 10 million lives could be saved (14). In low- and middle-income countries, large proportions of the population have limited access to essential medicines because of poor availability and higher price of medicines so patients are unable to afford it. Although there have been lots of researches undertaken globally on accessibility of medicines, still there has been insufficient progress in improving medicine affordability and availability for individual patients in many countries (15).

Ethiopia has been facing major public health problems due to lack of access to essential medicines so that a number of people are suffering with diseases that can easily be prevented or treated effectively by having appropriate essential medicines consistently available (9). The findings of this study was very important primarily for pharmacy professionals to create alertness about lack of access to essential medicines and show its public health burden with the need for immediate action to improve accessibility. Health care facility managers and stakeholders can get some insight of focus areas on access to medicines so they can try to improve, change or develop strategies based on the evidences identified to ensure accessibility to essential medicines.

Moreover, findings of this study will be very important for responsible authorities and experts by showing them the status of the study area with respect to availability and affordability to create strategies that can help improve access to essential medicines of Hawassa town. Finally, other researchers in the study area can use it as a source of information for further study.

3. Objective of the study

3.1 General objective

- ✓ The general objective of this study is to assess the availability, price and affordability of selected EMs in health facilities in Hawassa town, SNNPR, ETHIOPIA.

3.2 Specific objectives

- ✚ To assess the availability of selected essential medicines in health facilities in Hawassa town.
- ✚ To assess the price of selected essential medicines in health facilities in Hawassa town.
- ✚ To determine the affordability of selected essential medicines in health facilities in Hawassa town.

4. Methods and materials

4.1 Study area and period

Hawassa town, the capital city of Southern Nations Nationalities and Peoples Regional State (SNNPRS), located 275 km south of Addis Ababa, the capital city of Ethiopia. Hawassa city administration has a Population of 258,808 people, out of which 133,137 are male and 125,671 are female. From the total number of the Population 157,873 people live in urban area, while the remaining 100,935 people live in the rural area of the Hawassa town. The town has health care facilities of 3 hospitals (1 specialized referral hospital, 1 general hospital and 1 primary hospital), 10 health centers owned by government sector and 142 private medicine outlets (21 pharmacy and 121 drug stores) owned by private sector. The study was conducted from April 5 – 30, 2018.

4.2 Study design

A facility based descriptive cross-sectional study was conducted to assess availability, price and affordability of selected essential medicines.

4.3 Population

4.3.1 Source population

All public health care facilities and all licensed private medicine outlets which are providing essential medicines for the population of Hawassa town.

4.3.2 Study population

The study population was classified as follows;

Medicine outlets: 1 specialized referral hospital (the main public hospital), 1 general hospital, 1 primary hospital and 7 health centers from public sector health care facilities and 10 private medicine outlets which are close to selected public health care facilities.

Essential medicines: 30 selected essential medicines. 13 (thirteen) was from WHO core list and 17 (seventeen) was from the Ethiopian national list of essential medicines 2014.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion criteria

- ✓ Public health care facilities.
- ✓ Licensed private medicine outlets (pharmacy and drug store) that can manage most of the selected essential medicines in Hawassa town.
- ✓ Essential medicines which have international reference prices, commonly used for the priority health care needs of the population in Hawassa town.
- ✓ Private medicine outlets closest to public medicine outlets within 10 km proximity to selected public medicine outlets (1).

4.4.2 Exclusion criteria

- ✓ Medicines which may overlap with the sampled core global medicines.
- ✓ Medicines which don't have international reference price.

4.5 Sample size determination and sampling technique

As per the WHO/HAI standardized methodology and WHO Operational package for assessing, monitoring and evaluating country pharmaceutical situations guide for coordinators and data collectors in addition to experiences reflected from lots of researches being done in the area of availability, price and affordability, it is usually not feasible to collect data from a large number of health facilities (31, 32), so a small sample of facilities need to be selected. Therefore, the following medicine outlets and medicines was selected.

4.5.1 Sampling of medicine outlets

Based on the Ethiopian health tier system the following are list of public health care facilities and private medicine outlets located in Hawassa town.

Table 1: Total number of public health care facilities medicine outlets, private medicine outlets in Hawassa town, SNNPR, ETHIOPIA, April 2018.

Public medicine outlets				Private drug outlets	
Tertiary level health care (Specialized hospital)	Secondary level	Primary level health care		Pharmacy (run by pharmacist)	Drug store (run by druggist)
	General hospital	Primary Hospital	Health Centers		
1	1	1	10	21	121

Public health care facilities

Ten health care facilities were selected according to the minimum sample size requirement of WHO operational package for assessing, monitoring and evaluating facility based pharmaceutical situations guide for coordinators and data collectors (32). There are totally 13 (thirteen) public health care facilities in Hawassa town and which are 1 specialized referral hospital, 1 general hospital, 1 primary hospital and 10 health care facilities.

Steps of selection

Step 1: Select the first facility. From a list of all public health care facilities in the study area, the main or biggest public hospital which is specialized referral hospital was selected purposively.

Step 2: Select the second facility. Identify all of the primary health centers or lowest-level public health facilities and randomly one of them was selected. Therefore, Tilte Health center was included.

Step 3: From 11 facilities left, using systematic sampling technique I have selected 5 facilities in every two intervals. Then 3 facilities were selected randomly from the rest not selected during systematic sampling. Here 1 General Hospital, 1 primary hospital and 6 health centers was included in the study. Totally 10 public health care facilities were selected.

Private medicine outlets

Ten (10) private medicine outlets which are found within 10 km proximity from the selected public health care facilities was selected to make the total sample size twenty as per WHO operational package for assessing, monitoring and evaluating country pharmaceutical situations recommendation (32). Totally 20 health care facility medicine outlets were selected for the study.

Table 2: Total number of selected medicine outlets in Hawassa town, SNNPR, Ethiopia, April 2018.

Public medicine outlets				Private drug outlets	Total
Specialized Referral hospital	General Hospital	Primary hospital	Health Centers	Pharmacy or drug store within 10 km proximity to the selected public health care facility.	20
1	1	1	7	10	

4.5.2 Sampling of essential medicines

A total of 30 essential medicines was selected. 13 (thirteen) was taken from core global list of medicines recommended by WHO/HAI for comparison and 17 (seventeen) supplementary medicines was added which are being used in the study area for the priority healthcare needs of the population. All the medicines are found in the management sciences for health international drug price indicator guide (2015) with their international drug prices. Moreover, they are also found in the national list of essential medicines for Ethiopia, 2014.

Table 3: List of selected essential medicines in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.

No	Indication	Medicine name	Strength	Dosage form
1	Infectious disease	Ciprofloxacin	500 mg	Tablet
2	Diabetes	Glibenclamide	5 mg	Capsule/tablet
3	Cardiovascular	Atenolol	50 mg	Capsule/tablet
4	Cardiovascular	Captopril	25 mg	Capsule/tablet
5	Anti-Malarial	Chloroquine	250 mg	Tablet
6	Infectious disease	Amoxicillin	500 mg	Capsule/tablet
7	Asthma	Salbutamol	0.1 mcg/dose	Inhaler
8	Infectious disease	Co-trimoxazole	200+40 mg/5ml	Suspension
9	Infectious disease	Co-trimoxazole	80/400 mg	Tablet
10	Infectious disease	Ceftriaxone	1 g/vial	Injection
11	CNS diseases	Diazepam	5 mg	Capsule/tablet
12	Pain/inflammation	Diclofenac	50 mg	Capsule/tablet
13	Pain/inflammation	Paracetamol	500 mg	Tablet
14	Ulcer	Omeprazole	20 mg	Capsule/tablet
15	Epilepsy	Phenobarbiton	100mg	Tablet
16	Anti-helminthic	Mebendazole	100mg	Tablet
17	Amoebiasis	Metronidazole	250 mg	Capsule/tablet
18	Infectious disease	Cloxacilline	500mg	Capsule
19	Infectious disease	Amoxicillin syrup	250mg/5ml	Bottle
20	Rehydration	ORS	To make 500 ml	Powder
21	Ulcer/ duodenal/	Cimetidine	400 mg	Tablet
22	Anti-fungal	Ketoconazole	200 mg	Tablet
23	Anti-diuretic	Hydrochlorothiazide	25 mg	Tablet
24	GIT	AIT /MgT	125 mg + 200 mg	Tablet
25	Pain/inflammation	Paracetamol	24 mg/ml	Syrup
26	Anti-TB	RHZE	150/75/400/275mg	Capsule/tablet
27	Anti-malarial	Coartum	20/120 mg	Tablet
28	Anti-anemic	Ferrous salt/folic acid	200/0.4 mg	Tablet
29	Anti-infective	TTC eye ointment	1 %	Tube
30	Antitoxin	TAT	1500 IU	Injection

4.6 Study variables

4.6.1 Dependent variable

- ✚ Availability
- ✚ Affordability
- ✚ Price

4.6.2 Access frameworks

1. Essential medicine policy
2. Regulation of medicines
3. Sustainable financing
4. Rational use of medicines
5. Reliable supply chain system
6. selection of medicines
7. procurement policy
8. Pricing policy
9. Price of medicines
10. Health insurance system
11. Promotion and advertising
12. Local production preference
13. Patented medicines
14. Fee waiver system

4.7 Data collection procedures

4.7.1 Data collection Instrument

Data collection format was adapted from the standardized WHO/HAI data collection forms. Medicine price and availability data collection form and affordability of standard treatments form was developed.

4.7.2 Data collection method

Having all the necessary materials for data collection, on arrival at the medicine outlets data collectors introduced themselves and staff was reminded about the purpose of the study. Data about the essential medicines was collected and recorded on medicine price and availability collection form. Review of prescription paper was done carefully to obtain the relevant information of the prices paid to standard treatments using a preprinted format for affordability of standard treatments. For each selected essential medicine, data on the most recent price, availability of Lowest-price generic (LPG) medicines and Highest priced brand (HPB) was collected on the day of data collection.

4.8 Data Processing and Analysis

Availability was based on whether the medicine was available in the medicine outlet on the day of data collection. Price data of medicines was entered as unit price into the Excel worksheet prepared manually.

Price data was checked carefully and entered into excel worksheet. The median price ratios for each medicines and the interquartile range was calculated with the excel worksheet and then by SPSS version 23 tool for further checkup. Comparisons of lowest priced generic medicine and highest priced brand was determined using Microsoft excel worksheet. The computerized excel worksheet was used USD as the currency for recording reference prices. The Ethiopian birr exchange rate for the USD prevailing on the first day of data collection was obtained from Hawassa branch of Ethiopian National bank. Medicines found in at least four pharmacies for their price data was included in the analysis to allow for robust determination (1).

4.9 Data quality assurance

Four data collectors (druggists) and one supervisor (pharmacist) was trained for one day about the objective of the study and clarification of tools. The trained supervisor supervised the data collectors on daily basis for completeness and consistency of the filled data collection formats.

Price and availability data's undergone careful entry verification using excel worksheet before analysis. At the end of each day, data collectors, supervisor and the principal investigator had meeting to review the format and clarify any unreliable information and ensure the data are complete, consistent and legible.

4.10 Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of Jimma University, Institute of Health. Official letter of cooperation was written from School of Pharmacy to Hawassa city health administration and the city health administration wrote supportive letter to each of the public and private health care facilities. Other necessary permissions were gained from public health care facilities, private retail outlets in the study area. Participation in the study was on a voluntary basis and responses were kept confidential and anonymous.

4.11 Dissemination plan

The findings of the study are planned to be presented and submitted to Jimma University as part of MSc thesis. The final result will be communicated and distributed to appropriate organizations working on related issue. Further effort will be made to present in different seminars, meetings and workshops finally to publish the thesis in scientific journals.

4.12 Definition of terms and Operational definitions

For the purpose of this survey:

- ❖ **Access:** refers to having essential medicines available and affordable at public health facilities or private medicine outlets present for the population in the catchment areas.
- ❖ **Affordability:** refers to the amount of daily wage of the lowest-paid government worker in comparison with the cost of a defined course of treatment for a specific acute condition or chronic condition. Affordability was estimated using median medicine prices and the average daily salary of the lowest-paid government worker then calculating the number of days' wages required to purchase seven days' course of treatment for an acute condition or thirty days' treatment for chronic condition. The cost of dispensed medicines incurred by patients was categorized in to affordable and unaffordable based on the average daily salary of the lowest paid government worker. Treatment costs less than or equal to the average daily salary of the lowest-paid government worker was considered affordable(17,35).
- ❖ **Availability:** refers to the percentage of medicine outlets in which the essential medicine concerned was available at the time of survey. The following ranges are used for describing availability (33):
 - <30% very low,
 - 30% - 49% low,
 - 50% - 80% fairly high and
 - > 80% high.
- ❖ **Generic equivalent:** all products other than the originator brand that contain the same active ingredient (substance), whether marketed under a brand name (“branded generic”) or the generic name.
- ❖ **International reference price:** the median international not-for-profit (and/or sometimes for profit) supplier/buyer prices, not retail prices.

- ❖ **Medicine out let:** is used more broadly to identify any place in which medicines are sold, including private retail pharmacies, outpatient pharmacies/dispensaries in public and NGO health facilities.
- ❖ **Median Price Ratio:** is the median unit price of a medicine divided by the international reference unit price of the medicine in USD).
- ❖ **Percentile:** the range of values containing the central half of the observations: that is, the range between the 25th and 75th percentiles (the range including the values that are up to 25% higher or down to 25% lower than the median) is called the inter-quartile range.
- ❖ **Price:** is expressed as a price per unit (e.g. tablet, dose) and was converted in to a median price ratio (MPR) only if the medicine is available in at least four facilities by dividing the median local price by an international reference price (31).

The following values for MPR was used to represent acceptable local price ratios:

Retail patient prices in Public Medicine outlets: $MPR \leq 1.5$

Retail patient prices in Private Medicine Outlets: $MPR \leq 2.5$

- ❖ **Regulation of medicines:** in this study it implies only about the pricing policy of medicines how it was set and the profit margins.
- ❖ **Fee waiver:** patients taking other than program medicines free of charge or who don't pay because they are poor and the government gave them exemption from payment.
- ❖ **Inter-sectoral price comparison:** the median prices of medicines when compared between public sector and private sector medicine outlets.

5. Results

5.1 Health care facilities

Availability and price data for each selected essential medicines under study was obtained from both public and private sector medicine outlets using pre-printed medicine information collection format.

Public health care facilities involved in the study are prescribing by generic and generic substitution was applicable. There was medicine selection committee in each public health care facilities and each of the individual health institutions responsible for medicines procurement and distribution. Procurement was limited on the national list of essential medicines and all health care facilities buying medicines directly from pharmaceutical fund and supply agency (PFSA), then for those medicines not obtained from PFSA open tender approach was employed to buy from whole sellers. Price of medicines were made publically accessible especially in public health care facilities. Regional Health Bureau only set the maximum mark-up to be 30 % while facilities are mandated to set price of all medicines and all of them put 25% mark-up but there was no regular price monitoring system in action made by responsible bodies. There was no insurance system at all and no any medicine was covered by insurance.

There was no essential medicine policy document, facility specific essential medicine list, incentives to dispensers to encourage generic medicine dispensing, regulation for local preference during procurement, existing formal medicines price regulatory authority and price monitoring system in both public and private health care facilities. There was no medicine with patent right. Program medicines and some essential medicines are free of charge in the public sector but there was no medicine given free of charge in private medicine outlets. Public sector revenue never used to pay salary of staff while in private medicine outlets salary was always paid from revenue fee of medicines.

5.2 Availability

The mean availability of essential medicines both for highest priced brand and lowest priced generic equivalents were indicated as a percentage in the following table 4. While assessing availability in private medicine outlets, RHZE was excluded since it was only available in public sector. Based on selected essential medicines, mean availability of generic essential medicines was 81.0 % and 83.3 %, while the median availability was 90% and 90 % in public and private sectors respectively. The availability of brand medicine was 1.5 % in public health care facilities and 45.3 % in private medicine outlets. Around 18 (60 %) from 30 surveyed essential medicines were highly available in public sector and 18 (62.07%) from 29 surveyed essential medicines were highly available in private sector medicine outlets on the day of visit. The availability of Atenolol 50 mg tab, Diazepam 5 mg tab and Phenobarbitone 100 mg tab was low at public sector medicine outlets.

Table 4: Availability of selected essential medicines in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.

Medicines name (n=30)	Type of health care facility			
	Public (n=10)		Private (n=10)	
	HPB %	LPGE %	HPB %	LPGE %
Ciprofloxacin 500 mg tab	20.0	100.0	100.0	100.0
Glibenclamide 5 mg tab	0.0	70.0	60.0	90.0
Atenolol 50 mg tab	0.0	40.0	30.0	50.0
Captopril 25 mg tab	0.0	50.0	0.0	70.0
Chloroquine 250 mg tab	0.0	80.0	0.0	100.0
Amoxicillin 500 mg cap	0.0	100.0	80.0	100.0
Salbutamol 0.1 mg/dose inhaler	0.0	50.0	60.0	60.0
Co-trimoxazole 240 mg/5 ml syrup	0.0	90.0	90.0	100.0
Co-trimoxazole 480 mg tab	0.0	90.0	80.0	90.0
Ceftriaxone I gm inj.	0.0	90.0	100.0	100.0
Diazepam 5 mg tab	0.0	30.0	0.0	80.0
Diclofenac 50 mg tab	0.0	100.0	100.0	100.0
Paracetamol 500 mg tab	0.0	100.0	100.0	100.0
Omeprazole 20 mg cap	0.0	90.0	80.0	90.0
Phenobarbitone 100 mg tab	0.0	30.0	0.0	50.0
Mebendazole 100 mg tab	0.0	100.0	70.0	100.0
Metronidazole 250 mg cap	0.0	100.0	0.0	100.0
Cloxacilline 500 mg cap	0.0	90.0	0.0	80.0
Amoxicillin 250 mg/5 ml syrup	10.0	90.0	100.0	90.0
ORS to make 500 ml	0.0	90.0	90.0	100.0
Cimetidine 400 mg tab	0.0	70.0	80.0	90.0
Ketoconazole 200 mg tab	0.0	80.0	30.0	70.0
Hydrochlorothiazide 25 mg tab	0.0	60.0	0.0	80.0
Al (OH)/Mg (OH) 125/250 mg tab	0.0	100.0	90.0	100.0
Paracetamol 24/ml Syrup	0.0	80.0	20.0	90.0
RHZE 150/75/400/275 mg	0.0	100.0	NA	NA
Coartum	0.0	100.0	0.0	70.0
Ferrous salt/folic acid 200/0.4 mg	0.0	100.0	0.0	80.0
TTC eye ointment 1 %	0.0	100.0	0.0	90.0
TAT 1500 IU	0.0	60.0	0.0	80.0
Mean (SD = 22.34), (SD=21.70)	1.5	81.0	45.3	83.3
Standard deviation	-	22.34	-	21.71

HPB= Highest priced brand **LPGE**= Lowest priced generic equivalent

Table 5: Level of Availability of selected essential medicines in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.

Level of availability	Public sector (n=10)	Private sector (n=10)
>80 % (High)	Ciprofloxacin 500 mg tab	Ciprofloxacin 500 mg tab
	Amoxicillin 500 mg cap	Glibenclamide 5 mg tab
	Cotrimoxazole 240/5 ml syrup	Chloroquine 150 mg tab
	Cotrimoxazole 480 mg tab	Amoxicillin 500 mg cap
	Ceftriaxone 1 gm inj.	Cotrimoxazole 240/5 ml syrup
	Diclofenac 50 mg tab	Cotrimoxazole 480 mg tab
	Paracetamol 500 mg tab	Ceftriaxone 1 gm inj.
	Omeprazole 20 mg cap	Diclofenac 50 mg tab
	Mebendazole 100 mg tab	Paracetamol 500 mg tab
	Metronidazole 250 mg cap	Omeprazole 20 mg cap
	Cloxacillin 500 cap	Mebendazole 100 mg tab
	Amoxicillin 250/5 ml syrup	Metronidazole 250 mg cap
	ORS to make 500 ml	Amoxicillin 250/5 ml syrup
	Coartum 20/120 mg	ORS to make 500 ml
	Ferrous salt/folic acid 200/0.4 mg	Cimetidine 400 mg tab
	Al (OH)/Mg (OH) 125/250 mg	Al (OH)/Mg (OH) 125/250 mg
TTC eye ointment 1 %	Paracetamol 24mg/ml syrup	
RHZE 150/75/400/275 mg	TTC eye ointment 1 %	
50 % - 80 % (Fairly high)	Glibenclamide 5 mg tab	Atenolol 50 mg tab
	Captopril 25 mg tab	Captopril 25 mg tab
	Chloroquine 150 mg tab	Salbutamol 0.1 mg inhaler
	Salbutamol 100 mcg inhaler	Diazepam 5 mg tab
	Cimetidine 400 mg tab	Phenobarbitone 100 mg tab
	Ketoconazole 200 mg tab	Cloxacillin 500 mg cap
	Hydrochlorothiazide 25 mg tab	Ketoconazole 200 mg tab
	Paracetamol 24mg/ml syrup	Hydrochlorothiazide 25 mg tab
	TAT 1500 IU	Coartum 20/120 mg
		Ferrous salt/folic acid 200/0.4 mg
	TAT 1500 IU	
30 % - 49 % (Low)	Atenolol 50 mg tab	
	Diazepam 5 mg tab	
	Phenobarbitone 100 mg tab	

5.3 Public sector patient out of pocket price

From the total of 28 (except RHZE and Coartum) essential medicines assessed in 10 public sector medicine outlets, price data of 26 generic medicines (except phenobarbital and diazepam) were found in 4 or more medicine outlets (as per WHO/HAI recommendation, medicines need to be found in at least 4 medicine outlets for their MPR to be calculated). At public sector medicine outlets, patient price for 26 essential medicines was found to be 2.54 times their international reference price. The median prices for individual generic medicines in the public sector ranges from 0.82 to 247.11 times the IRP for cimetidine 400 mg tab and salbutamol 0.1 mg/dose inhaler, respectively. When compared with IRP, 10 (35.71 %) essential medicines have MPR of less than or equals to 1.5 which is the acceptable local retail patient price in the public sector medicine outlets, while the rest 18 (64.29 %) of the medicines have retail patient price above the acceptable value. Look table 6 below.

5.4 Private sector patient out of pocket price

From the total of 29 essential medicines assessed in 10 private sector medicine outlets, patient price data of 29 lowest priced generics and 15 high priced brands were found in 4 or more private sector medicine outlets and was collected during data collection period. Based on the data collected, patient prices for 29 generics and 16 brands were found to be 4.09 and 13.37 times their IRP respectively. The prices charged to patients for generic essential medicines ranges from 1.47 to 306.55 times the IRP for cloxacillin 500 mg and salbutamol 0.1 mg/dose inhaler respectively. Prices charged to patients for brand essential medicines ranges from 0.83 to 370.97 times the IRP for Oral Rehydration Salt to make 500 ml and salbutamol 0.1 mg/dose inhaler respectively. When compared with IRP, 9 (31.03 %) from the lowest priced generic medicines and 2 (12.5 %) from highest brand medicines have local retail patient price of less than or equals to 2.5, which was the acceptable retail local price while the rest 20 (68.97 %) lowest priced generic medicines and 13 (86.7 %) of highest priced brand medicines found in private sector have a local retail patient price above the IRP of 2.5 which was unacceptable local retail price. Look table 6 below.

Table 6: Median price ratios of lowest priced medicines in the public and private sectors (n= 20) in Hawassa town, SNNPR, Ethiopia, April 2018.

Medicine name	Lowest price medicines MPR	
	Public sector (n=10 outlets)	Private sector (n=10 outlets)
Ciprofloxacin 500 mg tab	1.48	2.04
Glibenclamide 5 mg tab	6.54	13.09
Atenolol 50 mg	2.59	5.16
Captopril 25 mg tab	1.46	2.93
Chloroquine 150 mg tab	1.35	2.13
Amoxicillin 500 mg	1.19	2.15
Salbutamol 0.1 mg/dose inhaler	247.11	306.55
Cotrimoxazole 240 mg/5ml suspension	112.37	188.96
Cotrimoxazole 80/400 mg	1.13	1.54
Ceftriaxone 1gm/vial inj.	1.41	2.03
Diazepam 5 mg tab	4.94	9.80
Diclofenac 50 mg tab	3.23	4.09
Paracetamol 500 mg tab	2.60	3.57
Omeprazole 20 mg cap	1.68	3.91
Phenobarbital 100 mg tab	0.37	6.10
Mebendazole 100 mg tab	2.51	2.76
Metronidazole 250 mg cap	3.02	3.35
Cloxacilline 500 mg cap	0.98	1.47
Amoxicillin 250 mg/5 ml suspension	136.67	167.81
ORS to make 500 ml	2.57	7.94
Cimetidine 400 mg tab	0.82	1.62
Ketoconazole 200 mg tab	0.87	1.48
Hydrochlorothiazide 25 mg tab	12.69	17.30
Al (OH)/Mg (OH) 125/250 mg tab	1.97	4.16
Paracetamol 24 mg/ ml	106.33	142.10
RHZE 150/75/400/275 mg	-	-
Artemether/Lumefanitrine 20/120 mg	-	7.87
Ferrous salt/folic acid 200/0.4 mg	2.88	12.56
TTC eye ointment 1 %	9.98	12.05
TAT 1500 IU	1.84	2.04
Median price	2.54	4.09

5.6 Inter-sectoral price comparison

This comparison was done only for essential medicines found commonly in each sector. As indicated below in the table the interquartile range shows variation in median price ratios across individual medicines (at the 25th and 75th percentile) in public sector and private sector medicine outlets. Patient prices in the private medicine outlets were 61.02% higher than patient prices in public sector medicine outlets. However, there were no substantial variations in the overall average availability of essential medicines between the two sectors indicating 81.0 % and 83.3 % in public and private sector, respectively. 45.3 % brand essential medicines were found in addition to their generic equivalent essential medicines in the private medicine outlets. The result shows private health care facilities were using mainly generics but they also avail substantial number of brand medicines (almost half of essential medicines were also available as brand).

Table 7: Median retail prices of essential medicines in relation to international reference prices in health care facilities of Hawassa town, SNNPR, Ethiopia, April 2018.

Statistics	Public sector		Private sector	
	HPB	LPG	HPB	LPG
Number of medicines	2	26	15	29
Median MPR	8.59	2.54	15.45	4.09
25 % ile MPR		1.39	8.10	2.08
75 % ile MPR		7.40	36.71	12.30
Minimum MPR	6.62	0.82	0.83	1.47
Maximum MPR	10.58	247.11	370.97	306.55
Variation in price (%)				61.02

Blank space indicates there is no result to fill.

HPB= Highest priced brand LPG=Lowest priced generic MPR= Median price ratio

5.7 Affordability based on selected diseases

Standard treatments costing over a days' wage of the lowest paid government worker in both public and private health facilities include: cardiac failure, asthma, Infections due to susceptible organism, Acute otitis media, and toxins. Moreover, the result also indicated that standard treatments for anemia, peptic ulcer, malaria, fungal infection and dehydration costs over a day's wage of lowest paid government worker in private sector medicine outlets. On average a lowest paid government worker would need to work for 0.64 and 1.07 days in order to purchase full dose lowest priced generic Amoxicillin from public sector and private sector to treat adult pneumonia, respectively. A full dose of generic co-trimoxazole suspension costs 0.47 and 0.79 day's salary of the lowest paid government worker from public sector and private sector to treat child pneumonia, respectively. For the treatment of infections due to susceptible organism, the lowest paid government worker would require 3.34 and 4.83 day's wages to buy generic Ceftriaxone 1gm inj. in public and private sector medicine outlets respectively. See the table below.

Table 8: Affordability: number of days' wage of lowest paid government worker makes to purchase standard treatments in Hawassa town, SNNPR, Ethiopia, April 2018.

Condition	Drug name, strength, dosage form	Treatment schedule	Days wages to pay for standard treatment	
			Public sector (n=10)	Private sector (n=10)
Anti-infective	Ciprofloxacin 500 mg tab	500mg P.O., BID for 7 days = 14 tab	0.66	0.91
Diabetes mellitus	Glibenclamide 5 mg tab	5mg, P.O. daily = 30 tab	0.95	1.79
Cardiovascular	Atenolol 50 mg	50 mg, P.O., daily= 30 tab	0.71	1.53
Cardiovascular	Captopril 25 mg tab	25mg P.O., TID = 30 tab	0.92	1.79
Malaria	Chloroquine 150 mg tab	1g at 0 and 24hrs. + by 0.5g at 48hrs. P.O= 10 tab	0.16	0.26
Anti-infective	Amoxicillin 500 mg	500 mg TID for 7 days = 21 capsule	0.64	1.07
Asthma	Salbutamol 100mcg/dose inhaler	1 inhaler of 200 doses	1.94	2.40
Dysentery	Cotrimoxazole 240 mg/5ml suspension	24 mg/kg * 14.5 kg BID for 5 days = 3480 mg. 72.5 ml	0.47	0.79
Anti-infective	Cotrimoxazole 80/400 mg	160/800mg P.O, BID for 7 days= 28 tab	0.32	0.48
Infections	Ceftriaxone 1gm/vial inj.	1 gm inj. daily for 7 days = 7 vial	3.34	4.83
Anxiety	Diazepam 5 mg tab	5 mg BID for 5 days= 10 ta	0.40	0.77
Pain/management	Diclofenac 50 mg tab	50 mg BID for 30 days= 60 tab	0.76	1.02
Pain/management	Paracetamol 500 mg tab	1gm prn= 10 tab	0.10	0.17
Peptic ulcer	Omeprazole 20 mg cap	20 mg BID for 14 days= 28 cap	0.56	1.43
Epilepsy	Phenobarbital 100 mg tab	100 mg daily = 30 tab	1.21	1.53
Helminthes	Mebendazole 100 mg tab	100 mg BID for 3 days= 6 tab	0.09	0.10
Anti -infective	Metronidazole 250 mg cap	500 mg TID for 7 days= 42 cap	0.66	0.72

Anti –infective	Cloxacilline 500 mg cap	500 mg QID for 7 days= 28 cap	0.87	1.47
Acute otitis media	Amoxicillin 250 mg/5 ml suspension	250 mg/5 ml P.O. TID for 10 days for children above 6 years of age = 150 ml (2 bottle)	1.63	1.99
Dehydration	ORS to make 500 ml	75 ml/kg * 14.5 = 1087.5 ml= 3 sachet	0.36	1.12
Peptic ulcer	Cimetidine 400 mg tab	400 mg BID for 4 weeks= 56 tab	0.89	1.91
Anti-fungal	Ketoconazol 200 mg tab	200 mg/d for 3 wk = 21 tab	0.98	1.61
Heart failure	Hydrochlorothiazide 25 mg tab	25 mg BID for 30 days= 60 tab	2.79	3.56
Dyspepsia	ALT/MTS tab	2 tab PRN= 10 tab	0.06	0.17
Pain/management	Paracetamol 24 mg/ ml	5 ml prn= 60 ml	0.47	0.63
TB	RHZE 150/75/400/275 mg	free	free	NA
Malaria	Artemether/Lumefantrine 20/120 mg	80/480 BID for 3 days= 24 tab	free	2.72
Anemia	Ferrous salt/folic200/0.4 mg	325 mg daily = 60 tab	0.77	3.34
Anti- infective	TTC eye ointment 1 %	2-4 times per day for 10-15 days= 1 tube	0.39	0.47
Toxins	TAT 1500 IU	3000 IU= 2 amp	3.92	4.35

- At the time of study 1 USD = 27.2407 ETB
- Lowest gov't wage= 960 ETB, Daily wage= 32 ETB or **1.1747** dollar

6. Discussion

Medicines must be available and affordable in the public and private sectors in order for patients to access treatment adequately (35). Improving the availability and affordability of essential medicines is one of the most important objectives for any national medicines' policies. Poor availability and less affordability of essential medicines remains a major public health problem for the majority of the population in most parts of the world.

Essential medicines are intended to be available within the context of functioning health care systems at all times, in adequate amounts, in appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford (34). According to the results of this study, availability of selected essential medicines was high (> 80 %) and on average 81.0 % and 83.3 % of the medicines were available in the public sector and private sector, respectively (excluding RHZE from the private sector). Few essential medicines (Atenolol, Diazepam and Phenobarbital) as per the study finding was low, thus it can affect the poor enforcing them buy from private sector which was expensive so it needs investigation and generic policy implementation in the procurement of medicines. There was significant difference between the lowest priced generic equivalent (LPGE) and highest priced brand (HPB) availability in private sector. LPGE had a high (> 80%) or a fairly high (50 – 80%) availability in the private sector than HPB which was 45.3 % (< 50 %) indicates low availability. This implies private sector avails LPGE medicines comparable to that of public sector so it plays vital role in ensuring access to the community. The finding of this study was comparable with a study done in South Wollo Zone February 2012, which reported average availability of 85.5 % in public health care facilities and 91.1 % in private pharmacies for twenty selected essential medicines (33). The slight difference could be due to the study setting, sample size and number of essential medicines. Although the average availability is comparable, the lists of medicines used for the survey are different. The median availability of essential medicines in this study in both public and private sector was 90%, which is higher than 76.5 % median availability investigated at a national level in 2005 (35). The current study result is also higher than a median availability of 70 % in SNNPR region based on the 2002 national pharmaceutical sector assessment (36). High

availability in this study might be due to the improvements in the pharmaceutical supply system of the health care facilities and pharmaceutical fund and supply agency valuable support which is responsible for the procurement and distribution of pharmaceuticals to the public health care facilities. The finding of this study indicated that specially in the public sector the availability of essential medicines was higher than that of the study done in Siri Lanka which showed the mean availability was 58% in the public sector and 74.37% in the private sector (28). For this study availability refers only the specific dosage form and strength of the medicines, but other dosage forms and strengths or alternative medicines are certainly available and being used in our observation. This might undermine the availability findings. In this study patients are not forced to go to private medicine outlets where medicines are relatively expensive since medicine availability in public health care facilities was high. This finding was opposite to the study in south wollo zone which revealed that patients seeking treatment in the health care facilities were less likely to receive all prescribed medicines in all of the health care facilities included in the study (33). The variation may be due to difference in the study setting and sample size. Enhancing waiver and exemption system is one of the initiative in the health sector development plan (HSDP) of the country and should be given great attention by decision makers and program planners to focus on increasing the number of essential medicines be given free of charge (37).

This study revealed that the median price ratios (MPR) of 26 lowest priced generic medicines in public sector and 29 lowest priced generic medicines in private sectors were 2.54 and 4.09 times their international reference price respectively. It was 2.54 times the international reference price (IRP) the patient can pay in the public sector and 4.09 times the IRP in the private sector the patient can pay in order to get the average standard treatment. In the current study patient charges in private sector were 61.02 % above patient charges in public health care facilities. Median MPR of 1.5 and below in the public sector and 2.5 and below in the private sector was considered efficient local pricing. When compared with IRP in the public sector, 18 (eighteen) lowest priced generic medicines have retail patient price above the acceptable value. In the case of private sector, 20 (twenty) lowest priced medicines have retail patient prices above the acceptable value. Therefore, the patient retail local prices for the majority of medicines in

both sectors had unacceptable median MPR. This indicates that medicines are expensive in Hawassa town and are not affordable. This finding in the public sector is higher than the national medicine price survey in Ethiopia in 2003 (35) which showed median MPR of 1.35. The variation between the two studies might be due to difference in the amount of daily wage used, reference price guide used, number and type of sampled essential medicines. The current study finding in the public sector was comparable with the study done in Builsa district of Ghana in 2009 which reported median MPR of 2.74. On the other hand, patient price in both public and private sector is lower than that of the 2011 study done in Haiti which reported MPR of 4.8 and 7.0 respectively (4). Additionally, patient price in this study at private sector medicine outlets were highly lower than that of the 2013 study in Swaziland which reported MPR of 32.4 (22). With respect to the current study the 2004 national medicine price survey revealed a comparable price variation of 67.2% between the two sectors (35). On the other hand, it is higher from previous studies done in Ethiopia between public and private sectors. A study in south wollo zone, in 2012 (33) showed that retail price in the private medicine outlets was 41.2 % above patient charges in the public pharmacies. The higher public and private sector retail prices in this study might be mainly due to the lack of price monitoring system in Hawassa town so that medicine outlets in both sectors are charging out of the profit margin. Though it is difficult to assess true affordability, treatments costing one days' wage or less were considered affordable (38). Affordability was calculated in terms of the lowest paid government worker who earns 32 ETB (1.1747 USD) per day, with the assumption that the income level of most of the poor is equivalent to the lowest-paid government salary per individual level. However, a significant proportion of the population may earn less than this amount in the study area and a number of economically dependent family members may live on the wage of one person. Therefore, medicines are unaffordable in the actual situation as the study revealed. When each common disease conditions were considered, medicines are less affordable with respect to their price. This is because of low wages used in the calculation. While affordability was measured in terms of only a single medicine, it is important to note that this may not be the reality that most disease conditions are treated with more medicines than calculated by this survey. Thus the calculated medicine cost may represent a few portion of what would actually be paid by a

family at any given time. Moreover, this study identified that the average number of medicines per prescription was around 2 and there may also be a possibility of more than one family member at a time would require medicines which means when the number of patient increases in one family at a time so the number of medicines also will increase. Therefore, considering proportion of total household income spent on health care, costs of treatment seem unaffordable to the people earning below, or even equivalent to, the lowest government wage. At the time of the study, patients spent on average 35.44 ETB (1.12 day's wage) on medicines. In this study, the primary source of payment to get medicines was through out-of-pocket expenditure. With out-of-pocket expenditure as the main source of finance for treatment, most people in under developed areas may not able to afford the full cost of medicines prescribed. Therefore, this financing mechanism or source of payment would be a great barrier for affordability of essential medicines specially for the poor and the town as part of the country should work on the initiatives of strategic objectives established to improve resource mobilization and utilization in HSDP (37). There was a fee waiver system to get dispensed medicines free of charge in the town. Here strengthening fee waiver system is important to serve the poor. There was variation in the average cost of dispensed medicines, which may be because of the difference in the nature of disease conditions. In secondary and tertiary level health care system most medicines are prescribed to treat chronic diseases for longer period of time in comparison with primary level health care system, which may be more expensive than medicines for acute conditions.

7. Conclusion and Recommendation

7.1 Conclusion

Access to essential medicines was hampered by low availability and high price which makes them unaffordable. Thus, further study on larger scale is critical to identify acute areas for policy interventions such as price and or supply, and to enhance access to essential medicines. The average availability of essential medicines was high (> 80 %) in both public (81 %) and private sector (83.3 %) medicine outlets with few medicines (phenobarbital, atenolol and diazepam) at low level availability in the study area. Even though the mean availability result was high in both sectors, 9 (nine) medicines in public sector and 11 (eleven) medicines in private sector were at fairly high level. There are 3 (three) medicines at public sector which are at low level. Those medicines found at fairly high and low level with the specified strength and dosage form on the day of visit in public and private sector medicine outlets are available in other strengths and dosage forms for use. At public sector median price ratio of 26 lowest priced generic medicines was found 2.54 times their international reference price whereas at private sector median price ratio of 29 lowest priced generic medicines was 4.09 times their international reference price. There was clear price variation between public and private sector medicine outlets in which price at private sector was 61.02 % higher than price at public sector. The cost of standard treatment for 5 (five) common disease conditions in public sector and 18 (eighteen) in the private sector requires more than one day's wage to afford. There was no existing medicine price regulatory body (assigned man power and budget), price monitoring system and essential medicine list in all public health care facilities. Therefore, developing facility specific medicine list, establishing regular price monitoring system are some of the priority areas which needs intervention. Moreover, strengthening the supply chain system was important to improve the availability and affordability of essential medicines above the result obtained in the study.

7.2 Recommendations

The following recommendations forwarded for the different relevant organizations. Key players can be Pharmaceutical Fund and Supply Agency (PFSA), NGO's, Regional health bureau/Hawassa city administration health office and Health care facilities,

Public health care facilities;

To improve availability;

- ✓ Investigate the cause for low availability of some medicines and stock status should be timely communicated with PFSA to improve availability.
- ✓ Rational use of medicines should be encouraged to minimize avoidable cost paid.
- ✓ Implementation of essential medicine policy in the procurement of medicines.

To improve price and affordability;

- ✓ Strong price monitoring mechanism should be in place.
- ✓ Implementation of different financing options like community revolving drug schemes and health insurance schemes (Social health and community insurance);
- ✓ Life-saving/vital medicines better become free of charge or with no mark-up cost.
- ✓ Procurement should be more flexible using different methods based on studies.
- ✓ Supply chain system needs improvement and better strategies.

Hawassa city administration health office;

- ✓ Create better supply chain system among public health care facilities to share some medicines based on their level of stock.
- ✓ Establish medicine price regulatory body and regular price monitoring schedule.

Pharmaceutical supply and fund agency

- ✓ Closely follow the stock status of health facilities with immediate adjustment.
- ✓ Improve its supply chain system and avail products with different payment system

Regional Health bureau

- ✓ Pay attention and closely monitor price of medicines regularly
- ✓ Develop strategies, undertake studies and take appropriate measure accordingly.

8. Limitation of the study

Availability refers only the specific dosage form and strength of the medicines, but other dosage forms and strengths or alternative medicines might be available and this might undermine the availability findings. Percentage of medicines availability at the time of data collection do not help us to suggest the availability for a given time period. The minimum daily wage of government worker used for calculating affordability may not represent every individual in the community, since every individual in the community are not government workers. The study used the smallest sample size and it was also conducted in one selected geographic area so called Hawassa town due to logistical constraints.

The indicators used in the survey do not measure all aspects of the pharmaceutical sector. Moreover, most of the estimates are based on a one point in time observation. Therefore, the results of the study must be understood as first–line indicators for further questioning and subsequent action.

9. References

1. WHO/HAI. Measuring medicine prices, availability , affordability and price components. Geneva, Switzerland 2nd edition. 2008.
2. Chahal HS, St Fort N, Bero L. Availability, prices and affordability of essential medicines in Haiti. *J Glob Health*. 2013;3(2):20-40.
3. Province J, Xi X, Li W, Li J, Zhu X, Fu C, et al. A survey of the availability , prices and affordability of essential medicines in. *BMC Health Serv Res* [Internet]. 2015;3(2):1–7. Available from: <http://dx.doi.org/10.1186/s12913-015-1008-8>
4. Zaidi S, Nishtar N. Access to essential medicines : in Pakistan identifying policy research and concerns. *PLoS ONE*. August 2011;2(5):3-15.
5. Obuaku C. Essential Medicines in Nigeria : Foregrounding Access to Affordable Essential Medicines. 2014;3(12):42–60.
6. Survey AHF. Access to Essential Medicines in Kenya A Health Facility Survey. 2009;2(3):1-35.
7. Connell KAO, Poyer S, Solomon T, Munroe E, Patouillard E, Njogu J, et al. Methods for implementing a medicine outlet survey: lessons from the anti-malarial market. *Malar J*. 2013;12(7):1-23.
8. Mhlanga BS, Suleman, et al. Price , availability and affordability of medicines. :*Afr J Prm Health care fam Med* 2014;6(1):1–6.
9. Sado E, Sufa A. Availability and affordability of essential medicines for children in the Western part of Ethiopia: implication for access. *BMC Pediatr*. 2016;16(40):1–8.
10. Laing R et al. Evaluating Availability and Price of Essential Medicines in the Boston Area (Massachusetts, USA): A survey using WHO / HAI methods. 2016;9(12):1-11 DOI 10.1186/s40545-016-0059-5.

11. Fentie M, Fenta A, Moges F, Oumer H, Belay S, Sebhat Y, et al. International Journal of Research in Availability of essential medicines and inventory management practice in primary public health facilities of gondar town ., 2014;3(3):173–178.
12. Ewen M, International HA, Kaplan W. Prices and availability of locally produced and imported medicines in Tanzania and Ethiopia Report of a survey conducted in December 2017;10(7):1-9.
13. Babar Z, Lessing C, Bissell K. The Availability , Pricing and Affordability of Three Essential Asthma Medicines in 52 Low- and Middle-Income Countries. 2013;10(6):63–82.
14. Cameron A, Ewen M, Ross-Degnan D, Ball D, Laing R. Medicine prices, availability, and affordability in 36 developing and middle-income countries: a secondary analysis. Lancet. 2009;373(9659):240–249.
15. Kheder S, Ali M. Medicine Prices, Availability, Affordability and price components in Sudan. 2014; 1(2):16-82.
16. F mk. Assessment of availability, affordability and prescribing patterns of essential medicines in public health facilities in tanga region, tanzania. July 2011;4(2)1-9.
17. Abiye Z, Tesfaye A, Hawaze S. Barriers to access : availability and affordability of essential drugs in a retail outlet of a public health center in south western Ethiopia. 2013;3(10):101–105.
18. Nyanwura EM, Esena RK. Essential Medicines Availability And Affordability : A Case Study Of The Top Ten Registered Diseases In Builsa District Of Ghana. 2013;2(8)1-27.
19. Bruno O, Nyanchoka OA, Ondieki MC, Nyabayo MJ. Pharmaceutical Care & Health Systems Availability of Essential Medicines and Supplies during the Dual Pull-Push System of Drugs Acquisition in Kaliro District , Uganda. 2015;3(3):1-25
20. UNHCR. UNHCR. UNHCR’s Essential Medicines and Medical Supplies: Policy and Guidance 2011. website:<http://www.unhcr.org/afr/4f707faf9.pdf>. 2011.

21. Bertoldi AD, Helfer AP, Camargo AL, Noêmia UL. Medicine prices , availability and affordability in Southern Brazil : a study of public and private facilities. 2010;395);1–24.
22. Sharma A, Rorden L, Ewen M, Laing R. Evaluating availability and price of essential medicines in Boston area (Massachusetts , USA) using WHO / HAI methodology. J Pharm Policy Pract. 2016;9(12);1–11.
23. Muhwezi M. Procurement , availability , affordability and use of essential medicines and health supplies at community level in (Uganda). 2015;2(7):137–60.
24. Bazargani YT, Ewen M, Boer A De, Leufkens HGM, Mantel-teeuwisse AK. Essential Medicines Are More Available than Other Medicines around the Globe. 2014;9(2):1–7.
25. Wang X, Fang Y, Yang S, Jiang M, Yan K, Wu L, et al. Access to Paediatric Essential Medicines : A Survey of Prices , Availability , Affordability and Price Components in Shaanxi Province , China. 2014;9(3):5-30.
26. Ud Z, Babar D, Izham M, Ibrahim M, Singh H, Bukahri NI, et al. Evaluating Drug Prices , Availability , Affordability , and Price Components : Implications for Access to Drugs in Malaysia. 2007;4(3):10-19.
27. Elhassan SM, Elhassan GO, Alfadl AA, Sirelkhatim SA, Alfarouk KO. Pharmacovigilance Evaluation of Drug Affordability in Khartoum State , Sudan. 2016;4(1):1–6.
28. Rathish D, Premarathna I, Jayathilake T, Kandegedara C, Punchihewa K, Ananda L, et al. Availability of essential medicines in selected public , primary and secondary health care institutions of a rural Sri Lankan district : a spot survey. BMC Health Serv Res. 2017;3(5):1–9.
29. Directorate General of Pharmaceutical Affairs and Drug Control sultanate of oman. Medicine Prices , Availability , Affordability and Price Components in Oman October 2007 Report date : December 2008 Sultanate of Oman Ministry of Health. December 2008;4(5):1–46.

30. Van Mourik et al. Availability ,price and affordability of cardiovascular medicines :A comparison across 36 countries using WHO/HAI data. *BMC Cardiovascular Disorders* 2010;10(25);1-9 doi:10.1186/1471-2261-10-25.
31. Hussien M, Tafese F. Access to Essential Medicines in Primary Health Care Units of South Wollo Zone, Ethiopia. *OALib*. 2015;02(01):1–10.
32. Gelders S, Ewen M, Noguchi N, Laing R. Price , availability and affordability: An international comparison of chronic disease medicines. *December* 2005;02(5):2-9.
33. World Health Organization and Health Action International 2008. Measuring medicine prices, availability, affordability and price components 2ND EDITION.
34. World health organization, December 2007. WHO Operational package for assessing , monitoring and evaluating country pharmaceutical situations: Guide for coordinators and data collectors. Geneva, Switzerland: World Health Organization.
35. Hussien M, Tafese F. Access to Essential Medicines in Primary Health Care Units of South Wollo Zone, Ethiopia. January 2015; *Open Access Library Journal*, volume 2(9): e983. <http://dx.doi.org/10.4236/oalib.1100983>.
36. Aitken M. Understanding the Role and Use of Essential Medicines Lists Report by the IMS institute for health care informatics. April 2015;www.theimsinstitute.org.
37. WHO/FMOH October (2005). Survey on prices of medicines in ethiopia. Addis Ababa. Ministy of health and the World health organization 2005.
38. FDRE/WHO (2003). Assessment of the Pharmaceutical Sector in Ethiopia. Addis Ababa. Ministry of health and the World health organization,October 2004.
39. Federal Democratic Republic of Ethiopia Ministry of Health, Health Sector Development Program IV October 2010).
40. Anson A, Ramay B, Esparza AR De, Bero L. Availability , prices and affordability of the World Health Organization’s essential medicines for children in Guatemala. 2012;3(4) 1–10.

10. Annexes

Annex 1: Information sheet and consent form

This is research proposal of JU for partial fulfillment of Master of Science in pharmaceutical supply chain management

Purpose of this study: This study is aimed to assess access to essential medicines in Hawassa town, SNNPR, ETHIOPIA.

Procedure: in order to collect our data, we invite you to take part in our project. If you are willing, you need to understand and sign the consent form.

Risk and /or discomfort: by participating this project you may feel some discomfort on scarifying your time otherwise, no risk in participating in this research project, so your response provide an important input to show the gap and improve access to essential medicines.

Benefits: if you are participating in this research project, the output of the study will have both direct and indirect benefit to you, as you and your families will use the services in the future.

Payment/incentives for participating: you will not be provided any incentive or payment to take part in this project.

Confidentiality: The information that we collect from this research project was kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone except research sponsors, advisor and data collector.

Right to Refuse or Withdraw: You have full right to refuse from participating in this research. Your refusal will not affect you from getting any kind of health related services within the community.

Person to Contact: If you want to know more information, you can contact the following: [GETNET TAFESE Tel: mobile 0916873465 or E-mail-tgetnet62@gmail.com or gech62@yahoo.com]

Annex 2: Medicine price and availability data collection form

Name of medicine outlet (optional).....

Medicine outlet unique survey ID (mandatory).....

Distance in km from nearest town (population >50 000)

Type of medicine outlet:

❖ Public sector health care facility (specify level of care below):

15. Primary health care facility _____

16. Secondary health care facility _____

17. Tertiary health care facility _____

❖ Private sector medicine outlet

• Pharmacy _____ Drug store _____

Type of price:

✚ Procurement price _____ Price the patient pays _____

Type of data:

• Sample outlet _____ Back-up outlet _____ Validation visit _____

Name of data collectors..... sign.....

Verification

To be completed by the area supervisor at the end of the day,

Signed..... Date.....

Highest priced brand and Lowest priced generic equivalent product: determined at facility

A	B	C	D	E	F	G	H	I
Generic name, Dosage form, strength	Product type	Brand or product	Available: "yes" or "no"	Pack size recommend	Pack size found	Price of pack found	Unit price (4digits)	Comment
Ciprofloxacin 500 mg tab	HPB							
	LPGE							
Glibenclamide 5 mg tab	HPB							
	LPGE							
Atenolol 50 mg	HPB							
	LPGE							
Captopril 25 mg tab	HPB							
	LPGE							
Chloroquine 250 mg tab	HPB							
	LPGE							
Amoxicillin 500 mg cap	HPB							
	LPGE							
Salbutamol 0.1 mg/dose inj	HPB							
	LPGE							
Cotrimoxazole 240 mg/5ml susp	HPB							
	LPGE							
Cotrimoxazole 80/400mg	HPB							
	LPGE							
Ceftriaxone 1gm/vial inj	HPB							
	LPGE							
Diazepam 5 mg tab	HPB							
	LPGE							
Diclofenac 50 mg tab	HPB							
	LPGE							
Paracetamol 500 mg tab	HPB							
	LPGE							
Omeprazole 20 mg cap	HPB							
	LPGE							
Phenobarbiton 100 mg tab	HPB							
	LPGE							
Mebendazole 100 mg tab	HPB							
	LPGE							
Metronidazole 250 mg cap	HPB							
	LPGE							
Cloxacilline 500 mg cap	HPB							
	LPGE							
Amoxicillin syrup 250 mg/5 ml susp	HPB							
	LPGE							
ORS to make 500 ml	HPB							

	<i>LPGE</i>							
Cimetidine 400 mg tab	<i>HPB</i>							
	<i>LPGE</i>							
Ketoconazole 200 mg tab	<i>HPB</i>							
	<i>LPGE</i>							
Hydrochlorothiazide 25 mg tab	<i>HPB</i>							
	<i>LPGE</i>							
MTS/ALT tab	<i>HPB</i>							
	<i>LPGE</i>							
Paracetamol 24 mg/ 5ml	<i>HPB</i>							
	<i>LPGE</i>							
RHZE 150/75/400/275 mg	<i>HPB</i>							
	<i>LPGE</i>							
Artemether/Lumefantrine 20/120 mg	<i>HPB</i>							
	<i>LPGE</i>							
Ferrous salt/folic acid 200/0.4 mg	<i>HPB</i>							
	<i>LPGE</i>							
TTC eye ointment 1 %	<i>HPB</i>							
	<i>LPGE</i>							
TAT 1500 IU	<i>HPB</i>							
	<i>LPGE</i>							

HPB= Highest priced brand, LPGE= Lowest Price Generic Equivalent

Annex 3: Affordability of standard treatments collection form

Disease condition and 'standard' drug treatment			Day's wages to pay for treatment	
Condition	Drug Name	Dosage and Duration	Highest priced brand (HPB)	Lowest price generic (LPGE)
Pneumonia	Amoxicillin	500 mg 3 times daily x 7 d		
Ulcer (duodenal)	Omeprazole	20mg twice daily x 30 days		
Helminthic	Mebendazole	100 mg 2 daily x 3 days		
Typhoid fever	Ciprofloxacin	500mg twice daily x 7 days		
Infection	Ceftriaxone	1 gm. iv daily x 7 days		
Hypertension	Captopril	25mg daily x 30 days		
ARI (child)	Cotrimox.Susp	240 mg/5ml 2x daily x 7 d		
Epilepsy	Phenobarbital	100mg daily x 30 days		

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name: _____

Signature: _____

Date of submission: _____

Approval of advisor

Name and Signature of the principal advisor

Name and Signature of the Internal Examiner

Name and Signature of the External Examiner

