Availability, Affordability and Price of Anti-Malaria Medicines in Gamo Zone, South Ethiopia Region

MERON YACOB (B. PHARM)

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Availability, Affordability and Price of Anti-Malaria Medicines in Gamo Zone, South Ethiopia Region

By: Meron Yacob (B. Pharm)
Advisors: Teferi Gedif (Prof.)
: Muluwork Sahila (MSc)

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DECLARATION

I hereby declare that this study entitled "Availability, Affordability and Price of Anti-Malaria Medicines in Gamo Zone, South Ethiopia Region" is my original work prepared under the guidance of my advisors Prof. Teferi Gedif and Mrs. Muluwork Sahile (MSc). This paper is submitted to the Department of Pharmaceutics and Social Pharmacy, School of Pharmacy in partial fulfillment of the requirements for the award of Master of Science degree in Health Supply Chain Management and it has not been previously submitted to any diploma or degree in any college or university. I would like also to confirm that all the sources of materials used in this study are duly acknowledged.

By: Meron Yacob

Signature _____

Date _____

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This is to certify that the thesis prepared by Meron Yacob, entitled: "*Availability*, *Affordability and Price of Anti-Malaria Medicines in Gamo Zone, South Ethiopia Region"* and submitted in partial fulfillment of the requirements for the Degree of Master of Science complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Internal Examiner: _____ Signature: _____Date: _____

External Examiner: _____ Signature: _____Date: _____

Advisor: Teferi Gedif (Prof.) Signature: _____ Date: _____

_____

Chair of Department or Graduate Program Coordinator

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Abbreviations

AAU	Addis Ababa University
API	Annual Parasite Incidence
AL	Artemether + Lumphantrin
AS	Artesunate
CSA	Central Statistical Agency
CQ	Chloroquine
EPSA	Ethiopian Pharmaceutical Supply Agency
GF	Global Fund
HAI	Health Action International
HCMIS	Health Commodities Management Information System
HMIS	Health Management Information System
IRS	Indoore Residual Spray
ITNs	Insecticide Mosquito Treated Bed Nets
IPLS	Integrated Pharmaceutical Logistic System
IRP	International Reference Price
MPR	Median Price Ratio
MOH	Ministry of Health
NMGE	National Malaria Guidelines of Ethiopia
PGH	Public General Hospital
PMI	President's Malaria Initiative
PQ	Primaquine
PHFs	Public Health Facilities
PHCs	Public Health Centers
PHPs	Public Health Posts
PPHs	Public Primary Hospitals
QN	Quinine
RAS	Rectal Artesunate
RRF	Report and Requisition Form
SOP	Standard Operating Procedure
USAID	United States Agency for International Development

Abstract

Malaria is a major public health problem in Ethiopia and has been consistently reported as one of the leading causes of morbidity and mortality. Frequent stock depletion and shortage of anti-malaria medicines were observed in public health facilities of Ethiopia. The aim of this study was to assess the availability, affordability and price of anti- malaria medicines in Gamo Zone, South Ethiopia Region. The study employed a mixed methods research design, combining both qualitative and quantitative data collection techniques. This study was conducted in one General Hospital, two primary hospitals, fifteen health centers, six health posts, ten private drug stores and the Ethiopian Pharmaceutical Supply Service of Arbaminch Hub. A two-stage cluster sampling technique was implemented to select twenty-four public health facilities and 10 private drug stores from the Zone. Record review, an observational check list and an in-depth interview were used as a data collection technique. The data was analyzed using Excel for quantitative descriptive analysis and thematically for qualitative data. The median percent availability of adult dosage forms of Artemether +Lumefantrine and Chloroquine was high (82%) and (84%) respectively in Public Health Facilities. The median availability of Artesunate injection and Primaquine tablet was 40% and Rectal Artesunate was unavailable in Public Health Facilities. The market price of Chloroquine tablet and Quinine injection was 0.3 and 0.9, respectively. A three days treatment of uncomplicated cases of malaria caused by Artemether + Lumefantrine costs the lowest paid unskilled government worker their 2.9 days wage. According to the Key informants, unavailability of anti-malaria medicines in Ethiopian Pharmaceutical Supply Service, poor Quality of reporting and requisition form, lack of training on new updates on the national malaria Guideline were the main contributing factor for the unavailability of anti-malaria medicines in their facilities. This study found low availability of Anti- malaria medicines in public health facilities. The study also demonstrates that, there was a gap in regularly distribution of Artesunate injection. Low supply of anti-malaria medicines, poor RRF data quality, lack of training on new updates were identifying as a contributing factor for low availability of medicines in facilities, emphasizing the need for continuous and sustainable availability of these medicines for the prevention, treatment, and elimination of malaria.

Keywords: affordability, anti-malaria medicines, availability, Price

1. INTRODUCTION

1.1. Background of the study

In over a hundred countries and territories there is a risk of malaria, a common life-threatening disease in the tropics and sub-tropics areas. The person-to-person transmission of malaria is by a feeding female *Anopheles* mosquito. The disease is caused by the Plasmodium species of which there are four types: *P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*. "*P. falciparum* and *P. Vivax* are the major species, which account for 60% and 40% cases respectively and *P. malariae* accounts for < 1% and *P. ovale* is rarely reported in the regions of Ethiopia (WHO, 2018).

Severe malaria illness in Ethiopia is usually caused by *P. falciparum* and occasionally by *P. vivax* (NMGE, 2012).

There are four major eco-epidemiological strata of malaria in Ethiopia: high land areas above 2,500m altitude are malaria free areas, high land fringe areas between 1,500-2,500m altitude where epidemics of malaria are mostly occurred, low land areas below 1,500m with seasonal pattern of transmission and stable malaria areas with all year-round transmission of malaria" (WHO ,2018).

According to the WHO eco-epidemiological strata of malaria in Ethiopia: Gamo Zone is located 680 to 4207 meters above sea level. So, the Zone contains high land areas above 2,500m altitude as malaria free areas, high land fringe areas between 1,500-2,500m altitude where epidemics of malaria are mostly occurred, low land areas below 1,500m with seasonal pattern of transmission and stable malaria areas with all year-round transmission of malaria" (WHO ,2018).

According to the national Malaria Strategic Plan (NSP 2021-2025), Ethiopia's malaria situation has been classified into five strata ((API) > 50 as high, API >10 & 50 moderate, API >5 & 10 low, API >0 & 5 very low, and API=0 cases, Free) based on annual parasite incidence [API] per 1000 population/year. As a result, Gamo zone is classified in all strata of malaria transmission (National Malaria Elimination Roadmap, 2017-2030).

The key component of malaria control and elimination strategies globally are prevention, diagnostic testing, treatment and prompt and effective case management in health facilities. In Ethiopia insecticide-based vector control remains a key component of malaria prevention and control. The two major vector control interventions implemented to prevent malaria in Ethiopia are insecticide-treated mosquito nets (ITNs) and Indore residual spray (IRS) – as recommended by WHO. The former is used for high malaria burden areas or where there is a risk of epidemics and the latter is for populations living in malaria risk areas (PMI, 2019). Population groups at a higher risk of getting malaria and developing severe case are infants, children under the age of 5, pregnant women and patients with Human Immune Deficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS) due to low immunity in these groups (WHO,2018).

1.2 . Statement of the problem

Essential medicines are medicines that satisfy the priority health care needs of the population (WHO, 2018). It improves health and saves lives (Lukas, R. et al., 2018). Having access to those medicines is considered as one of the fundamental human rights whose importance has been given recognition and much attention by governments around the world (Hogerzeil,2006). Both the 1946 World Health Organization Constitution and the 1948 Universal Declaration of Human Rights (UDHR) recognize the right to health (UDRH, 1948).

Getting this fundamental right, though, depends on and cannot be fulfilled without equitable access to medicines. When there are adequate and equitable medicines, it minimizes the sufferings and improves the health of the people. More importantly it saves the lives of so many (Hogerzeil, 2006).

At this time, with the advancement of technologies, the expectation is that access to medicines shouldn't be a big problem (WHO, 2016). However, it has been a major issue not only for low- and middle-income countries but also for high income countries (Shukar, 2021).

Globally, more than 2 billion people have no or little access to medicines because it is either unaffordable or unavailable or inaccessible for all. In most African countries the challenge is greater (WHO, 2017).“Low-income countries experience poor availability of

essential medicines in health facilities, substandard-quality treatments, frequent stock-outs and sub optimal prescription and use of medicines," says the world health body (Pheage**,** 2017).

No or little access to medicines has a big economic, clinical and humanistic outcome to patients. Millions of people in Africa die of malaria, tuberculosis and HIV-related illnesses mainly from lack of access to medicines (Pheage**,** 2017).One of these African countries where the problem is observed is Ethiopia (SIAPS, 2014).

Although Ethiopia has combating malaria for many years, 60% of the Ethiopian population still lives in malaria endemic areas and 68% of the land mass is favorable for malaria transmission (EPHI, 2015).

One of the heavy economic burdens of malaria falls on Ethiopia because the highest malaria transmission often occurs from September to December. The planting and harvesting season go with the highest malaria transmission time. Also, majority of malaria load falls on older children and working adults in rural areas (PMI, 2018). Lack of these essential medicines also result in pushing a large number of families in to poverty.

According to the WHO eco-epidemiological strata of malaria in Ethiopia: Gamo Zone is located 680 to 4207 meters above sea level. So, the Zone contains high land areas above 2,500m altitude as malaria free areas, high land fringe areas between 1,500-2,500m altitude where epidemics of malaria are mostly occurred, low land areas below 1,500m with seasonal pattern of transmission and stable malaria areas with all year-round transmission of malaria" (WHO, 2018).

According to the Ethiopian situation report of 2023, there was a high prevalence of malaria in South Ethiopia Region. One of the Zones which calls for enhanced response was Gamo Zone.10,299 cases of malaria were reported in a week between 13-19 June in 2023. In the reporting week 0.85 percent of malaria affected people were treated as inpatients (OCHA,2023).

Population living in Gomo Zone have been suffering from many diseases those could be communicable or non-communicable disease that often affected the people of Gamo Zone were malaria (Ashenafe Senbeta,2016).

Seasonal variation of malaria was shown in the districts of Gamo Zone especially in the month of September to January and July to August. The highest malaria prevalence was observed in December months of each year while low rate of Malaria prevalence was observed in July months of each year. So, health professionals should pay attention on December months of each year (Ashenafe Senbeta,2016).

Based on the Ethiopian situation report of 2023, there was a gap in Anti Malaria medicines for the prevention, control and treatment of the disease in districts of South Ethiopia Region. One of the Zones where the gaps were observed was Gamo Zone (OCHA,2023).

Based on a study which was done in Jimma Zone in 2021, one of the most commonly stock out medicines out of the surveyed essential medicines was Artemether lumefantrine 20/120mg where the average availability was found to be 43.3% in health facilities of Jimma zone during the study period (Eyassu, 2021).

A study which was conducted in the Oromia region in 2014 indicates that the availability of Artemether + lumefantrine (AL) was 26.8%, and 6.7% at NGO and private sector medicine outlets, respectively. Quinine tablet availability was 20% in public, 3.3% in private, and 57% in NGO sectors, while the availability of artesunate injections was 43% in public, 3.3% in private, and 0% in NGO sectors.

A supportive supervision undertaken in Gamo Zone also indicates shortage of anti-malaria medicines in Gamo zone (RHB, 2017). Therefore, a continuous and sustainable availability and affordability of medicines should be guaranteed to minimize the sufferings and improve the lives of millions of people (WHO, 2018).

Studying the availability, affordability, and price of anti-malarial medicines in Gamo zone is to identify the gaps and challenges in accessing effective and affordable malaria treatment. Malaria is major public health problem in the zone, and access to effective treatment is critical for reducing morbidity and mortality in the zone. Studies on the availability, affordability, and price of anti-malarial medicines can provide valuable insights into the challenges faced by healthcare providers and patients in accessing effective and affordable malaria treatment in Gamo zone. These studies can also inform policy decisions aimed at improving access to effective and affordable malaria treatment,

such as the development of pricing policies and the implementation of interventions to improve the availability of essential medicines. Therefore, the current study was identifying gaps and challenges of the availability, affordability, and price of anti-malarial medicines in Gamo zone is essential for improving access to effective and affordable malaria treatment and reducing the burden of malaria in the zone and contributing efforts toward malaria elimination in the country.

1.3 . Research questions

This study was conducted to answer the following basic research questions based on the statement of the problem:

1. What is the availability, affordability and price of anti-malaria commodities in public health facilities, private drug stores and EPSA Arbaminch hub of Gamo Zone during the year under review?
2. What are the challenges of making anti-malaria commodities available in the Gamo Zone?
3. What can be done to improve the availability of anti-malaria commodities in public health facilities of Gamo Zone?

1.4 . OBJECTIVES OF THE STUDY

1.4.1. General objective

- To assess the accessibility of anti-malaria medicines in public health facilities, private drug stores and EPSA Arbaminch hub of Gamo Zone.

1.4.2. Specific objectives

- To determine the availability of anti-malaria medicines in Gamo zone
- To assess the affordability of anti-malaria medicines in Gamo zone
- To assess the price of anti-malaria medicines in public health facilities, private drug stores and EPSS Arbaminch hub of Gamo Zone during the year 2018-2019 G.C
- To identify challenges associated with availability of anti-malaria medicines in Gamo Zone.

2. LITRATURE REVIEW

2.1 . The Health Sector of Ethiopia

A three-level system is found in the Health System of Ethiopia. The first level in the health system contains a primary hospital which covers from 60,000-100,000 clients, health centers which provide health services from15, 000-25,000 clients and around 5 health posts for each primary health centers which covers from 3,000-5,000 clients. The first level in the system is together called Primary Health Care Unit and a referral system connected them together. The next level in the health system of Ethiopia is the General hospital giving health services from 1-1.5 million clients and the last level which covers from 3.3-5 million clients is the specialized hospital (MOH, 2010).

2.2. The Pharmaceutical Sector in Ethiopia

Based on the Food and medicine administration proclamation number of 1112/2019, the pharmaceutical sector is regulated by the Ethiopian Food and Drug Authority (EFDA, 2019).

As indicated in the EFDA 2019 document, the use of Anti-Malaria commodities requires prior evaluation and approval of its efficacy, safety and quality of the medicine and registration by governing body called Ethiopian Food and Drug Authority (EFDA, 2019).

According to the first edition of the standard operational procedure (SOP) manual for the Integrated Pharmaceutical Logistic System (IPLS) in PHFs of Ethiopia, the Ethiopia Pharmaceuticals Supply Agency (EPSA) started functioning in 2007. The SOP manual also indicates that the agency has an authority for the quantification, procurement, temporary storage and distribution of medicines and medical commodities. As indicated in the 2017 SOP manual of EPSA, which was published in 2019, IPLS was developed to show its mandate in the area of medical supply in an efficient and effective manner. According to the SOP, IPLS is the term applied to the reporting and distribution system of medical commodities (EPSA, 2019).

2.3. Supply Chain of Anti-Malaria Medicines

Pharmaceutical commodities should be first selected on the bases of the National Essential Medicine List (NEML) of the country and must be registered for its overall use. Giving priority to some commodities during pharmaceutical selection is very important for a continuous availability of the medicine and medical equipment (FMHACA, 2014).

The quantification of Anti-Malaria commodities will be carried out every 1-3 years with the formation of a quantification team from the MOH, EPSA and partners. Quantification includes forecasting and supply planning. The purpose of forecasting and supply planning is to estimate quantities and costs of commodities which will be procured and when the procured commodities should arrive to ensure an uninterrupted supply of commodities (MSH, 2017).

After quantification, a procurement process will be started by using different methods at the EPSA. Anti-Malaria commodities are procured in Ethiopia with the financial support of the Global Fund (GF), President's Malaria Initiative (PMI) and other partners.

The procured commodities will be cleared from the port after the documents review and physical inspection of the commodities by FMHACA (FMHACA, 2014). The procured Anti-Malaria commodities will be stored temporarily in the central EPSA and distributed every two months to the hubs and from these to PHFs (EPSA, 2019).

2.4. Anti-Malaria Medicines and information flow in the IPLS

Anti-Malaria commodities are distributed by EPSA hubs every two-month depending on the seasonal consumption of PHFs. The Public Health Centers (PHCs) order also contains the needs of the Health Posts (HPs). Based on the SOP manual; a combined report and requestion form should be sent to EPSA hubs every two months by PHFs. Those of these that are accessible to the hub receive these commodities from the hub. However, PHFs that are inaccessible to EPSA hubs receive Anti-Malaria commodities through district Health Offices (DHOs). The inaccessible PHFs will send report and order forms to EPSA hubs through DHOs. As indicated in the SOP manual, HPs will send the completed report and requestion form of pharmaceutical commodities every month to the PHCs. The latter use the report in the former to supply the commodities based on the seasonal needs of the

facilities. As indicated in the manual, the feedback from the upper level to lower level goes to the IPLS (EPSA, 2017).

2.5. Anti-Malaria Medicines used for treatment, prevention and diagnosis

Based on the National Malaria Guidelines of Ethiopia (NMGE) published in 2022, immediate and effective treatment and diagnosis will prevent most cases of uncomplicated malaria from progressing to severe and fatal illness. According to the document, to avoid progression of the disease, treatment must begin within 24 hours after the onset of the symptom. As indicated in the NMGE, malaria should be diagnosis by using a microscopic in public hospitals and health centers and Rapid Diagnostic Tests (RDTs) in HPs. As indicated in the document, prompt availability and affordability of the medicines and medical equipment's near to the village of the population is very important for the treatment, prevention and diagnosis of the patient (NMGE, 2022).

As recommended by the National Malaria Guideline of Ethiopia, Artemether + Lumefantrine tablet (AL tab) and Chloroquine tablet (CQ tab) is the first-line medicine for uncomplicated malaria caused by P. falciparum and P. vivax respectively. The MOH with other partners procure and distribute the dispersible AL tab for pediatrics in Ethiopia. The guideline also shows AL tab for the second- line medicines for P. vivax and AL tab is the recommended treatment of malaria for a mixed infection caused by P. falciparum and P. vivax (NMGE, 2022).

The pre-referral treatment of severe and complicated cases of malaria with Rectal artesunate (RAS) at the lower level of health facilities is critical to reduce fatal complications. Based on the 2022 published NMGE, Artesunate injection (AS inj.) is the recommended first-line medicine for the treatment of severe and complicated cases of malaria in public hospitals and health centers. RAS is the preferred pre-referral medicine in health posts (NMGE, 2022).

According to the MOH, Primaquine tablet (PQ tab) should be given at hospital and health center level for radical treatment of malaria caused by P. vivax. As indicated in the treatment guideline, a single dose of PQ tab is also started to be used with AL to reduce malaria transmission caused by P. falciparum in all PHFs of Ethiopia (NMGE, 2022).

Malaria in pregnancy is addressed in Ethiopia by giving priority to pregnant women for ITNs and by improving the availability and affordability of the diagnosis and its treatment. Based on the guidelines of Ethiopia, CQ tablet is the recommended treatment for uncomplicated cases of malaria caused by P. Vivax in all trimesters of pregnancy (NMGE, 2012).

2.6. Essential medicines availability, affordability and price

Essential medicines are medicines that satisfy the priority health care needs of the population (WHO, 2018). However, the availability of this medicine becomes a major public health challenge worldwide (wirtzvj, et al., 2017).

Research conducted in a district of Sri Lanka on the overall availability of essential medicines in selected public, primary and secondary health care institutions in 2017 indicated that the overall availability was 71%, whereas the average overall availability of the primary care institutions was 56% (Dehvarajan, R. et al., 2017).

The availability of anti-malarial drugs, diagnostic tests for malaria, and first-line anti-malarial medications in health facilities was reported to be 76% (95% CI 67–84) and 83% (95% CI 79–87) in 2023, respectively, according to a systematic review and meta-analysis on the subject (Hosein A,2023).

The overall mean availability of 50 key essential medicines in Public Health Facilities of South Indian Union Territory primary health centers (PHCs), central government PHCs, and tertiary care teaching hospitals was 72.2% (range 66% to 80%), 77% (range 76% to 78%), and 74%, respectively. The median availability of 50 key essential medicines in 10 surveyed public health facilities was 76% (Dinesh K,2021).

A pilot assessment which was made in 2012 in supply chains for pharmaceuticals and medical commodities for malaria, tuberculosis and HIV infection in Ethiopia showed that the availability of malaria commodities was 81% in hospitals and health centers. Similarly, the availability of rapid-diagnostic test kits was 67% and the availability of anti-malarial medicines was 78% in health posts. (Daniel, G. et al., 2012)

The availability of essential medicines was found to be significantly higher than that of non-essential medicines (27.3%) in a WHO study on essential medicines in African

regions. The median availability of essential medicines was found to be 61.5%. In the public and private sectors, the median availability of critical drugs was 40% and 78.1%, respectively, while the corresponding figures for non-essential medications were 6.6% and 57.1% (Zuma SM,2019).

According to a study done on Affordability of Essential Medicines and Associated Factors in Public Health Facilities of Jimma Zone, Southwest Ethiopia. The average cost of dispensed medicines in the surveyed health facilities was not affordable for most of the patients (Eyassu M,2021).

The public and private sectors had an average of 42.8% and 43.3% of essential medicines available, respectively for children in the Western part of Ethiopia. The lowest-cost medications were offered for sale in the public and private sectors at median prices that were 1.18 and 1.54 times their international reference prices (IRP), respectively. Priced in the public sector at 0.90 to 1.3 times their respective IRP, and in the private sector at 1.23 to 2.07 times, were the other half of these medications. The private sector's patient prices were 36% more than the public sector's. The lowest paid government unskilled worker had to pay a day's wages or more for medicines, making them unaffordable for treating common conditions that were common in the zone in both the public and private sectors (Edo Sado,2016)

Based on a study which was done in Jimma Zone in 2021, one of the most commonly stock out medicines out of the surveyed essential medicines was Artemether lumefantrine 20/120mg where the average availability was found to be 43.3% in health facilities of Jimma zone during the study period (Eyassu, 2021).

According to a study conducted in health facilities of Tigray region, northern Ethiopia, the availability and affordability of priority life-saving medicines (artemisinin combination therapy) for under-five children was almost thrice in the public sector compared to the private sector (Solomon A,2018).

A study which conducted in the Oromia region in 2014 indicates that the availability of Artemether + lumefantrine (AL) was 26.8%, and 6.7% at NGO and private sector medicine outlets, respectively. Quinine tablet availability was 20% in public, 3.3% in

private, and 57% in NGO sectors, while the availability of artesunate injections was 43% in public, 3.3% in private, and 0% in NGO sectors.

The study found that 11.8% of patients in Ethiopia forgive treatment because of cost, and 45.6%, 45.7%, and 8.7% of those who did not purchase drugs from public health institutions cited lack of availability, cost, or ineffectiveness as their reasons respectively (Abiye Z,2013)

A technical report of Anti-Malaria drug management program conducted in the Oromia Region of Ethiopia in 2014 indicates that CQ tablet availability was 80% in the private and public sector. The availability of AL, however, varied considerably, with 80%, 26.8%, and 6.7% availability at public, NGO, and private sector medicine outlets, respectively. Quinine tablet availability was 20% in public, 3.3% in private and 57% in Non-Governmental Organizations (NGO) sectors, while the availability of intravenous AS injection was 43% in Public, 3.3% in private, and 0% in NGO sectors (SIPS, 2014).

Research which was undertaken in public facilities of the City of Gondar, North-West Ethiopia indicates that the availability of Artemisinin Based Combination Therapy (ACT) was 91% (Mulugeta, F.et al, 2015)

The National Survey of the Integrated Pharmaceutical Logistics System carried out in 2015 in Ethiopia indicates that the availability of Artemisinin Based Combination ACT was 88% at all levels of the facilities (USAID, 2015).

Based on a study done in Motta General Hospital and Health center, only 80% of the 15 necessary medications were available at the General Hospital on the day of the survey, while 93.3% were available at the health Center. Just three (20%) of the necessary medications were stocked at the health Center during the previous six months, compared to 60% at General Hospital (Bereket B,2022).

According to USAID/DELIVERY project final country report for Ethiopia published in 2016 during malaria transition from MOH to EPSA, the availability of ACT was 84% (USAID, 2016)

Based on a systematic review and meta-analysis on the availability of malaria diagnostic tests, anti-malarial drugs, and the efficacy of treatment, the pooled proportion of the

availability of these resources in health facilities was 76% (95% CI 67–84) and 83% (95% CI 79–87), respectively.

2.7. Factors contribute to Medicines unavailability and unaffordability

According to Ukraine national supply chain assessment, which was conducted in 2016, poor availability of medicine is due to three co-existing factors; shortage of funds, inefficient use of allocated funds, and underperforming operations (SIAPS, 2016).

A two-day technical workshop, which was held in Addis Ababa, Ethiopia from 7- 8 December 2016 to address the challenges in improving access to Anti- Malarial and malaria case management in high malaria burden countries in Africa indicates that in Ethiopia data regarding specific malaria indicators are not accessible through the national Health Management Information System(HMIS) the primary source of data used by MOH, collection of accurate consumption data is challenging in many areas, lack of infrastructure, geographical variation also results imbalances in commodity distribution (MMV, 2016).

Acute shortages of antimalarial medications (artemether and lumefantrine) were observed in Kenya, Uganda, and Sub-Saharan Africa as a result of a protracted procurement process, which raised the death rate. There is a gap in the effective control of malaria due to shortages of sulphadoxine/pyrimethamine (Fansidar) and chloroquine in Pakistan's public and private sectors (Malik et al., 2013). Due to increased demand, shortages of hydro chloroquine and chloroquine were discovered during the COVID-19 pandemic in numerous countries (Mazer-Amirshahi et al., 2020).

According to a study done on the stock-outs of essential health products in Mozambique-longitudinal analyses from 2011 to 2013, the strongest relationship found between facility-level factors and medicine stock-outs was the distance from the district warehouse: for every 10 km increase in distance, the rate of stock-outs increased by 19% when considering stock-outs in general and 31% when considering stock-outs with district availability. In contrast, the mean distance for the 22 clinic visits without a stock-out was 4.1, while the mean distance for the 56 clinic visits with a stock-out for any reason was 25.5. The rate of stock-outs with district availability was inversely correlated

with the number of technical staff members: a 4% decrease in stock-out rates was linked to every additional staff member (Bradley H,2014).

Based on a study done on drug shortages in developed countries--reasons, therapeutic consequences, and handling, drug shortages are caused by logistical problems, such as poor supply chain management and transportation problems. Natural disasters, poor traffic, and awful weather are typically the root causes of transportation issues (Dill and Ahn, 2014; Mazer-Amirshahi et al., 2014).

Lack of medication at the health facilities was found to be one of the barriers to school-age children in rural Malawi receiving malaria treatment, according to research on the subject. According to reports, SAC was instructed to purchase their medications from pharmacies or private establishments when they visited the medical facilities for treatment. Families, however, weren't always able to afford the medications due to financial difficulties (Patani M, 2023).

According to a scoping review on the challenges to the availability and affordability of essential medicines in African countries, the lack of adequate human resources, financial constraints, high cost of available medications on the market, poor inventory management, manual consumption forecasting, inefficiencies in drug registration, and trade-related aspects of intellectual property rights agreement regulations are all factors that limit the availability of essential medicines in African countries (Aderaw Y,2023).

The shift in treatment policy resulted in a low availability of AL in the private sector, which in turn caused a drop in the proportion of patients taking a recommended malaria treatment (85% to 53%), according to a study on improvements in access to treatment for malaria in Tanzania following community, retail sector, and health facility interventions—a user perspective. (Sandra A,2010).

3. METHODS

3.1. Description of the Study Area

This study was conducted in Gamo Zone, which is found in the South Ethiopian Region of Ethiopia. Gamo is one of the 14 Zones in the region. The Zone has 12 districts (woredas) and 4 towns. It is named after the Gamo peoples, whose homeland lay in this Zone. It has two lakes (Lake Chamo and Abaya). The Zone is located 505 kilometers south of Addis Ababa and 275 kilometers south west of Hawassa. The general elevation of the Gamo Zone ranges from 680 to 4207 meters above sea level. The highest point is called Mount Gughe, which is 4207 meters above sea level and the highest mountain peak in the zone. The administrative center of Gamo Zone is Arba Minch. The Zone had one General Hospital, four primary hospitals, fifty-three health centers, two hundred ninety-nine health posts and forty-seven private medicine retail outlets (Drug Stores) in the zone, which provide diagnosis, treatment and prevention services to the public (MOH, 2018). The extrapolated population size of the Zone for 2018/19 was 5,562,063 (CSA, 2021).

3.2. Study design and Period

A descriptive cross sectional study design was used to assess the availability, affordability and price of anti-malaria medicines. A sequential explanatory mixed study approach was used for collecting, analyzing and interpreting of quantitative and qualitative data. First quantitative data was collected and analyzed and followed by qualitative data to assess the availability, affordability, and price of anti-malarial medicines, as well as to identify challenges in public health facilities regarding making anti-malarial medicines available in Gamo Zone, South Ethiopia Region. The study's data collection period lasted from April 10th to May 10th, 2019.

3.3. Study population/ Data sources

Public health facilities, private pharmacy and drug stores and EPSS Arbaminch Hub in Gamo Zone were the source of the population. The study population for this research included selected public health facilities, private drug stores, distribution coordinator of

EPSS Arbaminch Hub, heads of public health facilities' Pharmacy departments and Arbaminch EPSS Hub. Documents like bin cards, stock cards model 19, Goods Receiving Voucher and Health Commodities Management Information System were the source of data.

Data about drug availability and price on the day of the survey were collected from the medicine outlets at the public health facilities, private pharmacy and drug stores and EPSS Arbaminch Hub medicine outlets using the medicine price collection form developed by WHO/HAI in Gamo Zone.

3.4. Eligibility criteria

3.4.1. Inclusion criteria

All selected public health facilities and private drug stores that were found in Gamo Zone and who were volunteers to be participated in the study and Arbaminch EPSS Hub were included in this study. Public health facilities that have at least 6 months data on bin card during the year under review were included in this study. Anti-Malaria medicines that were used for treatment purpose were included in this study to evaluate the availability affordability and price of commodities. Anti-Malaria medicines that were used for prevention and treatment purpose and integrated in the Pharmaceutical Logistic System of Ethiopia was included in this study. For the evaluation of affordability and price of Anti-Malaria commodities, only those medicines that were procured from private suppliers in PHFs and private drug stores during the year under review were included in this study. Only the lowest paid unskilled civil servants, who were paid the lowest wage, was included in this study to assess affordability

3.4.2. Exclusion criteria

Anti-malaria medicines that were used for prevention purposes like Indoor Residual Spray (IRS) and ITNs were excluded from this study because they were managed by MOH vertically. Private Pharmacies were excluded from this study because there was no pharmacy in the Zone during the study period. To calculate the median price ratio (MPR) of anti-malaria medicines, those medicines that were not obtained with the same strength, unit and dosage form with the international reference price were excluded from this

study. To evaluate the affordability and price of anti-malaria medicines, prices that the patient paid for services (for cards) and consumable goods like syringes were excluded from this study.

3.5. Sampling Frame

The sample frame for this study was Arbaminch EPSS Hub and a list of public health facilities and private medication outlets collected from Gamo Zone health department.

3.6. Sample Size and Sampling Techniques

The study was carried out in the South Ethiopia Region, which is divided into 14 zones. Gamo zone was one of the region's zones, with 12 districts and four town administrations. There are 656 health facilities in the Zone, including 1 general hospital, 4 primary hospitals, 53 health centres, and 299 health posts, as well as 1 Public Pharmaceutical agent and 36 private drug stores.

Twenty-four PHFs were selected based on the simple proportionate random sampling techniques. The only Public General Hospital (PGH) was selected purposively. From the totally available 4 Public Primary Hospitals (PPHs), 2 of them were randomly selected and a two- stage cluster sampling technique was used to select 15 PHCs and 6 HPs during this study. First, the Zone was categorized into towns and districts based on district and towns administrations where they are located. Then, 1 town administration and 5 districts were selected based on random sampling proportionate technique from the totally available 4 town administration and 12 districts in the Gamo Zone. In the second stage of sampling, 15PHCs were selected based on proportionate random sampling technique. Only 6 HPs within the randomly selected districts were selected. For the selection of 10 private drug stores random sampling techniques were used from the selected 5 woredas and Arbaminch EPSS hub was deliberately chosen for this study because it is the only public pharmaceutical supplier in the Gamo Zone. To gather qualitative data, a comprehensive interview was conducted with a purposefully selected random sample of the EPSA Arbaminch hub distribution coordinator, as well as with the heads of pharmacy departments, store managers, and public health facility managers, until the data was saturated. (Annex 1).

3.7. Data collection Tool

World Health Organization operational package for assessing, monitoring and evaluating country pharmaceutical situation level II survey form (WHO, 2007) was used to evaluate the availability and affordability of anti-malaria medicines for this study. A guide that was developed by WHO and Health Action International (HAI) for measuring medicine prices, availability, affordability and price components (WHO/HAI, 2008) was also used to compare the market prices of anti-malaria commodities with the international reference unit price for the study.

3.8. Data collection Technique

The average availability of anti-malaria medicines during the year under review was obtained by reviewing bin cards from Health Commodities Management Information System (HCMIS) of EPSA Arbaminch Hub and PHFs pharmaceutical stores of Gamo Zone. The total number of days the medicines were available during the year under review were taken as the availability. Average availability of anti-malaria medicines on the day of visit in Gamo Zone was obtained from, PHFs and private drug stores by using an observational check list. The treatment schedule of anti-malaria medicines to evaluate its affordability was also reviewed from the National Malaria Guidelines of Ethiopia (NMGE, 2022). The reviewed anti-malaria medicines for this study based on the NMGE were AL 20+ 120 mg tablet (6x1,6x2,6x3 and 6x4) CQ tab, CQ syrup, QN tab, QN inj., AS inj., RAS and PQ tab.

Based on the 2022 National treatment Guideline of Ethiopia the medicines used for the treatment of Malaria in the PHFs during the study period are categorized as applicable if it was given in the facility and non-applicable if it was not given per the 2023 National Guideline of Ethiopia in PHFs.

Medicine	PGH	PPH	PHC	HP
AL	Applicable	Applicable	Applicable	Applicable
CQ	Applicable	Applicable	Applicable	Applicable
AS inj.	Applicable	Applicable	Applicable	Not Applicable
RAS	Not Applicable	Not Applicable	Not Applicable	Applicable
QN tab	Applicable	Applicable	Applicable	Not Applicable
QN inj.	Applicable	Applicable	Applicable	Not Applicable

PQ tab	Applicable	Applicable	Applicable	Applicable

The market prices of malaria medicines in PHFs, EPSS and private drug stores, which were procured during the year under review, were obtained by reviewing stock cards, Goods Receiving Voucher (GRV) and receipt of commodities, respectively. The lowest unit price of each commodity was obtained by dividing the total cost of strips, vials and co-blistered packs by the total number of tablets, capsules or vials these contains. The international reference unit price (IRP) of those medicines was obtained by reviewing the international drug price indicator guide developed by MSH in 2015.

To compare the market prices of anti-malaria medicines in PHFs, private drug stores and EPSS with the IRPs, medicines with same unit, dosage forms and strength were used. Only those medicines, which were sold in PHFs and private drug stores of Gamo Zone and procured by EPSA in the same year.

The IRP of each medicine was obtained from the International Drug Price Indicator Guide of 2014^{ed} developed by MSH in 2015. 1 USD had a foreign exchange rate of 28.49 ETB during that time. 23%[1] of the additional cost was added to the supplier's median unit price because it doesn't include any cost for contingency, insurance, import tax, and freight.

The limited means of wage during the year under review in Ethiopia, only civil servants with the lowest wages, which was 420 Ethiopian Birr per month, was used to calculate the equivalent number of a daily wage (LPN,2019). Affordability was calculated by dividing the total cost of treatment by the daily wage of civil servants with the lowest income. Affordability was checked by considering the number of wage days it took for the civil servants with lowest income to complete the full course of treatment. If the total cost of AMM to complete the full course of treatment took one or less than one day's wage of the civil servants with the lowest income, the medicine was affordable. If it was above one, it was unaffordable (WHO, 2011). In this study, the affordability of drugs was only considered for the patient who paid for one course of full malaria treatment. For this study, 3 doses of AS and QN injection were used to calculate its affordability.

The principal investigator and one note taker conducted an in-depth interview. Qualitative data was collected using a pre-tested semi-structured questionnaire in an empty room of the facility. An in-depth interview guide was used to collect the data. Informed consent was obtained from all respondents. The interview was prepared in English, and it was translated into Amharic. On average, interviews took about 25 minutes. The interview was audio recorder and note taking were used during the interview. The recorded data was transcribed in Amharic, and translated from Amharic to English by the principal investigator. Purposively selected pharmacy personnel (distribution coordinators of Arbaminch EPSs hub, public pharmacy department heads, store managers and manager of the facility) were included for the in-depth interview. The interview was conducted by the principal investigator. The sample size was based on the saturation of the collected data.

3.9. Data Quality Assurance

For data quality control, there was a two-day training for 3 data collectors and 1 supervisor on the study objectives, data collection methodologies and instruments, and data collection ethics. Readings, discussions, interviews, and field exercises were used to conduct the training. Throughout the study period, the supervisors and principal investigator regularly supervised data collectors. The tool was pre-tested at two PHCs and one PPH in Wolita Zone from April 8th to April 9th, 2019. The principal investigator provided two days of training to the data collectors. To ensure trustworthiness of the data collected using an in-depth interview, an immediate transcription of the manual transcript for those who was not willing to be taped and repeatedly listening for verification of the manual transcripts by audio record was done after data collection for those data that was recorded. Data was returned to participants to check for accuracy and resonance with their experiences.

3.10. Data Analysis and Interpretation

The quantitative data analysis was done by using excel sheet through descriptive analysis techniques, including measures of central tendency (e.g., mean and median). The analysis of qualitative data was done manually and relevant quotations was used to illustrate themes in the presentation of study findings. A thematic analysis approach was used for qualitative data analysis. The records were listened to and transcribed from the voice

recorder. The findings were grouped according to key themes and each of the different positions was summarized and the findings were presented by narration.

3.11. Data Presentation

The findings of this research are presented in the form of tables and figures

3.12. Ethical Consideration

Ethical clearance was obtained from the School of Pharmacy, Addis Ababa University (AAU) with the reference number PH/Ceutics#196/11/2019. To request their support during the data collection process, Addis Ababa University's School of Pharmacy Department of Pharmaceutics and Social Pharmacy wrote a support letter to Gamo zone health department. The Gamo Zonal Health Department also sent letters to the randomly selected districts. The necessary explanation about the purpose, expected possible benefits of the study were communicated to the Zonal and selected town, district, and PHFs administrators.

During the consent process, they were provided with information regarding the purpose of the study, why and how they were selected to be involved in the study, and participants were also assured about confidentiality and anonymity of the information obtained in the course of the study by not using personal identifiers and analyzing the data in aggregates. Concerning the key informant interviews, interviews were recorded by voice recorder after interviewees giving informed consent. The name of the interviewees and the hospital in which they work did not appear in data analysis, and interviewees were assured that the information they provide was only to be handled by the research team, and that was not discussed with the hospital administrators or other participants of the study.

4. RESULTS

In order to evaluate the availability, cost, and pricing of anti-malaria medications, a total of 24 PHFs—1 PGH, 2 PPHs, 15 PHCs, and 6 HPs—as well as ten private drug stores and the Arbaminch EPSS Hub were visited. Documents were also reviewed.

4.1. The Median Availability of Anti-Malaria Medicines in Gamo Zone

For the purposes of this study, PHF availability was classified as follows 1-50 very low; 51-65% low; 66-80% fairly high, and >80% high for PHFs for the year under review and the availability of anti-malaria medications was defined as being available when any amount was available in private drug stores on the day of the visit.

4.1.1. The Median availability of Anti-Malaria Medicines in Public Health Facilities

An analysis of the median availability of anti-malaria medicines during the year reviewed in PHFs of Gamo Zone is presented below (period availability). This is further refined with an overall availability, taking into account substitutions and alternatives in dosage and medicine.

The median availability of adult dosage forms of Artemether+ Lumefantrine and Chloroquine tablet (i.e., AL and CQ tab) was 84% and 82%, respectively in Public Health Facilities (PHFs). However, the median availability of Pediatric dosage forms of AL, which is flavored and dispersible, and CQ (i.e., AL and CQ syrup) was very low 25% and 64%, respectively in PHFs. As shown in the Fig 1 below, the median availability of Artesunate and Quinine injection (i.e., AS inj. and QN inj.) was 40% and 15%, respectively and Rectal Artesunate (i.e., RAS) was totally unavailable (0%) in Gamo Zone. The availability of Quinine tablet (i.e., QN tab) was 7% in PHFs. The result shows 52% availability for Primaquine tablet (i.e., PQ) during the year under review in Gamo Zone.

The median availability of AL and CQ for adult and pediatric dosage forms and AS inj. and PQ tab was very high (100%) in the General Hospital (i.e., PGH). QN tab and QN inj. were unavailable in the PGH of Gamo Zone (Fig 1).

The median availability of adult dosage forms of AL, CQ and PQ tab and CQ syrup was 100% in Public Primary Hospitals (i.e., PPHs). The availability of pediatrics dosage forms of AL was very low (0%-40%). Although the result shows 18% of AS and 43% of QN inj., the availability of AS inj. was less than the availability of QN inj. (i.e., it shows more availability of QN inj. than AS) (Fig 1).

The median availability of pediatric dosage forms of AL, AS inj., QN tab and QN inj. were very low in PHCs. The availability of adult dosage forms of AL and CQ tab were high in PHCs (Fig 1).

Pediatric dosage form of AL and Rectal Artesunate (RAS) were not available in PHPs. Even the median availability of adult dosage forms of AL and CQ tab and of CQ syrup was 54%,57% and 19%, respectively in PHPs in Gamo Zone (Fig 1).

The median availability of pediatric dosage forms of AL decreases as one goes from PGH to PHCs and becomes unavailable in PHPs and makes the total availability very low in PHFs. The availability of AS and QN inj. was 18% and 34%, respectively in PPHs. Rectal Artesunate, which is the pre-referral treatment for children under the age of 6 in PHPs, was unavailable during the year under review. Quinine tablet (QN tab) availability was 34% in PPHs and 6% in PHCs. (Fig 1).

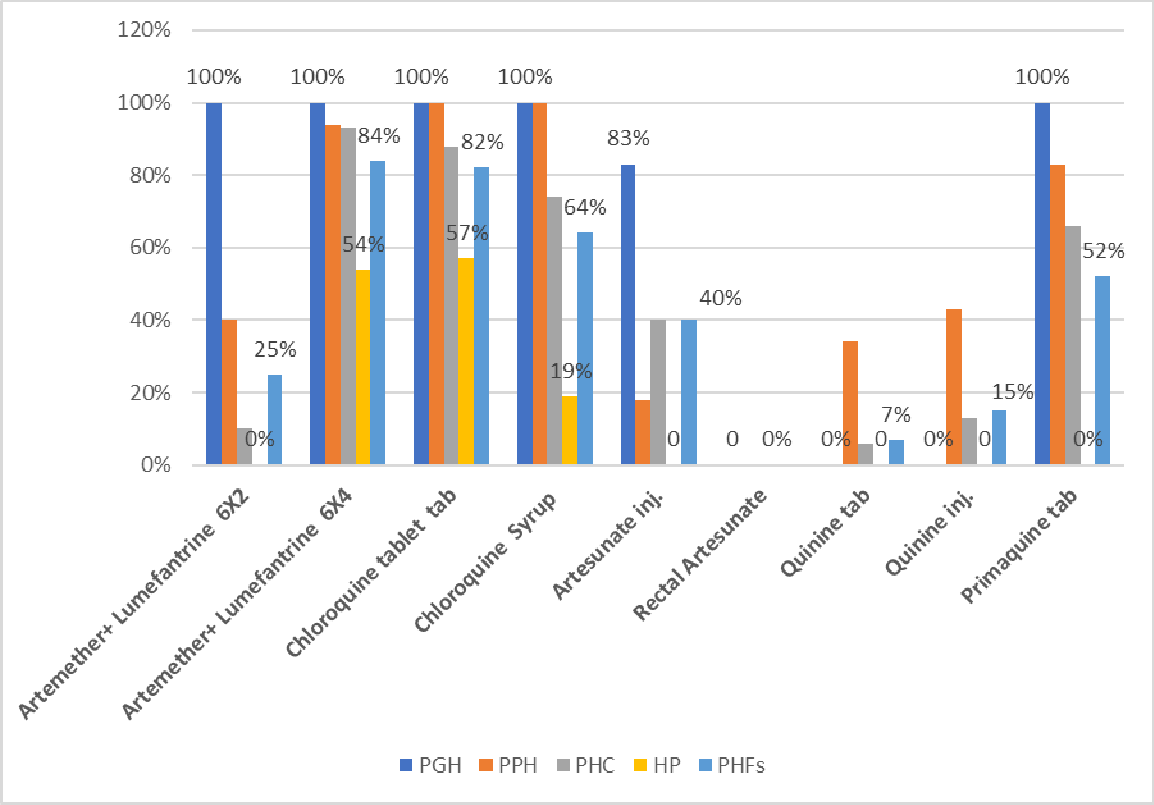

Figure 1: The median availability of anti-malaria medicines in public health facilities (2018-2019GC), Gamo Zone, Ethiopia, June 2020.

The overall median availability of CQ in PHFs was high (82%) which is the mean of CQ tab and syrup. The overall availability of AS was 30%, which is the mean of AS inj. and RAS. The overall availability of PQ was 52%. PQ overall availability was 52%. The overall availability of AS and QN was 30% and 11%, respectively in PHFs of Gamo Zone (Fig 2).

The overall availability of QN was taken from the mean of QN inj. and tablet which is 0% in PGH. The overall availability of AL, CQ, AS and PQ was high. QN overall availability was very low in PGH of Gamo Zone (Fig 2).

The overall average availability of AL in PPHs was (high) 96% and the overall availability of CQ was 100%, which was the median of CQ tab and CQ syrup. The overall availability of QN was 39%; this was the median of QN tab and QN inj. Primaquine (PQ) tablet overall availability was 83%. The overall availability of QN and AS was 39% and 31% respectively in PPHs in Gamo Zone (Fig 2).

The overall median availability of AL and CQ was 94% and 81%, respectively in PHCs. The overall availability of QN was the median of QN tab and QN inj. and PQ and AS overall availability was taken from PQ tab and AS inj. (Fig 2).

The Public General Hospital had 83% and above 83% of anti-Malaria medicines availability with the exception of QN, which shows 39%. Public primary hospitals (PPHs) and PHCs had 96% to 94% of AL, 100% to 81% CQ and 83% to 66% PQ respectively. Artesunate (AS) inj. had been less than 50% in all of the PHFs except PGH, where its availability was 83%. Public health posts (PHPs) similarly had 54% of AL and 57% of CQ and unavailability of RAS during the year 2018/19. The results of the PHFs were an average of the overall availability. (Fig 2)

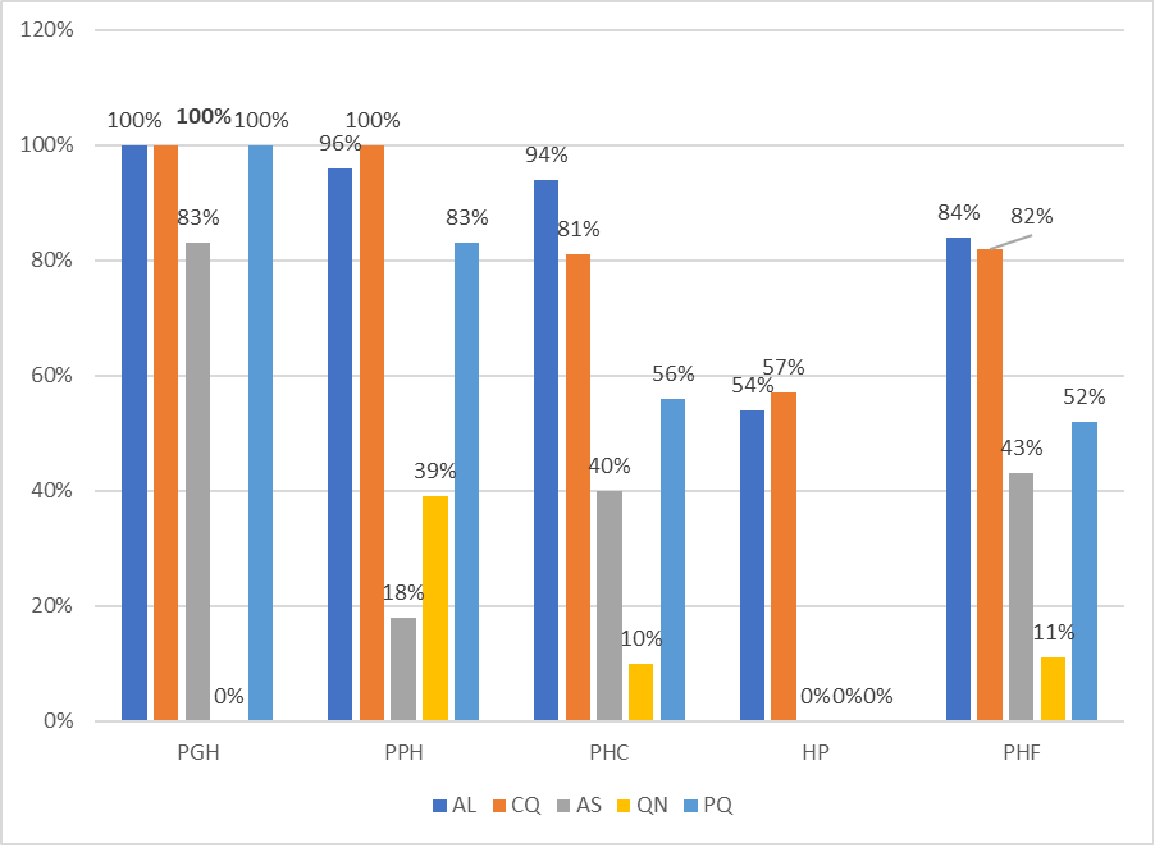

Figure 2: The Overall Availability of anti-malaria medicines in Public Health Facilities(2018-2019GC), Gamo Zone, Ethiopia, June 2020.

4.1.2. The Overall Availability of Anti-Malaria Medicines in EPSA Arbaminch Hub and PHFs

The overall availability of AL, AS and CQ were above 83% in PHFs and in EPSA Arbaminch hub.

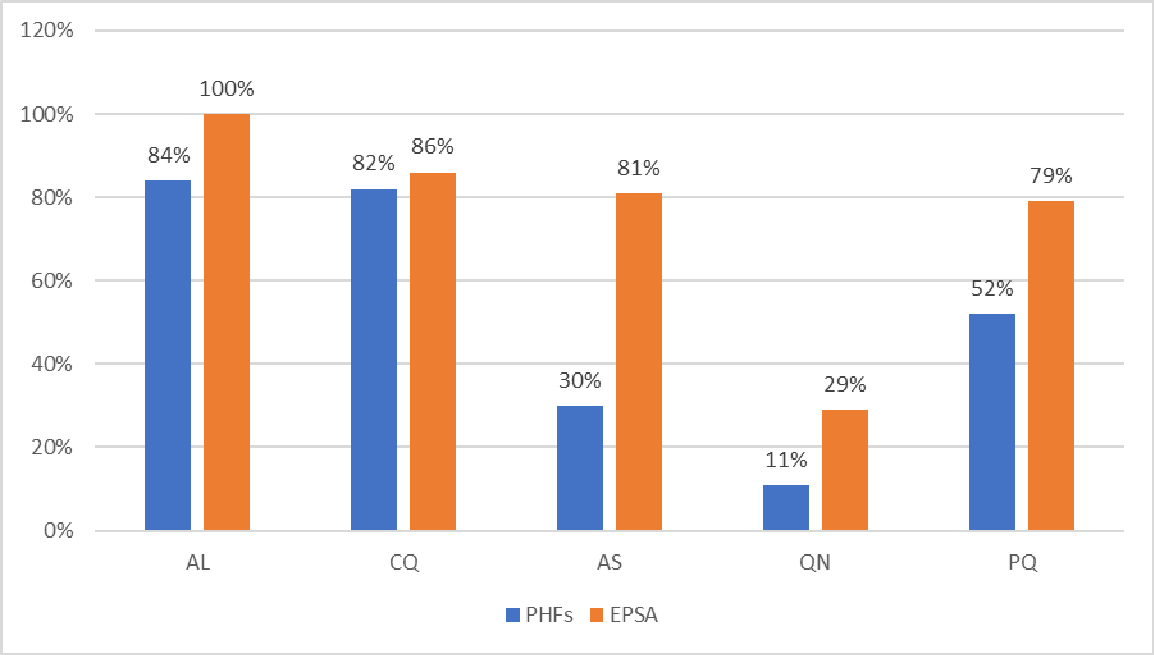

Figure 3: The overall availability of anti-malaria medicines in PHFs and EPSA Arbaminch Hub(2018-19GC), Gamo Zone, Ethiopia, June 2020.

4.1.3. The Average Availability of Anti-Malaria Medicine in Public Health Facilities and Private Drug Stores (PDSs)

The research looked at the average availability of anti-malaria medicines in PHFs in comparison with PDSs. This is further refined with an overall availability, taking into account substitutions and alternatives in dosage and medicine.

As data for annual recording of anti-malaria medicine for PDSs was not available, a comparison with PHFs during the year under review was not possible. In comparison of the day of visit, the overall availability of AL and CQ comes from adult dosage forms of AL and CQ tab (Fig 4).

The median availability of pediatric dosage forms of AL was very low in PHFs and unavailable in PDSs in Gamo Zone on the day of visit. The availability of CQ syrup was 100% in PDSs; however, its availability was 71% in PHFs. The availability of QN and PQ tab were 0% in PDSs (Fig.4)

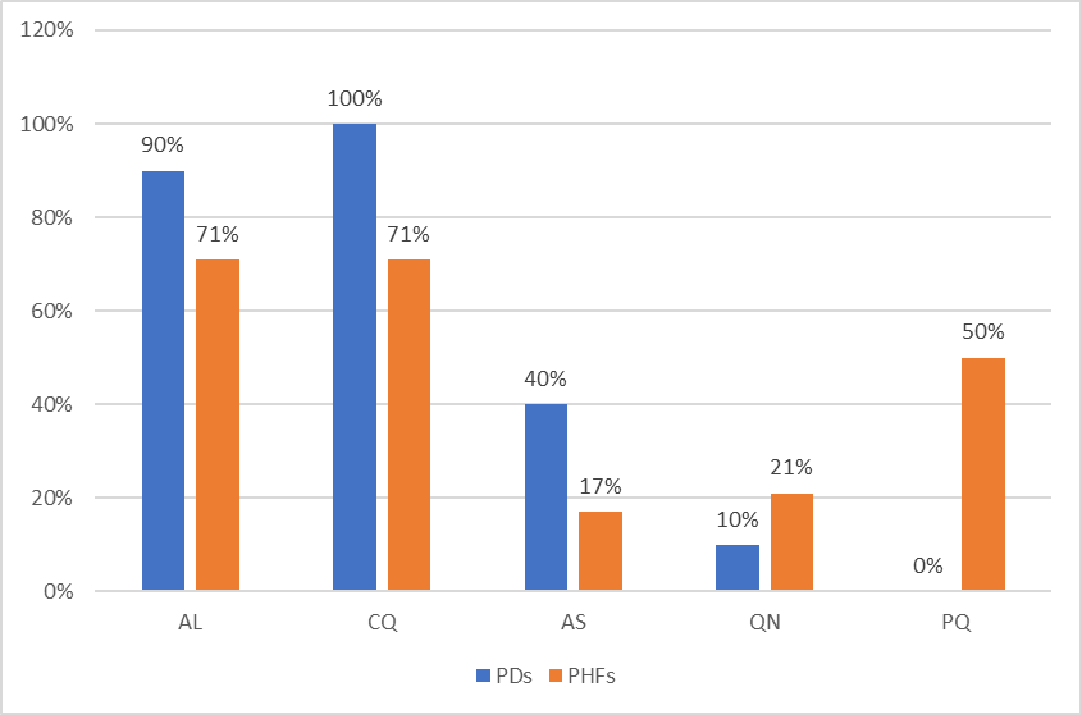

Figure 4: The overall availability of anti-malaria Medicine in PHFs and PDSs on the Day of Visit (2018-2019GC), Gamo Zone, Ethiopia, June 2020.

4.2. Market Prices of Anti -Malaria Medicines in EPSA and PHFs and PDSs of Gamo Zone

Anti-malaria medicines are administered to patients free of charge when they are treated in PHFs of Ethiopia. Due to the lack of Anti-Malaria medicines in some PHFs of Gamo Zone, PHF's will be forced to procure them and sell them to the sick (where these should be administered free of charge). Otherwise, PHFs will be forced to procure them from private drug stores. The market prices of Anti-Malaria medicines were compared with the International Reference Unit Prices (IRPs). The procedural guideline of the 2nd edition of World Health Organization's and Health Action International for Measuring Medicine

Prices, Availability, Affordability and Price Components was followed to compare the market price by calculating the Median Price Ratio (MPR) (WHO/HAI, 2008).

MPR = Median local unit price/International reference unit price

4.2.1. Market Price of each Anti- Malaria Medicines in Public Health Facilities

Out of 15 PHCs visited during the study which had procured anti malaria medicines from private suppliers, 2 had procured CQ tablets during the year under review. One PHC obtained CQ syrup and CQ tablet and 2 others bought QN inj. and QN tablet to sell them to patients during the same year. From 2 PPHs surveyed in the Gamo Zone, 1 procured QN inj. and QN tablet and sold them to the patients during the same year.

The MPR of QN tablet and QN inj. was 0.8 and 0.9 respectively, which was almost close to 1. This indicates that the market price of Anti-Malaria medicines in PHFs of Gamo Zone was almost the same as the IRP during the year under review. Chloroquine tablet, which was sold in PHFs of the study area during the same year, had a MPR of 0.3. This shows that the market price of CQ tablet was lower than the IRP. There was a variation in the MPR of medicines. CQ syrup had MPR of 0.3, which was smaller than those of others while QN inj. had a MPR of 0.9, which was higher than those of all others in PHFs of Gamo Zone. This means that the market price of CQ syrup was smaller than that of all other medicines and the market price of QN inj. was higher than that of all others when compared to IRPs (Table 1).

Table 1: Price of Anti- Malaria Medicines in Public Health Facilities (2018-2019 GC), Gamo Zone, Ethiopia, June 2020.

Medicines	Median lowest price (One vial, bottle tablet or capsule, vial)	International Reference Price (IRP)	Median Price Ratio (MPR)
Chloroquine phosphate 250mg tablet	0.31	1.02	0.3
Quinin sulphate 300mg tablet	2.27	2.93	0.8
Quinin dihydrochloride 600 mg/2ml inj.	13.5	14.2	0.9

The MPR of the overall Anti-Malaria medicine was calculated by dividing the median lowest price of those medicines by the IRP. The MPR for the overall Anti-Malaria medicines in the visited PHFs of Gamo Zone during the year under review was less than 1. This indicates that the market price of the overall Anti-Malaria medicine in PHFs of Gamo Zone during the year under review was smaller than that of the IRP (Tab 2).

Table 2: Price for the Overall Anti- Malaria Medicines in Public Health Facilities(2018-2019GC), Gamo Zone, Ethiopia, June 2020.

Medicines	Median lowest price	International	Median

	of the overall AMMs	Reference Price of AMMs (IRP)	Price Ratio of AMMs (MPR)
Anti-malaria medicines (AMMs)	2.27	2.93	0.77

4.2.2. Market Price of Anti-Malaria Medicines in Private Drug Stores of Gamo Zone

The MPR of QN inj. was 1.1. This indicates that the market price of QN inj. in the private drug stores of Gamo Zone was the same as the IRP. However,4 other anti-malaria medicines' market prices in the private drug stores were less than the IRP. The result also shows a variation in the MPR of medicines. CQ tablet had the lowest MPR among all the medicines. QN inj. had also the largest MPR among other medicines (Table 3).

Table 3: Market Price of each Anti- Malaria Medicines in Private Drug Stores(2018-2019GC), Gamo Zone, Ethiopia, June 2020.

Medicines	Median of lowest price (One vial, bottle tablet or capsule, vial) in birr	International reference price in birr	Median price ratio in birr
Artemether 20mg + Lumphantrine 120mg tablet	3	3.2	0.94

Chloroquine phosphate 250mg tablet	0.5	1.02	0.49
Artesunate 60mg/ inj.	71.5	80	0.89
Quinin sulfate 300mg tablet	2.29	2.93	0.78
Quinin dihydrochloride 600 mg/2ml inj.	15.60	14.2	1.1

The MPR of the overall anti-malaria medicines was calculated by dividing the median lowest price of those medicines by the IRP.

The MPR for the overall anti-malaria medicines in private drug stores of Gamo Zone during the year under review was 0.9. This indicates that the market unit price of the overall anti-malaria medicines in the visited private drug stores of Gamo Zone was almost the same as the IRP (Table4).

Table 4: Market Price of the Overall Anti-Malaria Medicines in Private Drug Stores (2018-2019GC), Gamo Zone, Ethiopia, June 2020.

Medicine	Median lowest price of the overall Anti-malaria medicines (AMMs)	Median International Price (MIP)	Median Price Ratio (MPR)

Anti-malaria medicines (AMMs)	3	3.2	0.94

4.2.3. Market Price of Anti-Malaria Medicines in EPSA

The procedures used to calculate the MPR in PHFs and private drug stores were followed to calculate the MPR of each anti-malaria medicine in this analysis. Almost all anti-malaria medicines which were procured by EPSS during the year 2018/19 had MPR under 0.5. However, AL 6X1 had MPR of 0.53. This indicates that the market prices of anti-malaria medicines in EPSS during the same year was half or less compared to the IRP. There was also a slight variation of MPR between medicines during the year under review.

Table 5: Procurement price for each Anti- Malaria medicines in Ethiopian Pharmaceutical Supply Agency(2018-2019GC), Gamo Zone, Ethiopia, June 2020.

Medicines	Median of lowest price (vial, bottle tablet/ capsule, vial)	International reference price	Median price ratio
Artemether 20mg + Lumphantrine 120mg 6 X 1 dispersible tablet	1.7	3.2	0.53
Artemether 20mg + Lumphantrine 120mg 6 X 2 dispersible tablet	1.25	3.2	0.39
Artemether 20mg + Lumphantrine 120mg	0.8	3.1	0.26

6 X 3 tablet			
Artemether 20mg + Lumphantrine 120mg 6 X 4 tablet	0.8	3.2	0.25
Artesunate 60mg/ inj.	38.76	80	0.48
Quinin sulfate 300mg tablet	1.36	2.93	0.46

The same procedures were followed with PHFs and private drug store to compare the overall market prices of anti-malaria medicines in EPSS with the IRP. The MPR of the overall anti-malaria medicines was 0.4. This indicates that the market price of EPSS was below that of the IRP (Table 6).

Table 6: Market Price of the Overall Anti-Malaria Medicines in EPSA (2018-2019GC), Addis Ababa, Ethiopia, June 2020.

Medicine	Median lowest price of overall Anti-malaria medicines (AMMs)	Median International Reference Price (MIRP)	Median Price Ratio (MPR)
Anti-malaria medicines (AMMs)	1.3	3.2	0.4

4.3. Affordability of Anti- Malaria Medicines in PHFs and PDSs of Gamo Zone

The median of the lowest unit price of each medicine from the total collected PHFs and private drug stores was used to calculate the affordability of the medicines.

4.3.1. Affordability of each Anti-Malaria Medicines in Public Health Facilities of Gamo Zone

PQ tablets, AS inj. and AL were excluded from this analysis because they were administered to the patient free of charge in PHFs during the same year.

For the complete course of treatment for uncomplicated cases of malaria caused by P. Vivax by using CQ tablets, the lowest paid civil servant will bear the cost of around one fourth of their day's wage. This result indicates that for the above-mentioned disease conditions the total cost of medicine to the lowest paid civil servant was less than their 1 day's wage. This shows that those medicines were affordable to the patient. For the full course of treatment of uncomplicated cases of malaria for a woman, who was infected with P. falciparum in the first trimester of pregnancy, by QN tablet, the lowest paid civil servant will pay their 3 days-and-a-half-day's wage. The lowest paid civil servant paid around their 3 days' wage and above their 3 days' wage to get the full course of treatment by QN inj. and QN tablet respectively as shown in table7.

Table 7: Affordability of each Anti-Malaria Medicines in Public Health Facilities of Gamo Zone(2018-2019GC), Gamo Zone, Ethiopia, June 2020.

Medicines	Treatment schedule based on the National Treatment Guideline of	Number of units (one vial, tablet, or capsule) needed to complete treatment	Median unit price (one vial, tablet, or capsule)	Total cost of treatment	Equivalent number of day's wage

	Ethiopia				
Chloroquine phosphate 250mg tablet	4-tab X 1 X 2 days + 2-tab X 1 X 1day	10	0.31	3.1	0.22
Chloroquine phosphate 50mg/5ml in 60 ml	20ml X 1 X 2 days + 15ml X 1 X 1 day	1	8.4	8.4	0.6
Quinin sulphate 300mg tablet	2-tab X 3 X 7 days	21	2.27	47.67	3.4
Quinin dihydrochloride 600 mg/2ml inj.	3 doses	3	13.5	40.5	2.89

4.3.2. Affordability of each Anti-Malaria Medicines in Private Drug Stores of Gamo Zone

Civil servants of the lowest income paid around their 3 day's wage to obtain AL from private drug stores in Gamo Zone. They also paid less than their half days wage and 1 day's wage to procure the full course of treatment of CQ tablet and CQ syrup respectively. The patient paid around their 1 month's wage to procure the full course of intravenous administrations of AS inj. To complete the full course of treatment for malaria caused by P. falciparum during the first trimester of pregnancy the lowest paid government workers needed to pay their 3.4 days wage. 3.3 days wage was paid by patients who purchased QN inj. to treat severe cases of malaria. This result indicates that the lowest paid government workers needed to pay less than their 1 day's wage to buy QN tablet and QN inj. To complete the full course of malaria treatment by CQ tablet and CQ syrup, the total cost of these medicines was affordable to the civil servants of the

lowest income. However, all other medicines included in this analysis took more than 1 day's wage of civil servants of the lowest income to purchase for the full course of treatment of malaria (Table 8).

Table 8:Affordability of each Anti-Malaria Medicine in Private Drug Stores of Gamo Zone(2018-2019GC), Gamo Zone, Ethiopia, June 2020.

Medicines	Treatment schedule based on the national treatment guidelines	Number of units needed to complete treatment	Median unit price (one vial, tablet, or capsule)	Total cost of treatment	Equivalent number of days wages
Artemether 20mg + Lumphantrine 120mg tablet	4-tab X 2 X 3 days	24	3	72	5.14
Chloroquine phosphate 150mg tablet	4-tab X 1 X 2 days + 2-tab X 1 X 1day	10	0.5	5	0.35
Chloroquine phosphate 50mg/5ml in 60 ml		1	15	15	1.07
Artesunate 60mg/ inj.	3 doses are required	6	71.50	429	30.6

Quininsulphate300mg tablet	2-tab X 3 X 7 days	21	2.29	48.09	3.4
Quinin dihydrochloride 600 mg/2ml inj.		3	15.6	46.8	3.3

4.4. Findings from Key informant Interview

4.4.1. Socio-demographic characteristics of key informants

Twenty-four health professionals working in public health facilities participated in this study as a key informant interviewee. It is evident from the table below that the majority of respondents were females 18(75%), while 6(25%) of the respondents were males. The majority of the respondent were between the age of 25-29(45.8%). In terms of field of study, 3 (12.5%) of respondents were BSc nurse, 4 (16.7%) of respondents had degree in Pharmacy, 16 (66.7%) of respondents had diploma in Pharmacy and 1(4.2%) respondent was level 4 health extension worker. Most of the respondents, 16 (66.7%) were having 6-10 years of work experience and 16(66.7%) were having experience from 6-10 years in the field.

Table 9. Demographic features of KIs in public facilities, Gamo Zone, 2019. (n=24)

Socio-demographic profile

Items	**Description**	**Frequency**	**Percentage**
Gender	Male	6	25
	Female	18	75
Age	25-29	11	45.8
	30-34	4	16.7
	35-39	5	20.8
	40+	4	16.7
Profession	Nurse BSC	3	12.5
	Pharmacy Degree	4	16.7

	Pharmacy Diploma	16	66.7
	Health Extension	1	4.2
Total Work Experience	less than 5 years	4	16.7
	6-10 years	16	66.7
	11-15 years	2	8.3
	15+	2	8.3
Work Experience	less than 5 years	6	25
	6-10 years	16	66.7
	11-15 years	1	4.2
	15+	1	4.2

The coordinator of inventory management for the Arbabinch EPSS hub, managers, head departments of pharmacies, and managers of healthcare facilities identified obstacles with regard to the supply of anti-malaria medications. Additionally, they sent along significant suggestions to address the obstacles related to the accessibility of those medications.

Availability of anti-malaria medicines in relation to EPSS

The sole public pharmaceutical supplier in Ethiopia is Ethiopian Pharmaceutical Supply Service. There are 19 EPSS hubs across the nation that provide the community with continuous and sustainable delivery of medications, supplies, equipment, chemicals, and reagents.

Unavailability of anti-malaria medicines in EPSS: During an in-depth interview for this study, difficulties with anti-malaria medications not being available in public health facilities were identified as a significant gap. The majority of Key informants (KIs) agreed that there was a problem with the anti-malaria medications that EPSA supplied being hard to come by. A few KIs agreed that their facilities had improved from prior years in terms of the accessibility of those medications. The majority of KIs did, however, note that the lack of anti-malaria medications in the EPSS hub posed additional costs for their clients in addition to posing a significant challenge to their facilities.

"This year, we did not receive artesunate injection from EPSS Hub. Consequently, we had to purchase QN injection from local suppliers rather than AS injection.

Discrepancies between malaria cases report: Discrepancies between cases reported from higher level and from PHFs were one of the challenges mentioned by EPSS Arbaminch Hub for the availability gap of malaria medicines between the hub and PHFs.

"Quantities of Anti-Malaria medicines requested by health facilities were sometimes equal to the number of cases in certain regions," the hub's managers stated.

Availability in relation to price and cost: The cost and accessibility of anti-malaria medications were not major concerns for the public health facilities that were visited during the study. The majority of KIs concurred that EPSS provided anti-malaria medications at no cost to their facilities.

"Anti-malaria medications were provided to our facilities at no cost since they were delivered from the EPSA hub to our facilities free of charge."

Despite the fact that all anti-malaria medications were provided to public facilities at no cost by the EPSS Hub, a few KIs brought up concerns about the cost and accessibility of those medications during a stock out and shortage of anti-malaria medications from the EPSA Hub.

"Due to a stock out and shortage of anti-malarial medications at EPSS Hub, we were compelled to purchase them from private vendors."

In relation to reporting and requisition form

Every two months, public health facilities submit their aggregated data to the appropriate hub. Based on the requisition and reporting form, EPSS Hubs then distribute medications to PHFs.

Lack of updated RRF: While the majority of KIs reported that their facilities had updated RRFs during the study period, a few reported that the inability of upper-level officials to promptly update and share the updated RRF led to the medicine's unavailability in their facilities during the review period.

“Since the primaquine tablet was not yet included in the RRF, we had to write the medication on the blank space with our hands. Occasionally, we forgot to write the medication on the reporting form, which prevented the medication from being delivered to us.”

Quality of RRF: In terms of timeliness, completeness, and accuracy in their facilities, the majority of KIs concurred that there was a problem with the quality of RRF. Seasonality was not used to determine the consumption of anti-malaria commodities for the upcoming period, nor were requests for anti-malaria medications made. A few of them concurred that the anti-malaria medication requests based on seasonality indicated improvements in their facilities compared to prior years. A store manager expressed,

"I just request anti-malaria medicines by seeing the past months consumption and did not consider the coming season during anti-malaria medicine request."

One of the issues raised by some respondents about the RRF's data quality was staff attrition and rotation at the trained level.

Training for Health professionals

Lack of training for IPLS: The primary obstacle to the appropriate requisition of anti-malaria medications is the absence of trainings specifically on the Integrated Pharmaceutical Logistic System (IPLS) for health professionals, despite the majority of KIs mentioning that the number of trainings they receive has increased recently. A few of the KIs stated that one of the biggest problems facing pharmacy staff was not knowing how to enter the balance in the reporting and request form.

"I did not take any training on how to register on the reporting and requisition form," a store manager claimed. I therefore just counted the stock on hand and registered it on RRF on the day that I reported to the EPSA hub. I was unable to even figure out how much stock was used in the previous few months.”

Lack of training on new updates on the National Malaria Guideline: The majority of KIs also stated that one reason those medications weren't available in their facilities was because staff members weren't trained on the latest developments in malaria therapy. A member of the pharmacy department stated:

"I did not receive any updates regarding the management of severe and complicated cases of malaria." All I know is that in public facilities, quinine was the first medication used to treat severe malaria. I was unaware that QN had been substituted with AS inj.

Data visibility at facility level

Lack of facility-level data visibility: Lack of data visibility in PHFs was another issue brought up by the EPSA Arbaminch hub in relation to the scarcity and unavailability of anti-malaria medications in PHFs.

"I could not see what medicines were available not available in the PHFs whenever I want to check the stock of PHFs," stated an employee of EPSS Hub.

5. DISCUSSION

5.1. Availability of AMM in PHFs, PDSs and EPSA Arbaminch Hub

The aim of the research was to assess the price, availability, and affordability of anti-malaria medications in the Gamo zone. Anti-malaria medicines availability has a significant impact on patient satisfaction and healthcare quality. When anti-malaria medication is in short supply, patients are forced to use more expensive substitutes.

The overall availability of anti-malaria medicines was 77% in PGH, 67% in PPHs, 58% in PHCs and 22% in HPs. This study was lower than the pilot study conducted in Ethiopia regarding HIV and malaria Commodities availability in 2012. The pilot study found AMM availability 81% in PPHs and PHCs and 78% in PHPs (Daniel, G. et al., 2012). The overall availability of AL and CQ on the day of visit in this study (71%) was also lower than the one conducted in the Oromia region in 2014, where the overall availability of AL and CQ was 80% on the day of visit (SIAPS, 2014). The availability of AL in PHFs in this study (84%) was lower than the one recorded in the National Survey of Ethiopia in 2015, where the availability of AL was 88% at all levels of health facilities (USAID, 2015). The low availability of Anti-malaria medicines in this study compared to other studies mentioned above might be due to the restriction of this study to Gamo Zone. However, the coverage of other studies was at regional and National level and there were also time variations between studies.

The availability of pediatric dosage form of AL on the day of visit in this study was 17% which is lower than a study conducted in the Oromia region (66.7%) of East Wollega Zone in 2015.

The availability of AS inj. was 83%, 18% and 35% in PGHs, PPHs and PHFs respectively in this study, which was low compared to a study conducted in Malawi. The availability of QN inj., which was the first- line of medicine for severe and complicated cases of malaria in that country during the study was 100% at public district and central hospitals and 60% at PHFs. However, the availability of AS inj. was 40% in PHCs in both studies. This study and the one conducted in Malawi shows that AS inj. availability

decreases as one goes from a higher level of facilities to a lower one (Khuluza, F. et al., 2017).

The availability of AS inj. in PHFs of this study was 40% which was very low compared to a study conducted in Embo County of Kenya, where the availability was 90% (Ndwigah, A.et al. 2014).

The availability of oral QN (7%) in PHFs of this study was even lower than the ones conducted in the Oromia Region, where it was 20% in PHFs during the study (SIAPS, 2014). Quinine tablet was almost unavailable in PPHs (6%) and completely unavailable in PGH (0%) in this study and the ones conducted in Malawi, where it was unavailable in district hospitals (Khuluza, F. et al., 2017).

The overall availability of PQ tablet in this study was 7% which was lower than the one conducted in Myanmar (formerly known as Burma) in 2018. Public health staff from Myanmar reported stock availability of the medicine as adequate during the study period (Han, KT. et al., 2018). The availability of PQ in PHFs in this study was 7% which was also lower than the ones conducted in the Oromia region in 2014. The availability of PQ, which was only used in the Oromia region for a radical cure for uncomplicated cases of malaria caused by P. Vivax during the study, was 20% (SIAPS, 2014).

5.2. Market Price and Affordability of AMMs in EPSA, PHFs and PDSs

The MPR of medicines in PHFs of Gamo Zone is the same with EPSA. It was less than 1. The MPR of CQ tablet in PHFs of the study area is 0.3. The market price of this medicine was very low from the IRP. The MPR of this medicine was also very low from other medicines. In addition to that due to local manufacturing of this medicine or low price of the ingredients of them might decrease the price of this medicine. However, QN tablet and inj. had a MPR near to 1 and this might be due to the procurement of the medicine from international suppliers.

In the private drug stores of Gamo Zone most AMMs had the MPR near to 1 during the year under review. However, the MPR of CQ tablet was 0.49. The reason for low MPR might be due to the local manufacturing of QN tablet in the private sector of Ethiopia.

The study conducted in Malawi about the availability and affordability of Anti-Malaria and antibiotics found the MPR of these medicines 2.3(Khuluza, F. et al., 2017). However, in this study the overall MPR of most Anti-Malaria medicines in both private and PHFs was less than 1. The reason for low MPR of those medicines in private drug stores might be due to proneness to theft of those medicines in the public facilities.

In this study the lowest paid civil servant paid their 3 and a half day's wage to complete the full treatment of malaria disease caused by P. vivax in the first trimester of pregnancy by QN tab in both private and PHFs. However, in Malawi the lowest paid civil servant paid around their 4 days wage to complete the above-mentioned disease conditions. In this study the lowest paid civil servant paid above their 3 day's wage for the treatment of severe cases of malaria by QN inj. However, this result was higher than the study of Malawi, where the patient paid their 2 and a half day's wage to complete the full course of treatment. The treatment of uncomplicated cases of malaria caused by P.faliciparum by AL costs the patient their 2.9 day's wage in this study and 2.5 of their wages in the study of Malawi. This indicates that the above-mentioned Anti-Malaria medicines were unaffordable in both countries during the study period.

In this study the MPR of each AMM in EPSA during the year under review was less than 0.6. This result was less than the study conducted in the Oromia Region of Ethiopia about the availability affordability of AMMs. In those studies, the price of Anti-Malaria medicines in the public sector had a MPR for QN inj. 1.36, AL 4.08, and CQ 1.01 and QN tablet 0.95. This indicates that the procurement price of those medicines was lower in this study than the study conducted in Oromia region in 2014. The MPR of the lowest generic AMM in the public facilities of Oromia region was 1.84. However, the MPR of this medicine was 0.77 in this study. Therefore, AMM in this study had low market price in PHFs of Gamo Zone when it was compared with the study conducted in Oromia region. The MPR of AMMs in private sectors of Oromia region was 1.96, which was higher than the MPR of this study. The overall MPR of AMM in private drug stores of this study was 0.93. This indicates that the market price of AMM in private drug stores of Gamo Zone was lower than the market price of these medicines in private sector of Oromia region during the study. This might be due a higher coverage of private sectors at

regional label in the study of Oromia region than this study which was only restricted in Gamo Zone.

STRENGTH AND LIMITATIONS OF THE STUDY

The strength of this study is that it tried to see the availability, affordability and price of anti –malaria medicines by using both qualitative and quantitative methods.

The limitation of this study includes: unavailability of updated Bin cards in the stores of EPSA Arbamich hub and consequently data were collected from HCMIS of the hub, lack of data for the year under review from the private drug stores, lack of updated data in the dispensaries of PHFs forced this study to use data from the medical stores, lack of updated data in HPs limited the number of HPSs in this study to 6. Another problem was that there was lack of adequate time and money to carry out the study in other fields of medicines and that consequently restricted the study to be limited to anti-malaria medicines.

6. CONCLUSION AND RECOMENDATION

6.1. Conclusion

This study assesses availability of Anti- malaria medicines in public health facilities of Gamo Zone. While the studies provide valuable insights into the availability, affordability, and price of anti-malaria medicines, there is a need for further research to explore these factors in a more comprehensive and diverse range of settings, including public health facilities and different geographic regions. This study found low availability of Anti- malaria medicines and unavailability of RAS in public health facilities This study also demonstrates that, there was a gap in regularly distribution of AS injection from EPSA to PHFs during the study period. Low supply of anti-malaria medicines from the public supplier, poor RRF data quality, lack of training on new updates were identifying as a contributing factor for low availability of medicines in facilities. Additionally, future studies should consider the influence of various socio-economic factors on the affordability of anti-malarial medicines to provide a more nuanced understanding of the challenges and opportunities in ensuring access to effective malaria treatment.

6.2. Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Regular Distribution of Artesunate inj. by EPSA Hubs to PHFs: Efforts should be made to ensure the regular and timely distribution of Artesunate inj. from EPSA hubs to PHFs. This will help to address the observed gap in availability of this essential anti-malaria medicine and ensure that it reaches the health facilities in a timely manner.
2. Strengthening Look, A head Seasonality Index in Hubs: The Look A Head Seasonality Index, which helps to predict the demand for medicines based on seasonal variations, should be strengthened in EPSA hubs.

3. Enhancing Data Visibility through a Dashboard System: A system, such as a dashboard, should be implemented to increase the visibility of data related to medicine availability, distribution, and stock levels at PHFs. This will enable better monitoring and decision-making at the lower level, and help identify and address any gaps or issues in a timely manner.
4. Faster Inclusion of Medicines in RRF and Health Commodities Management Information System: Efforts should be made to expedite the inclusion of medicines in the Requisition and Reporting Form (RRF) and Health Commodities Management Information System, particularly for commodities that were not previously included. This will help to streamline the supply chain process and ensure that essential medicines are available when needed.
5. Training on New Medicines and Updates in National Guidelines: MOH should provide training to health workers on new medicines and updates in the national guidelines. This will help ensure that health workers are knowledgeable about the latest medicines and their proper use, and can provide accurate information to patients.
6. Ensuring Continuous and Sustainable Availability of Anti-malaria Medicines and: The government should prioritize and ensure continuous and sustainable availability of anti-malaria medicines in all health facilities. This can be achieved through effective supply chain management, regular monitoring and supervision, and adequate funding to support procurement and distribution efforts.
7. Further research should be carried out to cover the whole country to assess the magnitude of the problem because this study just focused on public health facilities located in Gamo Zone. More meaningful results would have been produced if the scope of the study was extended to more than one zone to get a better understanding of the potential challenges of availability, price and affordability of medicines at public health facilities across the country.

Overall, implementing these recommendations will help improve the availability, accessibility, and affordability of anti-malaria medicines in public health facilities and

private drug stores, and contribute towards reducing the burden of malaria in the study area

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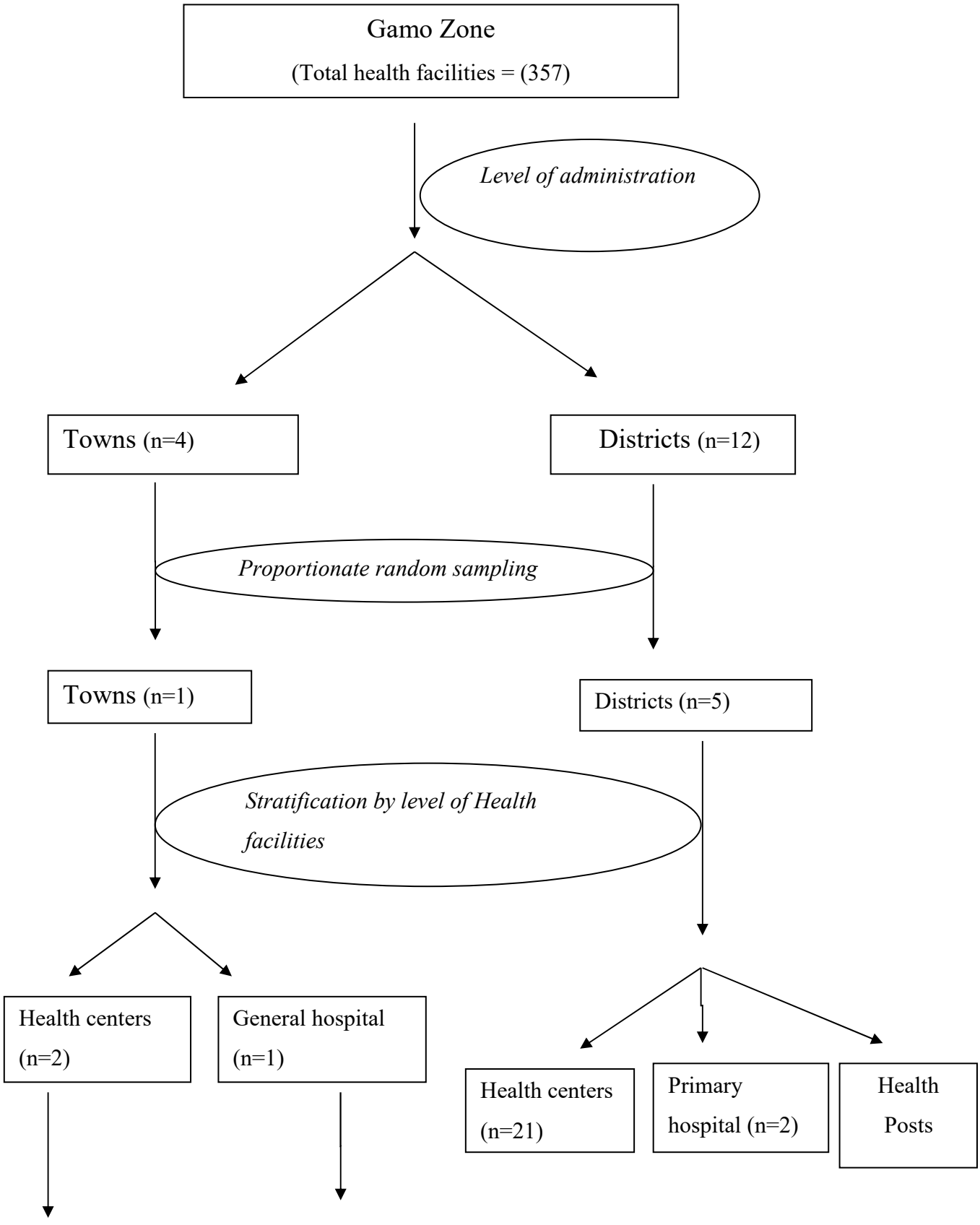
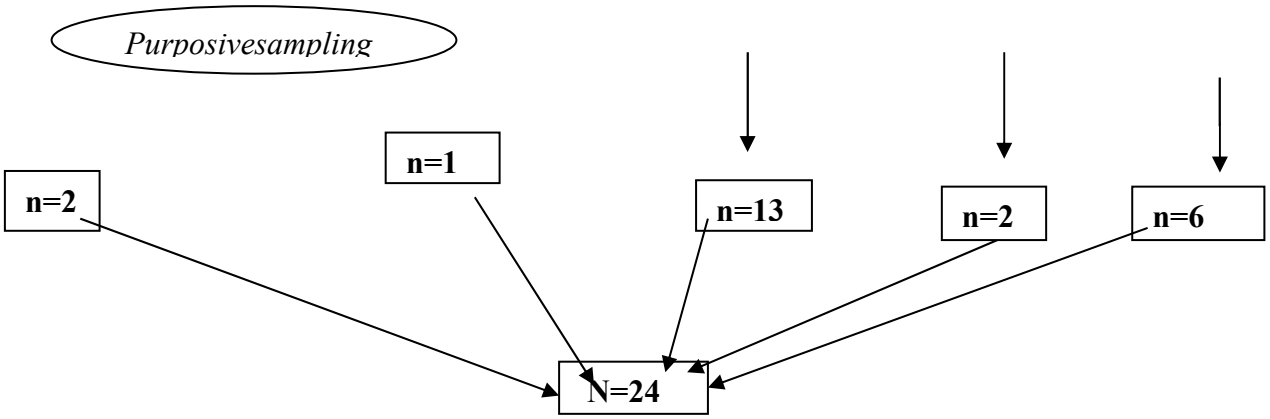
ANNEXES

Annex 1: Diagrammatic presentation of sampling procedure, June 2020.




Purposivesampling
n=2
n=1
n=13
n=2
n=6
N=24

Annex 2: List of key Anti-malaria commodities

1. Artemether + Lumefanthrine (20+ 120) mg; 6x1 tablet
2. Artemether + Lumefanthrine (20+ 120) mg; 6x2 tablet
3. Artemether + Lumefanthrine (20+ 120) mg; 6x3 tablet
4. Artemether + Lumefanthrine (20+ 120) mg; 6x4 tablet
5. Chloroquine Phosphate150mg base tablet
6. Chloroquine Phosphate 50mgbase syrup
7. Artesunate 60mg Injection
8. Rectal artesunate 50/100 mg suppository
9. Quinine Sulphate 300mg tablet
10. Quinine Dihydrochloride 300mg/ml injection
11. Primaquine Phosphate 7.5mg base tablet

Annex 3: Data Collection Tool for Record Review

Informed Consent
Introduce yourself and ask facility representatives to introduce themselves. Good day. My name is _____. I am conducting a survey regarding the availability of anti-malaria commodities at the public health facility level. I am looking at the availability of anti-malaria commodities and factors associated with it. I am visiting selected public health facilities in Gamo Zone; this facility was randomly selected to be in the survey. The objectives of the survey are to collect current information about the availability of anti-malaria commodities and to identify factors associated with it. This is not a supervisory visit and the performance of individual staff members is not being evaluated. The results of this survey will provide information to make decisions and to promote improvements in the availability of anti- malaria commodities. I would like to review the past twelve months' data records from bin card, model 19 and daily registration book to check the availability of anti-malaria commodities at this facility. In addition, I would like to check selected malaria commodities you have in stock today. Do you have any questions? May I begin the record review? Health facility agreed ……..... continue the record review Health facility not agree ……...…. end the record review
INFORMATION ABOUT THE HEALTH FACILITY

Date: Health facility Name: _____	DAY MONTH YEAR

_____	

General information: Public health facility pharmacy/dispensary

Facility……. **Date**……

Region……**Investigator**……

1) Does the law require a pharmacist to be present during hours of operation of public/government pharmacies/drug outlets?

Yes No

2) Is a pharmacist present at the time of the visit?

Yes No

Assessment

1 complies with the law (items 1 and 2 are both Yes)

2 does not comply with the law (item 1 Yes and item 2 No)

3 no requirement for pharmacist presence (item 1 No)

3) Who is dispensing during the time of visit? (Check all that apply)

Pharmacist (1=Yes; 0=No) Pharmacy aide/ health assistant (1=Yes; 0=No)

Nurse (1=Yes; 0=No) Untrained staff (1=Yes; 0=No)

Survey form1: Public Health Facility Pharmacy/dispensary

Indicator: % of Anti-Malaria commodities available

Medicines expired

Public Health Facility pharmacy

Facility No…… (1-25)

Facility……. **Date**…….

Region……... **Investigator**……

	Anti-malaria commodities [A]	**Unit**	**In stock Yes= 1, No=0 [B]**	**Expired medicine on shelves Yes= 1, No=0 [C]**
1	Artemether + Lumefanthrine (20+ 120) mg; 6x1	Blister		
2	Artemether + Lumefanthrine (20+ 120) mg; 6x2	Blister		
3	Artemether + Lumefanthrine (20+ 120) mg; 6x3	Blister		
4	Artemether + Lumefanthrine (20+ 120) mg; 6x4	Blister		

5	Chloroquine phosphate 150mg base tablet	10x 10		
6	Chloroquine phosphate 50mgbase syrup	Bottle		
7	Artesunate 60mg inj.	Amp		
8	Quinine sulphate 300mg tab	10x10		
9	Quinine sulphate 300mg/ml inj.	Amp		
10	Primaquine phosphate 7.5mg base tablet	10x10		
11	Malaria RDT	25		
12	Microscope service for malaria			
			B1= Sum of B=	C1= sum of C
			B2= % in stock= B1/13X100	C2= % Expired =C1/13X100

Notes:

[A] The lists of 15 key medicines identified at the national level and pre-printed on this survey forms.

[B] Mark "1" if any quantity of any dosage form of the medicines is in stock in the facility on the day of the visit. Mark "0" if the medicine is not available in stock. Add the total at the bottom

[B1]. Calculate the percentage in stock [B2] by dividing the total in stock [B1] by 15 and multiplying by 100.

[C] For all medicines in stock, check if any of the stock is expired. If any amount of a medicine has an expiry problem, mark “1” for yes. Do not count expired medicines stored in a separate area for destruction. Add the total at the bottom [C1]. Calculate the percentage expired [C2] by dividing the total expired [C1] by the total number of medicines in stock [B1] and multiplying by 100

Survey form 2: Public Health Facility Pharmacy/ dispensary

Indicator: Average stock out duration

Adequate record keeping

Public health facility

Facility No……. (1-25)

Facility……. Date…….

Region…… Investigator….

Key anti-malaria commodities [A]	Records cover at least 6 months within the past 12 months Yes=1, No= [B]	Only collect data for medicines with records covering at least 6 months within the past 12 months		
		Number of days out of stock [C]	Number of days covered by the review (at least 6 months) [D]	Equivalent number of days per year [E] = C x 365 ÷ D [E]
1.Artemether + Lumefanthrine (20+ 120)				

mg; 6x1				
2.Artemether + Lumefanthrine (20+ 120) mg; 6x2				
3.Artemether + Lumefanthrine (20+ 120) mg; 6x3				
4.Artemether + Lumefanthrine (20+ 120) mg; 6x4				
5. Chloroquine150mg base tablet				
6. Chloroquine50mg base syrup				
7.Artesunate 60mg inj.				
8.Quinine 300mg tab				
9.Quinine 300mg/ml inj.				
10.Premaquine 7.5mg base tablet				
11Malaria RDT				
12Microscope service for malaria				
	[B1] = Sum			**[E1] = Sum of E =**

	of B =			
	[B2]= % adequate records = B1 ÷ 15 x 100 =			
	[F]= Average number of stock out days= E1/B1			

Annex 4: Data collection tool for an in-depth Interview

Name of the interviewer: _____

Date: _____

Prior to the interview, a support letter from Addis Ababa University was presented. Permission was obtained from the relevant official of the organization. The principal investigator was described to the respondent about the purpose of the study, the duration, the activities to be undertaken and all other relevant information. The interview was proceeding after securing permission from the relevant official.

The interview period was from 90 to 120 minutes.

1. Could you please describe the type of the distribution system that you used to supply anti-malaria commodities to public health facilities? Probes: Is it pull, or push (informed push) or a mix of them? How frequently is the distribution done?

_____

_____

_____

_____

2. Anti-malaria commodities are already integrated in to the IPLS; would you please tell me about its current status including coverage in terms of number of products? Probes: Did public health facilities consistently reporting using the regular reporting forms and timeline? Did malaria programs are lagging behind? If yes why?

_____

_____

_____

_____

3. How often do you receive/report and review anti-malaria commodities logistic reports from/to facilities/EPSA and make decisions or inform decision makers about the information you received/report? How often do you provide on job training and supportive supervision?

4. What are the factors for poor availability of Anti-Malaria commodities?

5. What kind of documents do you have to guide the LMIS? Probes: Do you have standard procedure for data generation and collection? What are the roles and responsibilities of the different actors in the system? Does it clearly mention timelines/frequency for reporting?

6. How frequently do you train health facility professionals on how to handle commodities and how to calculate the consumption data?

7. What kinds of post-training support do you provide to the health facilities to ensure data quality? Probes: Who else involved in providing support to the health facilities? Do you think the support is adequate? Do you have suggestions to improve the quality of the support?

8. What kinds of decisions are made based on the LMIS reports? And who makes these decisions? Probes: Could these decisions be made without the system? And what would be the impact if the system fails? What is the reporting cycle consistent with the timing of decisions that need to be made?

9. What are the factors associated with the unavailability of Anti-Malaria commodities? Probes: Factors associated with distribution, procurement, data quality, wastage etc…

10. What do you suggest to address these issues? What kind of plans do you have to address some of the factors you mentioned above? Probes: Remind the respondent to make sure that recommendations are put forward for all the factors mentioned above.

11. How do you calculate the consumption of Anti- malaria commodities? Probe: Do you use a look ahead seasonality index to calculate the consumption of anti-malaria commodities for the next period? If not, what are the factors associated with it and your suggestions to address them?

Annex 5: Data collection tool for an in-depth Interview (for Health Facilities)

Name of the interviewer: _____

Date: _____

Prior to the interview, a support letter from Addis Ababa University was presented. Permission was obtained from the relevant official of the organization. The principal investigator was described to the respondent about the purpose of the study, the duration, the activities to be undertaken and all other relevant information. The interview was proceeding after securing permission from the relevant official.

The interview period was from 90 to 120 minutes.

1.Could you please describe the type of the system that you used to receive anti- malaria commodities from EPSA? Probes: Is it pull, or push (informed push) or a mix of them? How frequently is the distribution done?

_____

_____

_____

_____

2.Anti-malaria commodities are already integrated in to the IPLS; would you please tell me about its current status including coverage in terms of number of products? Probes: Did you consistently reporting using the regular reporting forms and timeline? Did malaria programs are lagging behind? If yes why?

_____

_____

_____

_____

3.How often do you report to EPSA and received Anti-Malaria medicines?

4.What are the factors for poor availability of Anti-Malaria commodities in your facilities?

5.How frequently do your higher officials provide training for your health professionals on how to handle commodities and how to calculate the consumption data?

6.What kinds of training support do higher officials provide to your health professionals to ensure data quality? Do you have suggestions to improve the quality of the support?

7.What are the factors associated with the unavailability of Anti-Malaria commodities? Probes: Factors associated with delivery, report, data quality, wastage etc…

8.What do you suggest to address these issues? What kind of plans do you have to address some of the factors you mentioned above? Probes: Remind the respondent to make sure that recommendations are put forward for all the factors mentioned above.

9.How do you calculate the consumption of Anti- malaria commodities? Probe: Do you see the seasonality of next periods to calculate the consumption of anti-malaria commodities for the next period? If not, what are the factors associated with it and your suggestions to address them?

_____

_____

_____

Name of the interviewer: _____

Date: _____

Prior to the interview, a support letter from Addis Ababa University was presented. Permission was obtained from the relevant official of the organization. The principal investigator was described to the respondent about the purpose of the study, the duration, the activities to be undertaken and all other relevant information. The interview was proceeding after securing permission from the relevant official.

The interview period was from 90 to 120 minutes.

1. Could you please describe the type of the distribution system that you used to supply anti-malaria commodities to public health facilities? Probes: Is it pull, or push (informed push) or a mix of them? How frequently is the distribution done?

_____

_____

_____

_____

2. Anti-malaria commodities are already integrated in to the IPLS; would you please tell me about its current status including coverage in terms of number of products? Probes: Did public health facilities consistently reporting using the regular reporting forms and timeline? Did malaria programs are lagging behind? If yes why?

3. How often do you receive and review anti-malaria commodities logistic reports from facilities and make decisions or inform decision makers about the information you received? How often do you provide on job training and supportive supervision?

4. What are the factors for poor availability of Anti-Malaria commodities?

5. What kind of documents do you have to guide the LMIS? Probes: Do you have standard procedure for data generation and collection? What are the roles and responsibilities of the different actors in the system? Does it clearly mention timelines/frequency for reporting?

6. How frequently do you train health facility professionals on how to handle commodities and how to calculate the consumption data?

7. What kinds of post-training support do you provide to the health facilities to ensure data quality? Probes: Who else involved in providing support to the health facilities? Do you think the support is adequate? Do you have suggestions to improve the quality of the support?

_

8. What kinds of decisions are made based on the LMIS reports? And who makes these decisions? Probes: Could these decisions be made without the system? And what would be the impact if the system fails? What is the reporting cycle consistent with the timing of decisions that need to be made?

9. What are the factors associated with the unavailability of Anti-Malaria commodities? Probes: Factors associated with distribution, procurement, data quality, wastage etc…

10. What do you suggest to address these issues? What kind of plans do you have to address some of the factors you mentioned above? Probes: Remind the respondent to make sure that recommendations are put forward for all the factors mentioned above.

11. How do you calculate the consumption of Anti- malaria commodities? Probe: Do you use a look ahead seasonality index to calculate the consumption of anti-malaria commodities for the next period? If not, what are the factors associated with it and your suggestions to address them?

_