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Patients' and Health Professionals' Perception and Satisfaction on Malaria Diagnostic service in Awi Zone; Amhara Nation Regional State, North West Ethiopia

By

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ACKNOWLEDGMENT

First of all I would like to thank the Almighty God who provided me the courage to finish this paper. My heartfelt gratitude extend to my advisors Dr. Aster Tsegaye and Fatuma Hassen who spent their precious time for guidance and constructive comments starting from the beginning of the research proposal to the preparation of the final thesis. And also I extend my appreciation to Dr. Alemayehu Worku for showing me the analysis part and providing guidance for the thesis.

Once again I would like to thank Departmental Research and Ethics Review Committee (DRERC) of School Medical Laboratory Science, College of Health Sciences for their on- time review and providing approval, and also Amhara National Regional State Health Bureau for accepting the proposal and providing a letter to Zonal office.

My special thanks goes to Ato Kelemu Dessie, Awi Zone Mal-Tra proram officer for his advice and immediate distribution of a letter to each Woreda Health office, and also heads & staffs of each Woreda health office for their cooperation and immediate distribution of a letter to health centers where the study was conducted.

My gratitude also extend to Ato Dereje Simeneh, Ankesh Guagusa Woreda health office staff who contributed a lot to conduct this research and even helped me through the hard time by providing me a motor lift for the hard to reach areas. I also greatly appreciate data collectors that collect the data without complaining with the payment (whose names are Tsegaye Kassahun, Addis Abera, Dereje Birhanu, Getay Tilahun and Beshaw Shitahun) , and also the whole staffs of the health centers and participants of the study.

Once again my gratitude extend to my colleague Muluken Getachew for his dedicated support starting from topic selection to the final thesis write up and Hailemariam Mihiretie for his contribution from topic selection to proposal development. And also Ato Yohanns Bayessa VCT coordinator, Dr. Aster Shewamare ART coordinator, and Yonas Sisay pharmacy in Zewditu Hospital for their contribution in providing me materials', and Mr. Dagne Minda for his guidance in software application.

Last but not least, my grateful appreciation extends to my families that encouraged and support me during conducting the study.

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Abbreviations

AAU: Addis Ababa University

ACT: Artemisinin Combination Treatments

ANRS: Amhara National Regional State

AOR: Adjusted Odds Ratio

COR: Crude Odds Ratio

CQ: Chloroquine

CSA: Central Statistical Agency of Ethiopia

DRERC: Departmental Research and Ethics Review Committee

E.C: Ethiopian Calendar

EQA: External Quality Assurance

FMoH: Federal Ministry of Health

HC: Health Center

HEW: Health Extension Worker

IRB: Institutional Review Board

Lab: Laboratory

MLS: Medical Laboratory Science

QC: Quality control

RDT: Rapid Diagnostic Test

SOPs: Standard operating procedures

SPSS: Statistical Package for Social Sciences

SSA: Sub-Saharan Africa

TAT: Turn Around Time

WHO: World Health Organization

Abstract

Patients' and Health Professionals' Perception and Satisfaction on Malaria Diagnostic service in Awi Zone; Amhara Nation Regional State, North West Ethiopia

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Addis Ababa University, 2014

Background: Correct diagnosis of malaria is crucial for proper treatment of patients and surveillance of the disease. However, there are various limiting factors including inadequate infrastructure and consumables. Furthermore, inappropriate perception and inadequate satisfaction of health service providers and users are suggested as significant challenges in the utilization and the quality of laboratory malaria diagnostic services in other African countries.

Objective: To assess perceptions and satisfactions of patients and health professionals about malaria diagnostic service in Awi Zone, Amhara National Regional State, North West Ethiopia.

Methods: Health facility based cross sectional study was conducted from November to December 2013. The patient sample size was determined by using single population proportion. Interview and self administered structured questionnaires were employed to collect information from laboratory personnel, clinicians and patients. Data were collected from 304 patients, 99 clinicians, 26 laboratory professionals and 11 key informants. Data was entered using Epi-Info 3.5.3, further analysis was done by SPSS version 20. Chi-square test was used to determine association between the main out come and associated factors. The strength of association between covariates and the main outcome was identified by using odds ratio in binary logistic regression, and also multiple logistic regression was utilized to crosscheck confounders for those associated variables. Values less than 0.05 and 95% CI were taken as significant level.

Result: Overall 52.6% of patients, 50% of laboratory professionals, and 61.2% of clinicians were satisfied with malaria diagnostic service in their health facility laboratories. Ethnicity, residence, knowing malaria diagnosis after consulting clinician, and time period to receive malaria result were independent predictors for patient satisfaction ($p< 0.05$). Lack of benefit, training or professional development and insufficient duty payment besides unequal workload were some of the factors significantly affected lab professionals level of satisfaction ($p<0.05$). Request for laboratory malaria diagnosis on the basis of clinical signs and symptoms of patients and trust for malaria diagnostic result were important predictors for clinician satisfaction ($p<0.05$).

Conclusion and Recommendation: Based on the finding, patients and health professionals level of satisfaction on malaria diagnosis service was in the range of 50% to 61.2%. Lab constraints were the main factors that mimic satisfaction for health professionals, and these in turn might cause negligence of professionals towards patients and prolonged waiting time that presented dissatisfaction for patients. Thus, the regional government should focus on those constraints that compromise the quality of malaria diagnostic service.

1. Introduction

1.1 Background information

Malaria is a major global health problem with over 1 million deaths annually, mainly affecting children under 5 years and pregnant women in sub-Saharan Africa (SSA). Correct diagnosis and effective treatment are among the main strategies in the fight against malaria. The first challenge is the correct diagnosis both in health facilities and in the community. Most cases of uncomplicated malaria in SSA are diagnosed clinically on the basis of fever and/or history of fever. A laboratory for confirmation of the diagnosis is rarely available, especially in rural areas. The practice of taking every febrile illness as malaria leaving other febrile illnesses like pneumonia, relapsing fever, meningitis etc; while prescribing anti-malarial drugs in the absence of malaria causes unnecessary expense to the patient and risks avoidable adverse effects as well as selection of resistant strains [1].

Malaria diagnosis based on clinical signs resulted in over-diagnosis of malaria which carries a risk of unnecessary use of anti-malarial drugs and masking other underlying causes of febrile illnesses. Likewise under-diagnosis of malaria may result in delayed treatment and progression into severe cases with fatal consequences. Using the current clinical guidelines, at low prevalence of malaria symptomatic diagnosis carries a low risk of missing malaria cases but with substantial over-prescription of anti-malarial drugs. Although symptomatic diagnosis of malaria has been considered reasonable in resource poor settings with high malaria transmission where laboratory infrastructure is inadequate, the current level of misdiagnosis has been found to be unsustainable particularly after introduction of the more expensive artemisinin-based combination drugs [2].

Early diagnosis, followed by prompt and effective treatment is the key to reduce malaria morbidity and mortality. Consequently, it is essential to recognize the importance of this aspect in the control programs. Laboratory diagnosis of malaria greatly facilitates the management of the disease by confirming the clinical diagnosis [3].

In most malaria endemic countries of SSA, the current standard for laboratory confirmation of a clinical malaria diagnosis is a peripheral blood film, examined microscopically. However,

microscopic based diagnosis of malaria is labor-intensive requiring trained staff and quality equipment that are scarce in resource-poor settings. Thus, most clinicians often rely on clinical signs and symptoms for diagnosis of malaria, even when slide microscopy is available. Besides, when anti-malarials were relatively cheap, presumptive treatment of all fever cases was deemed more cost-effective [4].

Although the debate about laboratory-confirmed diagnosis versus presumptive treatment has been ongoing for years, nobody has embarked on the definitive study to show that mortality is not higher with the former than the latter. There is evidence confirming that the strategy based on documented diagnosis is safe, even in uncontrolled settings. New evidence shows that clinicians trust and act upon rapid diagnostic test (RDT) results. Indeed, studies conducted under programmatic conditions, 2%–10% of all patients with negative results were given antimalarial drugs. This contrasts with disappointing results published earlier that illustrates the behavior change that can be achieved through proper training and trust gained by accumulating field experience with RDTs [5].

Making a diagnosis requires careful clinical examination and laboratory investigation whereas malaria could be over diagnosed in endemic areas. In the non-endemic areas a high index of suspicion is usually required. However, in the most vulnerable groups like: neonates, under-fives, pregnant women, the elderly and non-immune who may develop potential life threatening complications of *falciparum* malaria, it is important in most cases to make a rapid, accurate diagnosis to ensure prompt treatment[6].

WHO recommends that before giving treatment, clinical malaria should be confirmed by parasite based diagnosis. Treatment given solely on the basis of symptoms (presumptive diagnosis and treatment) should only be considered when a parasitological diagnosis is not possible. In 2008, 33 of 43 malaria endemic countries in the African region and 45 out of 63 countries in other regions were reported to have developed a policy of parasitological testing of suspected malaria cases in persons of all ages. However, policy development has not matched actual practice. Parasitological test for suspected malaria cases is carried out in less than 20% of individuals living in 21 of the highest disease burden countries [6].

Following WHO recommendations, most African countries have adopted treatment protocols for malaria based on artemisinin combination treatments (ACT). The new protocols have proven to be very effective, but they are also much more expensive than previous regimens. The presumptive treatment of all fevers for malaria, previously a current practice, has therefore being questioned on economic grounds [7].

In areas of intense malaria transmission, such as large parts of tropical Africa, where the burden of malaria is greatest and where severe disease and mortality are largely confined to children less than 5 years of age, malaria treatment is often dispensed on the basis of “fever” rather than on the basis of a parasitologically confirmed diagnosis. In these settings, malaria is by far the commonest cause of childhood fevers and most young children have malaria parasitaemia. However, with high malaria transmission and high levels of immunity, a significant proportion of the infections are asymptomatic and detecting parasites in the blood does not always help to distinguish malaria from other causes of fever. Moreover, in most of these areas microscopy and rapid diagnostic tests are not generally available at the periphery of the health services or at community level, where most cases of malaria are managed [8].

Malaria is a major public health problem in Ethiopia. The main objective of the malaria prevention and control program in Ethiopia is to reduce morbidity and prevent mortality by applying intervention strategies that are suited to the local epidemiological situation of the disease. Early accurate diagnosis and prompt treatment is one of the main strategies in malaria prevention and control. Based on the level of the health facility, different diagnostic methods can be used. The most commonly used methods are clinical diagnosis based on signs and symptoms only and the use of microscopy and rapid diagnostic tests [9].

Correct diagnosis of malaria is crucial for proper treatment of patients and surveillance of the disease. However, laboratory diagnosis of malaria in Ethiopia is constrained by inadequate infrastructure, consumables and insufficient skilled personnel. Furthermore, the inappropriate perceptions and inadequate satisfactions of health service providers (laboratory personnel and clinicians) and users (patients/care-takers) on the quality of laboratory services were also suggested as significant challenges in the utilization of the available services [2].

1.2 Statement of the problem

Providing health care in Sub-Saharan Africa (SSA) is a complex problem [10]. One of the major challenges in implementing health programs in SSA is the reliability of medical laboratory services. The diagnostic support of laboratories is essential for a wide range of diseases and testing purposes, both from clinical and public health perspectives [11].

Reports call for more resources to assist in the prevention and treatment of infectious diseases that affect the population; but, policy makers, clinicians, and the public frequently fail to understand that diagnosis is essential to the prevention and treatment of disease. Access to reliable diagnostic testing is severely limited in the region, and misdiagnosis commonly occurs. Understandably, allocation of resources to diagnostic laboratory testing has not been a priority for resource-limited health care systems. However, unreliable and inaccurate laboratory diagnostic testing leads to unnecessary expenditures in a region already plagued by resource shortages, promotes the perception that laboratory testing is unhelpful, and compromises patient care. The barriers to implementing consistent testing within this region illustrate the need for a more comprehensive approach to the diagnosis of infectious diseases, with an emphasis on making laboratory testing a higher priority [10].

The reliability of results of laboratory investigations continues to be the major challenge facing rural laboratory scientists, technologists and technicians, especially those who do not have access to latest automated machines. However, with quality control measures, adequate knowledge and with training and retraining, simple methods can give reliable results. Light microscopy is the “gold-standard” method for detection of malaria parasites in blood films but it is difficult to provide the service in rural healthcare centers that lack necessary facilities and a qualified microscopist. The main barriers include high investment in technical expertise, quality monitoring, microscope maintenance and time needed to correctly identify malaria parasites in blood films [12].

In Africa over 70% of malaria cases do not present initially to health facilities but diagnose and manage their “malaria” (i.e., fever) at home with traditional remedies or drugs bought from local shops. They only attend health centers after self-treatment fails, and even then they do not

receive a good-quality diagnosis. At peripheral health facilities a diagnosis of malaria is based solely on clinical features such as fever. Although this approach can reduce morbidity many infectious diseases mimic malaria and this strategy leads to high rates of over-diagnosis and over-treatment of malaria [13].

Effective and affordable treatment is recommended for all cases of malaria within 24 hrs of the onset of illness. Most cases of "malaria" are self-diagnosed and most treatments, as well as deaths, occur at home. The most ethical and cost-effective policy is to ensure that newer drug combinations are only used for true cases of malaria. Although it is cost effective to improve the accuracy of malaria diagnosis, simple, accurate, and inexpensive methods are not widely available, particularly in poor communities where they are most needed. A study in Uganda, by Karin Kallander and his colleagues emphasizes the difficulty in making a presumptive diagnosis of malaria, and highlight the urgent need for improved diagnostic tools that can be used at community and primary-care level. Health systems need strengthening at referral and community level, so that rapid accurate diagnosis and effective treatment is available for those who are least able to withstand the consequences of illness. Indirect evidence strongly suggests that misdiagnosis of malaria contributes to a vicious cycle of increasing ill-health and deepening poverty [13].

In Tanzania, malaria is commonly over-diagnosed in people presenting with severe febrile illness, especially in those living in areas with low to moderate transmission and in adults. This is associated with a failure to treat alternative causes of severe infection. Diagnosis needs to be improved and syndromic treatment considered [14].

Malaria has been consistently reported in Ethiopia as one of the three leading causes of morbidity and mortality in the past years. The magnitude of the problem in 2002/03 has even worsened and the disease has been reported as the first cause of morbidity and mortality accounting for 15.5% out-patient consultations, 20.4% admissions and 27.0% in-patient deaths. The health service delivery system in Ethiopia is organized in a four tier system. The most peripheral level is the health post staffed by frontline health workers. The next level of health facilities in the tier are health center, district hospital and regional/referral hospital. Laboratory based diagnostic facility is available at all levels of the health care delivery system except at health posts [9].

At the health post level, malaria diagnosis and treatment is based on clinical signs and symptoms that are not specific and usually leads to excessive use of anti-malarial drugs. However, for the improvement of diagnosis and management of malaria cases in areas where laboratory based diagnostic service is not available, diagnosis based on clinical sign and symptom and use of rapid diagnostic tests is the alternative approach that should be adopted until a time when microscopic diagnostic services expand [9].

A study done on laboratory service in Amhara Region North Ethiopia in 1999 revealed that physical facilities were seriously lacking, consisting of only one room in 85.2% of the health centers. Supply of electricity was never continuous. Whereas virtually all the health centers had up to five medical doctors each, laboratory manpower was grossly below the ideal requirement. Over half of the health centers had only one technician each, resulting into heavy workload. Laboratory reagents were insufficient, equipment lacking, and maintenance and repair were not accorded adequate attention. Eighty different tests were offered by the health centers in various combinations. Twenty categories of suggestions were advanced by the respondents. There was a great shortage of manpower, equipment, chemicals and other supplies to provide adequate laboratory services in the health centers within the region. Consequently, the laboratories were functioning below capacity [15].

Awi zone has high risk malaria areas and many people died due to malaria. The villages are in a low land area with endemic malaria. Malaria report from Awi Zone including previous two years indicates that in 2004 E.C. the total malaria cases reported were 122, 418 of which 39, 508 were confirmed as *Plasmodium falciparum (P. falciparum),* 33,705 as *P. vivax,* and 6098 as mixed while the remaining were diagnosed clinically. In 2005 E.C. the total report shows 198,714 of which 98,129 were confirmed as *P. falciparum*, 85,587 were confirmed as *P. vivax* and 6833 were mixed. The first quarter report of 2006 E.C.(July, August and September) indicated that the total malaria cases were 34,520 of which 17, 327 were confirmed as *P. falciparum*, 16,009 were confirmed as *P. vivax* and 1068 mixed. Malaria zonal death report indicated that in 2004 there were six deaths and in 2005 there were 11 deaths, and also in the first quarter of 2006 E.C. there were three deaths, even though zonal health facilities strongly implement preventive techniques like environmental management, community awareness and case management[16].

1.3 Rationally of the study

The laboratory services provide a basis for good clinical diagnosis and patient management and also a means to manage patient's response to treatment as well as monitor disease trends [17]. However, the inappropriate perception and inadequate satisfactions of health service providers and users on quality of laboratory service present a significant challenge in the utilization of available services [2]. Thus, this study was conducted to assess perceptions and satisfactions of patients and health professionals about laboratory malaria diagnosis service in malaria endemic areas of the study site. Malaria is the major problem and there was malaria case death in the study area. The study enables users and health service providers to understand the benefit of quality laboratory malaria diagnostic service. And also to further identify constraints and needs of health professionals in the study site. Finally, the study serves as a base line data for further rigorous study based on the finding and recommendations provided.

2. Literature Review

2.1 Laboratory Malaria diagnosis

Globally, 300–500 million episodes of malarial illness occur each year, resulting in over one million deaths, most of which are among children under five years of age. The greatest burden of malarial disease and death lies with the poor, who also have the least access to interventions against malaria. Malaria control requires an integrated approach, comprising prevention (including vector control) and treatment with effective antimalarial agents. Lack of information, education and access to early diagnosis and prompt- effective treatment has impeded the success of the global malaria programme in reducing severe morbidity and mortality from the disease [18].

The policy and strategies for Malaria control by the WHO hinges on Malaria prevention, diagnosis and treatment. Diagnosis of malaria has been a challenge in both endemic and non-endemic countries alike: the former having over diagnosis with consequences of wastage of resources for treatment, excessive drug pressure and antimalarial drug resistance and the latter under diagnosis or even missed diagnosis which in some cases lead to malaria mortality. An over view of problems associated with over diagnosis in severe malaria identified the unavailability and unreliable parasitological confirmation of parasitemia as the greatest challenge in endemic countries [6].

To be effective, global malaria control programs require the availability of adequate laboratory tests in the field. To date, microscopy remains the gold standard for the diagnosis of malaria, but RDTs are rapidly becoming a primary diagnostic test in many areas, particularly where microscopy may not be available. One of the most important findings in the recent literature is that despite the widespread use of diagnostic tests, treatment is too often based on clinical findings rather than on results of diagnostic tests [19].

Low level of payment has its own impact that demotivates health professionals like laboratory personnel and reducing the quality of their work. Trends in employment and remuneration of civil servants in SSA reflect those for government health workers. In the decade before 1985, numbers of civil servants in many SSA countries grew at more than 5% every year. In Ghana, for example, the civil service was five times as large in the 1980s as it had been at independence in

1957, and about 30% of all Ghanaian civil servants worked for the Ministry of Health. And yet, SSA has consistently had fewer central government employees as a proportion of total population than other regions of the world (1·1% in the early 1990s compared with an average of 1·3% for developing countries in Asia and Latin America) [20]. Another study conducted in seven countries of SSA shows that lack of professional development/opportunity for training being the major motive for changing job followed by lack of additional benefit and appreciation or recognition from management [11].

Laboratory malaria diagnosis is increasingly receiving much better attention due to observed high rate of misdiagnosis and adoption of more expensive anti-malaria drugs but still there is lack of laboratory staffs well trained for malaria microscopy. A study in Tanzania shows that Twenty-one laboratories (58.3%, n = 36) had only one laboratory personnel. Of these particular laboratories, 12 (57.1%), eight (38.1%) and one (4.8%) were each run by a laboratory assistant, laboratory attendant and laboratory technician, respectively. Only 36 (57.1%) laboratory personnel had attended at least one refresher course since their last graduation (years of service up to the date of visit ranged from 1 - 36, with a mean of 13.7 years). Thirty-six (57.1%) laboratory personnel reported to have been satisfied with their job. Out of these, 23 (63.9%) said that they were satisfied because they liked the job, seven (19.4%) said that they had better working environment and two (5.6%) felt that they had better opportunities. Forty-six (73.0%) laboratory personnel reported lack of equipment and/or reagents, lack of training or retraining, heavy workload and poor motivation as the major constraints to the performance of their laboratories. Six (9.5%) reported that laboratory personnel were under qualified or incompetent while five (7.9%) mentioned shortage of working space or facilities, electricity and water as the main constraints [2].

A research done in Burkinafaso shows that the clinical diagnosis based on fever and / or a history of fever had a sensitivity of 75% and a specificity of 41% when compared to confirmed malaria (defined as an axillary temperature of 37.5^0C and / or a history of fever and parasites of any density in the blood smear). Few febrile children under 5 years of age were assessed for other diseases than malaria such as pneumonia. No antimalarial was prescribed for 1.3% of patients with the clinical diagnosis malaria and for 24% of confirmed cases, while 2% received an antimalarial drug prescription without the corresponding clinical diagnosis. Chloroquine (CQ)

was overdosed in 22% of the prescriptions. This shows that the laboratory service plays important roles in diagnosing, treating and monitoring malaria [1].

A research done in five administrative zones of Oromia shows that among the 58 facilities providing laboratory services, 24% of the 159 laboratory staff had received malaria microscopy training in the year prior to the survey, and 72% of the facilities had at least one functional electric binocular microscope. Facilities had variable levels of equipment, materials and biosafety procedures necessary for laboratory diagnosis of malaria. The mean monthly number of malaria blood films processed at secondary/tertiary facilities was 225, with a mean monthly 56 parasitologically confirmed cases. In primary facilities, the mean monthly number of clinical malaria cases seen was 75, of which 57 were tested by rapid diagnostic test (RDTs). None of the surveyed laboratory facilities had formal quality assurance/quality control protocols for either microscopy or RDTs [21].

2.2 Clinicians' perception and satisfaction for quality malaria laboratory diagnosis

Physician satisfaction offers important explanatory and evaluative insights into the patient-doctor relationship and the process of medical care [22]. A qualitative study in South west Nigeria shows that a physician perceived "Malaria tests with microscopy are cumbersome and in the long-run malaria rapid diagnostic tests are not available indefinitely in the clinic. The study participants reported that when patients come with a temperature, before we think of anything, we have to think of malaria." [23]

A research conducted by D'Acremont V. et al., shows that clinicians trust and act upon RDT results. Indeed, in studies conducted under programmatic conditions, 2%–10% of all patients with negative results were given antimalarials. This contrasts with disappointing results published earlier that illustrates the behavior change that can be achieved through proper training and trust gained by accumulating field experience with RDTs. To align practices in formal care settings with those at community level, it is proposed to also use RDTs outside health facilities [5].

According to Leslie T. et al., in Afghanistan, among the health centers with microscopy, a blood slide was produced in the clinic for most patients (95.6%). In the new microscopy arm, malaria

treatment was given to 37/39 (95%) patients with a positive clinic slide result compared with 732/733 (99.9%) in the established microscopy arm (Fisher's exact P=0.007). Overall, 21% (32/154) of patients with a negative clinic slide result were treated with a malaria drug in the new microscopy arm compared with 270/905 (28.8%) in the established microscopy arm (χ^2=5.3, P=0.02). Doctors in the established microscopy arm were more likely to prescribe a malaria drug in the presence of a negative clinic slide result than were nurses or midwives (254/795, 31.9% *v* 16/140, 11%; Fisher's exact test: P<0.001), although the type of patient (age, sex) did not differ. This trend was less evident in the new microscopy arm (25/109 23% *v* 7/45 16%; Fisher's exact test: P=0.3). For patients with a positive clinic slide result, nurses and midwives prescribed malaria drugs with near 100% accuracy [24].

2.3 Patients' views about malaria diagnosis service

A qualitative study in Ghana revealed that many respondents conveyed their unwillingness to question or challenge the clinician's decisions around whether to test and how to respond to the test result. "I am always glad when the Doctor asks me to go for laboratory test because I would be wondering what is causing my illness. Sometimes I feel like telling the Doctor I want to go for laboratory test but I don't know what is on his mind. So when he eventually tells me to go for the test I become happy". And also other respondents described that Doctors are our second Gods "When you are sick and you go to the clinic and you go for the test and the test reveals the cause of your sickness, it is only the doctor who can find solution to that problem. So, it all depends on what the doctor thinks is the right thing to be done" [25].

A study conducted in North Eastern Tanzania, shows that patient satisfaction (and dissatisfaction) was coded from positive (or negative) comments about their consultation made spontaneously by patients during their exit. A mother of a 5 years old child said 'I was told that she has malaria but am not satisfied because she has not been tested. I wanted her to be tested first so that I can be assured what she is suffering from.' Having been tested increased the frequency of satisfaction expressed (although not statistically significant, P = 0.192), and this was particularly noticeable among adult patients. Knowing the test result was statistically significantly associated with expressing satisfaction at interview [26].

Some mothers were of the opinion that "*it is better to run tests to know the exact problem causing the child's illness*," physicians did not recommend it because of time factor, absence of personnel to perform laboratory tasks, and, finally, delay in receiving lab results. In this setting, giving antimalarial treatments to all children with febrile illness was deemed to be necessary by physicians particularly as malaria transmission is hyperendemic [23].

A study in Trinidad and Tobago depicts that patients were satisfied with courtesy and consideration shown by doctors and their degree of satisfaction increased greatly with increasing age, but decrease with increasing level of education. And almost 48% were dissatisfied with the waiting time after arrival at the health center while ethnicity had no influence on the degree of satisfaction [27].

In Ethiopia, although direct published evidence on perception and satisfaction of clinicians/or clients regarding laboratory diagnosis of malaria is lacking, there are reports from the general laboratory or antiretroviral therapy (ART) services [28, 29]. Accordingly, a recent study on clients and clinician satisfaction with laboratory service at selected government hospitals in Eastern Ethiopia shows that more females than males, urban than rural residents, illiterate than literate, age range from 18-27 years and farmers than other occupation were satisfied in laboratory service. And also satisfaction rate was higher on availability of laboratory staff in working hours and willingness to conduct laboratory investigation [28].

Moreover, patients satisfaction survey on laboratory services at antiretroviral therapy clinics in public hospitals, Addis Ababa, Ethiopia revealed that there is statistically significant associations between the overall patients' satisfaction with waiting time to get blood drawing service, availability of ordered laboratory tests and waiting time to get laboratory result ($p<0.05$) [29]. From this study it can be extrapolated that waiting time and test availability could be among the factors influencing patients' satisfaction on malaria laboratory diagnosis in Ethiopia. Nonetheless, to our knowledge, no published data are available on the perception and satisfaction of patients and health professionals about quality of laboratory malaria diagnosis.

2.4 Key informants view about malaria diagnosis service

According to response of health worker key informants in Zanzibar, the mother was considered as a barrier to health care. Death due to malaria was attributed to mother's delay in bringing the child to the health facility as they might be distracted by work, other care giving responsibilities, and financial constraints. Additionally, they reported lack of adequate staff and laboratory tests as barriers to differentiate causes of febrile illness, whereas transportation cost and drug unavailability were mentioned as major challenges [30].

2.5 Hypothesis

The perception and satisfaction of patients and health professionals towards quality of laboratory malaria diagnosis service in the study Woredas will not be different from studies reported elsewhere in Ethiopia on the general or ART laboratory services.

2 Objectives

3.1 General Objective

- To assess the perception and satisfaction of patients and health professionals about quality malaria laboratory diagnostic service in Awi Zone selected Health facilities, North West Ethiopia

3.2 Specific Objectives

- To assess patients perception towards malaria laboratory diagnosis service
- To determine patients satisfaction on malaria laboratory diagnosis service
- To assess the perception of health professionals towards quality malaria laboratory diagnosis service
- To determine satisfaction level of health professionals on malaria laboratory diagnosis service

4 Materials and Methods

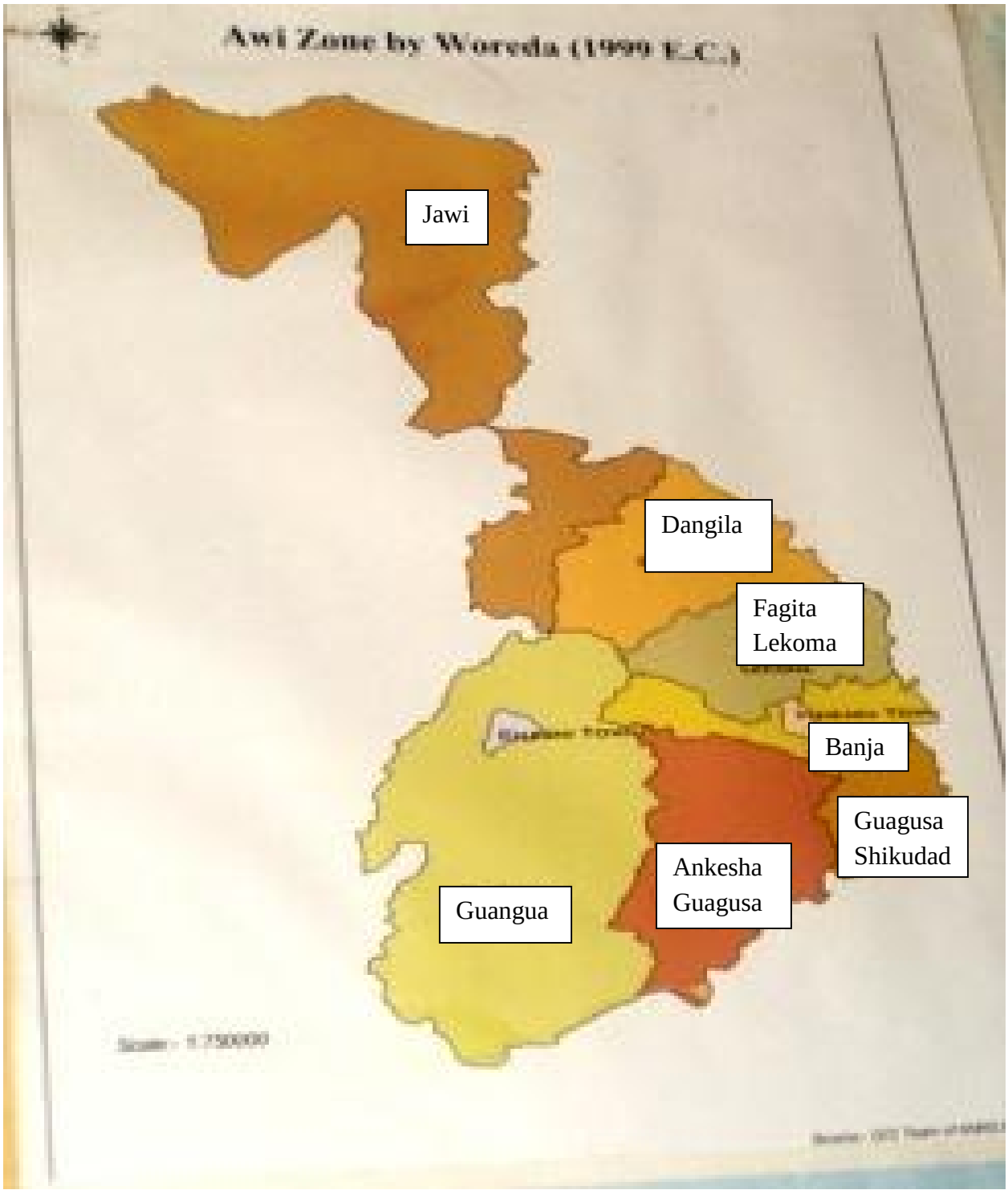
4.1 Study design and period

Health facility based cross sectional study was conducted to assess patients and health professionals' perception and satisfaction towards malaria laboratory diagnosis service from November to December 2013.

4.2 Study area

The study was conducted in Awi Zone selected health facilities in the Woreda. Awi- Zone is one of the 11 – zones of Amhara National Regional State including Bahir-Dar Administrative Zone. The zone gets its name and status during the transitional government of Ethiopia. It is divided in to eleven woredas and has a total population of 1,119,555 of which 560,129 are males and 559,426 are females. According to residence, 161,379 are urban (town) and 958,176 are rural residents and have total surface area coverage of 8,588.8 square kilometers. It is located North Western Ethiopia, Amhara National Regional State, at a distance of 420 km from Addis Ababa. Its astronomical location is 10^0 53' North Latitude and 36^0 56' East Longitude. Awi Zone is bounded by North Gondar in the North, West Gojjam in South and East, Beneshangul National Regional State in West.

Regarding the Woredas in which actual data were collected, Ankesha Guagusa Woreda has a total population of 225,734 of which 112,227 are males and 113,507 are females. The majority (203,755) are rural residents while 21,978 are town residents. The Woreda has a total surface area of 95,503 hectares and is located and bounded by Banja Woreda in the North, West Gojjam in the South, Guangua Woreda in the West, and Guagusa shikudad and Banja Woredas in the East. The study was conducted in six health centers of Ankesha Guagusa Woreda with minimum and maximum distance of 19km and 52 km from Awi zone Injibara town. Dangila Woreda has a total population of 145,694 of which 73,576 are males and 72,118 are females. It is 485 kms far from Addis Ababa and has five health centers with minimum and maximum distance of 8km and 25km each from the Woreda. Chagni Administrative town has a total population 32, 239 of which 15,747 are males and 16,492 are females; 31,172 are urban (town) while 1067 are rural residents. It is located south western part of Awi zone, 505 km away from Addis [16].


Awi Zone by Woreda (1999 E.C.)
Jawi
Dangila
Fagita Lekoma
Banja
Guagusa Shikudad
Ankesha Guagusa
Guangua

4.3 Population

Source population: All health professionals and clients of health facilities in Awi Zone selected woredas.

Study population: All health professionals and malaria suspected patients of selected health facilities in Awi Zone giving consent during the study period.

***Inclusion criteria*:** All health professionals willing to participate in the study from November to December 2013 and all adults ≥ 18 years who are suspected for malaria during the study period were included.

***Exclusion criteria*:** Those patients who are severely sick (unable to respond during interview) were excluded.

4.4 Sample size determination and sampling technique

Sample size determination

The required sample size for patient satisfaction on quality of laboratory malaria diagnosis was determined by using single population formula considering the following assumptions:

- Proportion of 90% (considering that patient satisfaction on quality laboratory malaria diagnosis and service delivery conducted in previous studies in Tanzania) [2]
- Level of significance = 0.05
- Marginal of error (d) = 5%
- Non-response rate= 10%

The formula for calculating the sample size (n) was:

$$n = \frac{(Za/2)^2 \, P \times (1-P)}{d^2}$$

Where:

· **n**= sample size

· **Z (a/2)** = Z-score at 95% confidence interval = 1.96

· **P**= positive proportion (assuming that 90 % of malaria suspected patients were satisfied with laboratory malaria diagnosis)

· **1-P=Q**= negative proportion

· **d**= marginal error=0.05 (5%)

Therefore n becomes:

n= $(1.96)^2$ x 0.9x 0.1/ $(0.05)^2$

n=138

By considering 10% non-response rate (NR) and a design effect of 2, the overall sample size was found to be:

NR=138*0.1=13.8=14

n=138+14=152

n=152*2=304

Sampling technique/ procedure

Among eleven woredas in Awi zone, multistage cluster sampling technique based on malaria endemicity was conducted and six of these woredas were malaria endemic. From the given six malaria endemic woredas, only three woredas were selected by using simple random technique. Within the selected woredas, twelve health centers included in the actual study. In this regard, patients and health professionals from selected woreda health centers and provided consent were involved in the study. Accordingly, study participants from Agew Gimjabet health center (hc), Wumbry Wundigy, Chagni, and Gissa health centers become 26 for each and also from Azena hc, Ayehu hc, Degera hc, Buya hc, Gumdry hc, Chara hc, Affessa hc and Abadra hc were 25 from each health center. Thus a total of 304 participants were selected by lottery method (**Figure 1**). Regarding health professionals, a total of 99 clinicians, 26 laboratory professionals, and 11 key informants (are clinicians with current position of heads of health centers) were the study participants from each health center. Overall, one clinician and four patients did not provide full information for the study.

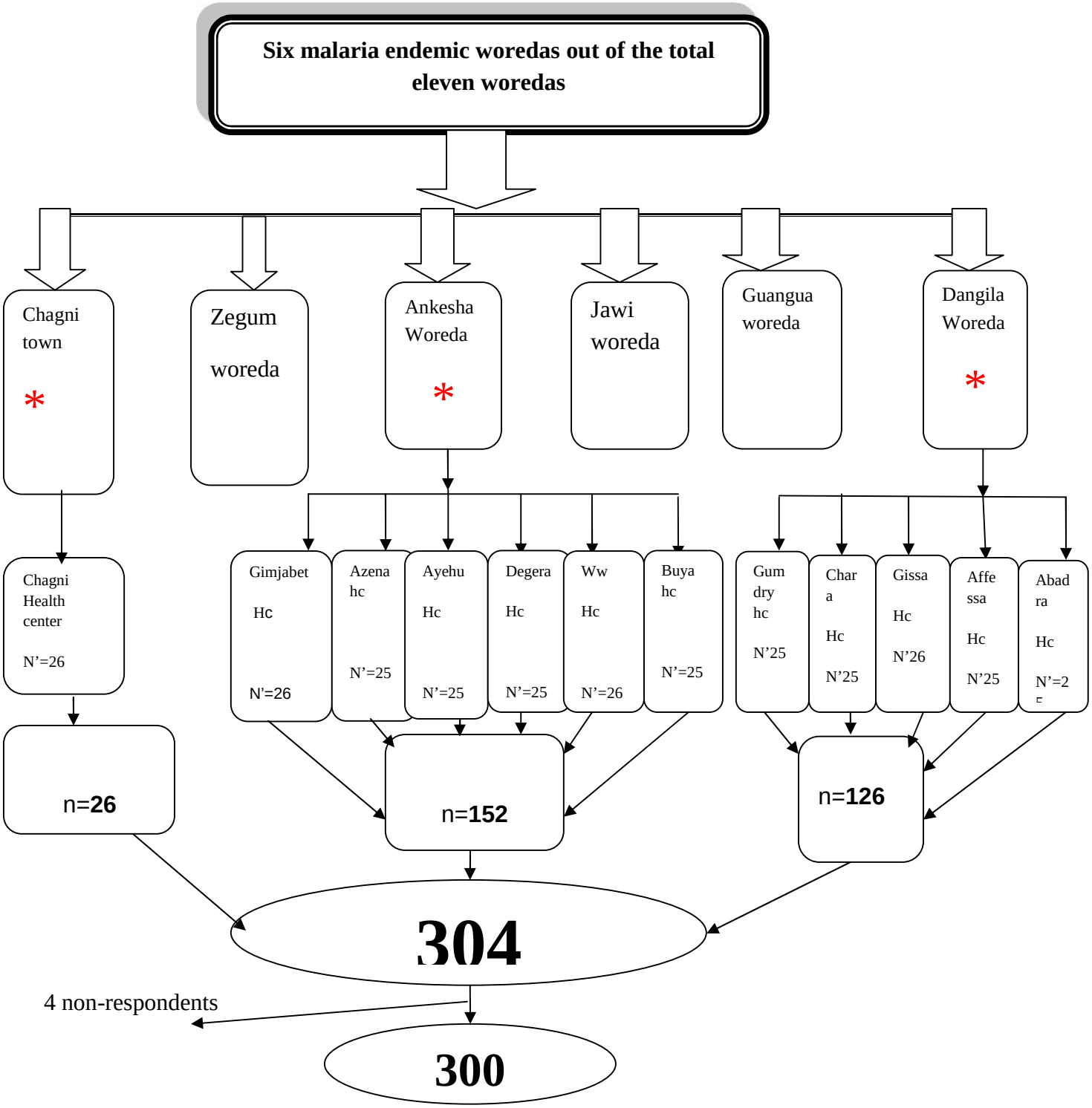


Figure1. Patients sampling procedure work flow

Note: * indicates selected woredas by lottery method

N' =total study participants in each health center (hc)

n=total number of patients in each Woreda Health Center (HC)

4.5 Study Variables

Dependent variables: Perception and satisfaction of Patients' and health professionals (laboratory professionals, Health officers, clinical nurses, midwifery, or Physicians) on malaria diagnosis service.

Independent variables: Socio-demographic characteristics (age, sex, residence, ethnicity, employment, educational status, work experience), Professional rank, Waiting time for diagnostic service, Patient awareness for diagnosis, Constraints for lab diagnosis, Clinicians trust for lab result.

4.6 Data collection procedure

Data collection instrument or questionnaire was adapted from different literatures so as to address perception and satisfaction of patients and health professionals towards quality lab service. The adapted questionnaire had mainly closed end while there is open ended also to strengthen the response in the closed end. Actual data was collected using interview based structured questionnaire for patients and self administrated structured questionnaire for health professionals considering socio-demographic characteristics and major outcomes of the study. The structured questionnaire is translated to the local language called Awigna specifically for patients by expert on language translation [32]. Two laboratory professionals, two clinical nurses and one accelerated midwifery plus clinical nurse totally five data collectors were involved in the study with special focus on local language.

4.7 Quality control

Training was provided for data collectors to maintain the quality of data collection without modification of data collection tool. Data collectors were trained on their responsibility for describing the purpose of the study, giving orientation, informing service users about the importance of honest and sincerely replay on responding to question besides clarity on the questionnaire. Before starting the actual data collection, pre-test was conducted at Injibara health center which is found in Injibara town- the capital of Awi Zone administrative to ensure the questionnaire was clear for the respondents. One key informant, twelve patients, ten clinicians, and four lab professionals participated in the pretest. Based up on their response a technique how to collect actual data especially for self administered questionnaire was undertaken, rather no modification of questionnaire was held. Clarifying self administered questionnaire for health

professionals and in-depth interview for key informants was held by the principal investigator for the purpose of quality data. Data collectors were assigned in health centers which are different from their actual working area not to be biased during data collection. Collected data from health professionals were cross-checked immediately for completeness by principal investigator while data from patients were checked for completeness and consistency daily overnight by data collectors and principal investigator. All completed data were examined once again for completeness and consistency during data management, storage and analysis. For instance, at every tenth entered data through Epi-Info 3.5.3 analysis was done for data consistency and missing variables and any error identified was corrected. And also overall activity was controlled by the principal investigator of the study.

4.8 Data entry, processing and analysis

Collected data were coded, entered, cleaned and analyzed. Data entry was done using Epi-Info 3.5.3 and exported to SPSS version 20 statistical software for analysis. A 5-point Likert scale from poor (1 point) to excellent (5 points) for few items were taken and the mean score or weighted average was calculated to categorize as satisfied and dissatisfied, and the value above or equal to the mean score was considered as satisfied while the value below the mean score was taken as dissatisfied. To identify constraints or limiting factors for lab professionals, yes/no type and Likert scale from degree of strongly agree (5-points) to strongly disagree (1-point) were utilized and the value above or equal to the mean score was considered as agree with the constraint while the value below the mean score was taken as disagree to the constraint that mimic quality lab service provision. The mean rating for each item is calculated by multiplying the number of answers or responses in each category by its rating value (1 to 5), obtaining a sum and dividing by the total number of responses for that item that is overall rate of satisfaction by Likert scale was calculated as (No. of excellent rating x5) + (No. of very good rating x4) + (No. of good rating x3) + (No. of fair rating x2) +(No. of poor rating x1) divided by the total number of responses for the specific item [28,33].

The main outcome variable was perception and satisfaction towards malaria diagnostic service. The association between this outcome variable and independent variables were done by using chi-square test and the strength of association was identified by using odds ratio in logistic regression. All socio-demographic characteristics and other covariates associated in univariate

and even 20% ($p< 0.2$) of covariates were entered to multiple regressions to adjust possible confounders so that independent predictors were statistically significant at p-value <0.05. In addition qualitative findings were paraphrased to look consistency of the result.

4.9 Ethical considerations

Ethical clearance was obtained from Departmental Research and Ethics Review Committee (DRERC) of School of Medical Laboratory Science, College of Health Sciences Addis Ababa University. Formal letter from DRERC was sent to Amhara National Regional State Health Bureau Research Committee and permission was obtained. In turn, a letter was written to Awi Zonal Health Department to allow the study to be conducted in the zone. Similarly, Awi Zonal Health Department has also written the permission letter to selected Woreda Health Offices. Moreover, selected Woreda Health Offices wrote permission letter to each health center in which the study was conducted. During data collection, the informed consent was considered from each patient and health professionals included in the study of the quality of malaria laboratory diagnosis from selected woreda health centers. All the information obtained from the study participants was kept confidential, names or personal identifiers were not included and identification of each participant was only possible through numerical codes. The information obtained used for further strengthening service quality in the study area.

4.10 Operational Definitions

Perception: is opinion or feeling of patients and health professionals towards quality malaria diagnostic service.

Satisfaction: Pleasure or contentment derived from users and service providers on malaria diagnosis.

Quality: character or nature as belonging to or distinguishing diagnosis in a right way.

Misdiagnosis: an inaccurate assessment of a patient's condition. Harm may be inflicted on the patient as the result of an incorrect therapeutic approach.

Severely sick: patients who are in a coma and convulsions with malaria and unable to respond during interview

Clinicians: in this study means those which acts as physician and that requests malaria diagnosis

Health professionals: include laboratory technician/technologist, nurse, midwifery, health officer.

Key informants: are clinicians with current position of heads of health centers

5. Result

5.1 Socio-demographic characteristics

In this study a total 300 patients participated from twelve health centers in Awi zone Amhara National regional state. Overall response rate was 98.7% (300/304). Among the respondents, 160(53.5%) were males and the remaining were females. The mean age of respondents was 31 ± 13 years. Majority (46%) were in the age range of 18-25 years followed by 30% from 26-35 years. Majorities (69.4%) were married, and 196(65.3%) respondents were Awi. Majority of respondents (45%) were illiterate, living in rural area (254 (84.9%)) and are farmers 159 (53%).

Moreover, 26 laboratory professionals and 98 clinicians with a response rate of 100% and 99% were involved in this study respectively. From lab respondents, 16(61.5%) were males. The mean age of lab respondents was 25± 2.5 years. Majorities (73.1%) of lab respondents were unmarried, were lab technicians (88.5%), and 65.4 % were working in rural area. Furthermore, 50 (51%) male and 48 (49%) of female clinician respondents were involved with mean age of 27± 5.25 years. The majority (69.1%) were 18-25 years followed by 26-35 (26.8%). Majority of respondents 72 (73.5%) were nurses. Regarding marital status, majority (53.1%) were married and 65.3% were working in rural health facilities, and were Awi 53(55.8%) (Table1).

Table1: Socio-demographic characteristics of respondents in Awi zone, Amhara National Regional State, North West Ethiopia, November to December 2013.

	Respondents		
	Patients	**Lab professionals**	**Clinicians**
Characteristics		**Frequency (Percent)**	
Age			
18-25	138 (46)	20 (76.9)	67 (69.1)
26-35	90 (30)	6 (23.1)	26 (26.8)
36-45	36 (12)		3 (3.1)
46-55	15 (5)		1(1)
>55	21 (7)		
Sex			
Male	160 (53.5)	16 (61.5)	50 (51)
Female	139 (46.5)	10 (38.5)	48 (49)
Marital status			
Single	85 (28.9)	19 (73.1)	43 (44.8)
Married	204 (69.4)	7 (26.9)	51 (53.1)
Divorced	2 (0.7)		2 (2.1)
Widowed	3 (1.0)		
Ethnicity			
Awi	196 (65.3)	14 (53.8)	53 (55.8)
Amhara	103 (34.3)	12 (46.2)	41 (43.2)
Other	1 (0.3)		1 (1.1)
Residence			
Rural	254 (84.9)	17 (65.4)	64 (65.3)
Urban	45 (15.1)	9 (34.6)	34 (34.7)
Educational level			
Illiterate	135 (45)		
Primary education	84 (28)		
Secondary education	47 (15.7)		
College/university	33 (11)		
Other	1 (0.3)		
Pt employment			
Farmer	159 (53)		
Merchant	26 (8.7)		
Government employee	34 (11.3)		

Non-government employee	2 (0.7)		
Other	79 (26.3)		
Level of profession			
Lab technician		23 (88.5)	
Lab technologist		3 (11.5)	
Responsibility in the lab			
Lab head		11 (42.3)	
Unit leader		3 (11.5)	
Subordinate		12 (46.2)	
Work experience in years			
1-2		9 (36)	34 (34.7)
3-5		16 (64)	35 (35.7)
6-10			16 (16.3)
>10			13 (13.3)
Profession and rank			
BSc nurse			4 (4.1)
Diploma nurse			66 (67.3)
Assistant nurse			1 (1)
Health officer			10 (10.2)
Midwifery			17 (17.3)
Current status			
HO			10 (10.2)
Nurse			72 (73.5)
Midwifery			16 (16.3)

5.2 Patients/ users perception about malaria diagnosis service provided

Majority 194 (64.7%) of patient respondents perceived that they knew about malaria diagnosis after consulting clinicians. On the other hand, 46 (15.3%) of respondents knew by themselves, 15 (5%) after consulting lab personnel, and 36 (12%) were both after consulting clinician and laboratory personnel.

The majority, 266 (89.3%) of patient respondents perceived that they were well diagnosed in facing fever upon giving blood for laboratory malaria diagnosis while the remaining 7(2.3%) were upon buying drug simply from pharmacy, 4(1.3%) upon seen by clinician without lab diagnosis, and 21(7%) with combination of these aspects. Regarding the waiting time for laboratory result, most of the patient respondents 187(62.5%) received lab malaria diagnosis result within 30 minutes while 84(28.1%) received within one hour, and 15(5%) received after

one hour. Most of the respondents 202(67.3%) felt that the waiting time to receive malaria diagnosis result is right. Furthermore, patient's perception towards health professionals was also assessed. Among a total of 299 respondents, 162 (54.2%) perceived that health facility staffs help patients all the time, 103 (34.4%) of respondents perceived as most of the time, 33 (11%) of respondents perceived sometimes, and 1 (0.3%) never. Meanwhile, 123 (41.1%) of respondents perceived that health facility staffs were very sensitive to worries and concerns of patients, while 139 (46.5%) responded as sensitive, and 36 (12%) responded as not very sensitive.

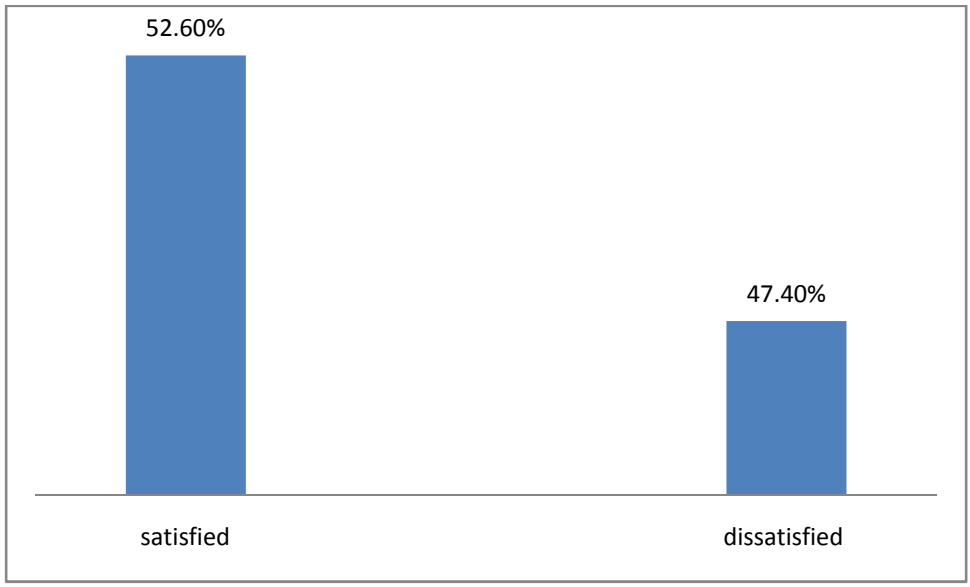
Qualitative response revealed that the reason for satisfaction was the use of laboratory blood examination for confirmation of malaria before taking treatment and respondents perceived that the right disease is identified through laboratory investigation or it verifies the exact disease. Appropriate laboratory service delivery (fast or immediate lab examination or diagnosis), right time service, lab professional's respect, politeness or approaches to patients were among the reasons for satisfaction. Qualitative responses also include, lack of discrimination and lab professionals perform lab tests based on order, provide on time lab result and the result is perfect, availability of lab investigation and the right treatment, presence of health professionals in the health facility. In contrary, there was neutral response on the above issues due to, shortage of" essential materials for the diagnostic service, for me satisfaction means when I get cured" another patient added "I want to hear about my disease from the laboratory personnel who performs the diagnosis." And also three out of four respondents as dissatisfied indicated that, *"I have symptom of malaria but service providers reported as no malaria"*, and one of these respondents said that,*" I checked immediately at private clinic and the result reported as malaria positive"*. This indicated there was testing error. Among the reasons are also lack of enough examination, lack of on time service delivery or late service delivery, non-respect of service providers, malaria drug is not available.

In Likert response scale, the highest mean rating score of satisfaction was found to be staff or health professionals language to communicate with patients (4.67) and the lowest mean rating score was waiting time for lab service (3.88) (Table 2).

Table 2: Response to different satisfaction questions by patients from twelve health centers in Awi zone, Amhara National Regional State, North Western Ethiopia, November to December 2013 (n=300)

Characteristics	Satisfaction score Frequency (%)					Weighted average	Unweighted Average (mean± SD)
	Excellent	Very good	Average/ good	Below average	Poor		
Easy to access the service (n=300)	110(36.7)	91(30.3)	91(30.3)	7(2.3)	1(0.3)	4.01	1.99± 0.89
Waiting time for lab service (n=300)	104(34.7)	79(26.3)	95(31.7)	21(7.0)	1(0.3)	3.88	2.12± 0.98
Respectfulness of health professionals(n=296)	108(36.5)	101(34.1)	74(25.0)	9(3.0)	4(1.4)	4.01	1.99± 0.93
Encouraged to ask any information(n=260)	106(40.8)	54(20.8)	85(32.7)	10(3.8)	5(1.9)	3.95	2.05± 1.03
Phlebotomy service for malaria lab test /examination(n=298)	100(33.6)	131(44.0)	66(22.1)	-	1(0.3)	4.10	1.9± 0.76
Availability of lab malaria test/results not missing(n=297)	105(35.4)	158(53.2)	24(8.1)	8(2.7)	2(0.7)	4.2	1.8± 0.75
Perception about quality of lab result(n=298)	95(31.9)	93(31.2)	104(34.9)	4(1.3)	2(0.7)	3.92	2.08± 0.88
Willingness to conduct lab investigation (n=300)	107(35.7)	115(38.3)	76(25.3)	1(0.3)	1(0.3)	4.09	1.91± 0.81
Availability of service providers in working hours (n=300)	114(38.0)	138(46.0)	40(13.3)	7(2.3)	1(0.3)	4.19	1.81± 0.78
Staff language to communicate(n=300)	224(74.7)	57(19.0)	15(5.0)	3(1.0)	1(0.3)	4.67	1.33± 0.65
The response to your request, and problems by lab personnel(n=299)	134(44.8)	112(37.5)	51(17.1)	1(0.3)	1(0.3)	4.25	1.74± 0.77
Explanation about prescribed malaria drug (n=300)	160(53.3)	123(41.0)	15(5.0)	1(0.3)	1(0.3)	4.47	1.53± 0.64

Note: "n" indicates number of respondents for single variable, SD=standard deviation


52.60%
47.40%
satisfied
dissatisfied

95%CI=0.052-0.289) less likely to be satisfied when compared with those which receive result within 30 minutes (Table 3).

Table 3: Univariate and Multivariate analysis for predictors of satisfaction towards patient respondents in selected health centers Awi Zone, Amhara National Regional State, North West Ethiopia, November to December 2013(n=300)

Characteristics	**Outcome**		**COR (95%CI)**	**P-value**	**AOR (95%CI)**	**P-value**
	Satisfied(≥48) Freq (%)	**Dissatisfied(≤47) Freq (%)**				
Age			1.261(1.021-1.559)	0.032	1.304(0.956-1.780)	0.094
18-25	57 (48.7)	60 (52.3)				
26-35	37 (52.9)	33 (47.1)				
36-45	15 (44.1)	19 (55.9)				
46-55	9 (69.2)	4 (30.8)				
>55	15 (78.9)	4 (21.1)				
Sex						
Female	48 (42.9)	64 (57.1)	1		1	
Male	84 (60)	56 (40)	2.00(1.208-3.312)	0.007	1.356(0.641-2.865)	0.425
Ethnicity						
Awi	114 (67.5)	55 (32.5)	1		1	
Amhara	18(21.7)	65(78.3)	0.134(0.072-0.247)	0.000	0.245(0.108-0.555)	0.001*
Work area						
Urban	4(12.5)	28(87.5)	1		1	
Rural	129 (58.6)	91(41.4)	9.923(3.365-29.263)	0.000	4.893(1.074-22.285)	0.040*
Educational level						
Illiterate	54(50)	54(50)	1		1	
Primary education	35(46.1)	41(53.9)	0.854(0.474-1.537)	0.598	0.718(0.241-2.144)	0.553
Secondary education	19(48.7)	20(51.3)	0.950(0.457-1.976)	0.891	0.637(0.186-2.183)	0.473
College/university	25(83.3)	5(16.7)	5.0(1.782-14.028)	0.002	2.998(0.361-24.883)	0.309
Employment						
Farmer	68(51.5)	64(48.5)	1		1	
Merchant	8(36.4)	14(63.6)	0.538(0.211-1.368)	0.193	1.629(0.395-6.719)	0.500
Government employee	25(80.6)	6(19.4)	3.922(1.510-10.182)	0.005	4.010(0.616-26.113)	0.146

Non-government employee	1(50)	1(50)	0.941(0.058-15.365)	0.966	0.997(0.002-489.998)	0.999
Other	31(47)	35(53)	0.834(0.461-1.506)	0.547	0.967(0.283-3.303)	0.958
Knowing malaria diagnosis						
By your selves	7(19.4)	29(80.6)	1		1	
After consulting clinician	100 (61.3)	63(38.7)	6.576(2.718-15.910)	0.000	3.320(1.115-9.886)	0.031*
After consulting lab personnel	6(40)	9(60)	2.762(0.736-10.362)	0.132	1.222(0.225-6.651)	0.817
Waiting time to receive malaria lab result						
Within 30min	119 (72.6)	45 (27.4)	1		1	
30min-one hour	14(19.7)	57(80.3)	0.093(0.047-0.183)	0.000	0.123(0.052-0.289)	0.000*
After one hour	0	10(100)	0.000(0.000)	0.999	0.000(0.000)	0.998

Note: The value 1 indicates reference category; * shows significant association

Based on the result of qualitative finding, patients also provided general service related improvement recommendations in the health centers. Respondents suggested that facilities like electricity, road or transport, water, waiting room, toilet, materials for diagnosis, and drug should be available to enhance satisfaction. Respondents also added that laboratory diagnosis should be provided always prior to ordering drug and malaria drug should be accessible in health centers since it is unaffordable to buy from private pharmacy and there is unwanted transport cost because of their inaccessibility.

Only one client suggested that, it is better if malaria drug is administered for all patients having clinical history similar with malaria, even if negative by laboratory examination. Most of respondents mentioned that card room management and delay should be solved, (for example card should be given early to reduce delay). Regarding human resource; respondents described that, additional clinicians (if possible doctors), lab professionals and in general additional human resource should be recruited to deliver quality service. Furthermore, respondents said that, all professionals should be sensitively deliver service without discrimination or prioritizing relatives or staffs and severely sick patients should be diagnosed immediately. Professionals should be committed, not be negligent, and respect time and patient. Clinicians should check using medical devices than simply asking patients; meaning, full clinical history of patients should be taken,

and explain the disease type and patient condition. According to two respondents, health education, for instance bed net usage should be given for the community. Lastly, one patient suggested that preventive techniques should be enhanced in the community.

5.3 Laboratory professionals' response on malaria diagnosis service conducted in their health facilities

5.3.1 Current malaria diagnostic service in Awi Zone

According to majority of respondents 15 (57.7%), the type of diagnosis performed in the health centers was microscopy while 9 (34.6%) responded that both microscopy and RDT were done, and 2(7.7%) responded RDT alone. The main reason for using RDT was because of lack of electricity, water, human resource and in general infrastructure of the health facility while 3(27.3%) of lab respondents disclosed no reagent for blood smear available and 2(18.2%) responded that no microscope available, and the remaining 1(9.1%) responded that both microscope and reagents are not available in the health center.

Almost all lab respondents (92.3%) used quality control or SOP to perform microscopy or RDT malaria diagnosis while the remaining 2(7.7%) respondents reported there was no SOP for malaria diagnosis. Based on the qualitative finding, there is lack of knowledge for preparing SOP, lack of training and inaccessibility of materials to prepare SOP. Majority 16 (61.5%) of respondents were not trained about lab malaria diagnosis while the remaining 10 (38.5%) have got trainings. Of these the majority (90%) took training only once and one respondent has training at least four times. According to these respondents, taking training is very important to cover knowledge gap, have good skill of diagnosing and identifying malaria species as well as the stages of malaria besides experience sharing.

The majority, 22(84.6%) of participants responded that they had no refresher courses while the remaining 4(15.4%) have taken refresher training on external quality assurance (EQA), internal quality control (IQC), acid fast bacilli (AFB), dried blood spot (DBS), malaria microscopy, sample collection, packaging and transportation. When taking training and refresher courses were cross tabulated with standard operating procedure (SOP) development, 100% of respondents which took trainings, 87.5% of respondents which do not have training on malaria

lab diagnosis and 90.9% without refresher course had SOP. There was no statistically significant association between having training and SOP development (x^2=0.166, df= 1, p=0.684). Regarding future training requirements participants responded that malaria microscopy and RDT training, and (theoretical like Diagnostic stage and life cycle, and practical like slide reading and grading species) are needed. Other malaria related trainings required include QC/QA, parasitological and hematological training, sample collection and training about reagent preparation.

When SOP availability was analyzed by level of their education, 3 (100%) lab technologists and 21 (91.3%) lab technicians had SOP. According to lab professional work experience, 2 out of 3 (66.7%) lab professionals which had one year of work experience, 5 out of 6 (83.3%) of those with 2 years experience, 4 out of 4 (100%) of those with 3 years experience, 8 out of 8 (100%) with 4 years experience and 4 out of 4 (100%) with 5 years experience had SOP. Again, there was no significant association between SOP development and work experience lab respondents (x^2=4.620, df= 4, p=0.329).

5.3.2 Perception of laboratory professionals towards malaria diagnostic service

Regarding the perception of lab professionals towards lab malaria diagnosis experience, 8 (30.8%) perceived that they have adequate experience, 15 (57.7%) medium and 3 (11.5%) inadequate experience. When this perception about malaria diagnosis experience was cross tabulated with SOP development or performing QC, all (100%) lab professionals with adequate and medium experience for malaria diagnosis have developed SOP and/ or perform QC for malaria diagnosis while only one (33.3%) of those with inadequate experience developed SOP. And also 50% of lab respondents perceived that they have high priority for patient satisfaction.

According to 53.8% of lab respondents', lack of benefit/ training, lack of professional development, excessive workload, electricity and water interruption, and lack of appreciation were the major constraints for quality lab malaria diagnosis.

The mean rating score for six items of perception and satisfaction revealed that the highest score was obtained for polite communication of lab professionals with clinicians (4.15), while the lowest score was 2.92 for human resource to provide malaria diagnostic service (Table 4).

Table 4: Laboratory professionals' response to different perception and satisfaction variables in selected health centers in Awi Zone, Amhara National Regional State, North Western Ethiopia, November to December 2013 (n=26).

variables	**Response Freq (%)**					
	Excellent	**Very good**	**Average/ good**	**Below average/fair**	**poor**	**Mean rating**
Quality/reliability of malaria lab result	6(23.1)	10(38.5)	10(38.5)	-	-	3.85
Matching malaria lab result with clinical data	6(23.1)	6(23.1)	11(42.3)	3(11.5)		3.58
Polite communication with clinicians	11(42.3)	9(34.6)	5(19.2)	1(3.8)		**4.15**
Enough equipment for lab service	6(23.1)	10(38.5)	8(30.8)	-	2(7.7)	3.69
Enough supplies and reagents	9(34.6)	7(26.9)	8(30.8)	1(3.8)	1(3.8)	3.85
Enough human resource to provide malaria diagnostic service	3(11.5)	5(19.2)	8(30.8)	7(26.9)	3(11.5)	**2.92**

Here: Freq= frequency

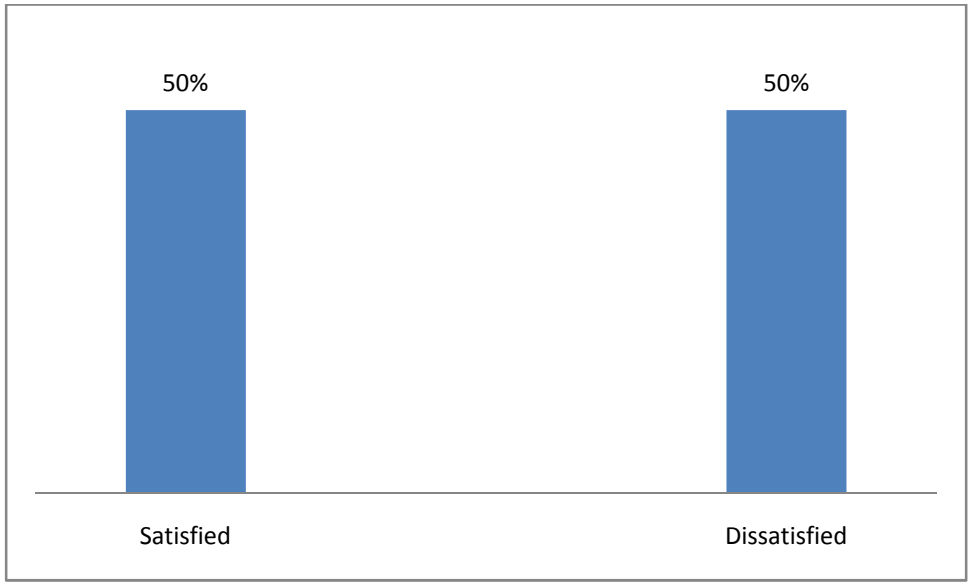

50%
50%
Satisfied
Dissatisfied

Table 5: Univariate and Multivariate analysis for predictors of satisfaction for lab professional respondents in selected health centers in Awi Zone, Amhara National Regional State, North West Ethiopia, November to December 2013 (n=26).

variable		outcome		COR(95%CI)	P-value	AOR(95%CI)	P-value
		Satisfied(≥ 22) Freq (%)	Dissatisfied(≤ 21) Freq (%)				
Age							
	18-25	10(50)	10(50)	1.00(.161-6.2)	1.000		
	26-35	3(50)	3(50)				
Sex							
	Male	8(50)	8(50)	1			
	Female	5(50)	5(50)	1.00(.206-4.856)	1.000		
Marital status							
	Single	11(57.9)	8(42.1)	1		1	
	Married	2(28.6)	5(71.4)	0.291(0.045-1.898)	0.197	0.489(.041-5.86)	0.572
Ethnicity							
	Awi	5(35.7)	9(64.3)	1		1	
	Amhara	8(66.7)	4(33.3)	3.600(.710-18.254)	0.122	8.011(.483-132.938)	0.147
Work area							
	Rural	9(52.9)	8(47.1)	1			
	Urban	4(44.4)	5(55.6)	0.711(.14-3.606)	0.681		
Level of education							
	Lab technician	12(52.2)	11(47.8)	1			
	Lab technologist	1(33.3)	2(66.7)	0.458(.036-5.789)	0.547		
Responsibility							
	Lab head	4(36.4)	7(63.6)	1			
	Unit leader	2(66.7)	1(33.3)	3.5(.236-51.899)	0.363		
	Subordinate	7(58.3)	5(41.7)	2.45(.456-13.161)	0.296		
Experience on malaria diagnosis							
	Adequate	6(75)	2(25)	1		1	
	Medium	6(40)	9(60)	0.222(.033-1.493)	0.122	0.16(.008-3.219)	0.231
	Inadequate	1(33.3)	2(66.7)	0.167(.009-2.984)	0.224	0.203(.004-9.439)	0.415
Training for lab malaria diagnosis							
	Yes	6(60)	4(40)	1			
	No	7(43.8)	9(56.2)	0.519(.104-2.581)	0.423		
Lab constraint out come							
	Yes	3(21.4)	11(78.6)	1		1	
	No	10(83.3)	2(16.7)	18.333(2.522-133.26)	0.004	30.6(1.83-511.8)	0.017*

The value 1 indicates reference category, * shows significant association, freq=frequency

5.4 Clinicians view towards laboratory malaria diagnostic service

In this study, vice head of the health center, adult outpatient department (OPD) coordinator, emergency case team leader, maternal and child health (MCH) focal person, voluntary counseling (VCT) and inpatient coordinator, tuberculosis (TB) clinic focal person, immunization and surveillance focal person, and clinicians who were assigned in different departments and that request malaria lab diagnosis were involved. Majority of clinician respondents 63 (64.3%) requested malaria lab diagnosis frequently. The main reason for frequent request of malaria diagnosis was for confirmation of malaria suspects. For those which requested less frequently 35(35.7%), the main reason was diagnosing malaria based on clinical sign and symptom of patients (94.1%). Almost half of clinician participants 51(52%) responded that the results from their laboratories were very reliable. The reasons provided were their laboratory had competent, motivated and skilled staff and they used more than one testing method (i.e. microscopy and RDT). Among 44 (44.9%) of clinicians that reported as the lab result was just reliable, 23(53.5%) expressed the complexity of identifying malaria parasite microscopically, 13 (30.2%) said that lab personnel are over worked, and 10 (23.3%) revealed the poor state of microscope /reagent. For those 3 clinicians that said their lab result was not reliable, the reason behind was lab personnel are overworked, poor microscope, no reagents and supplies, no electricity, and no updated knowledge or training for lab personnel.

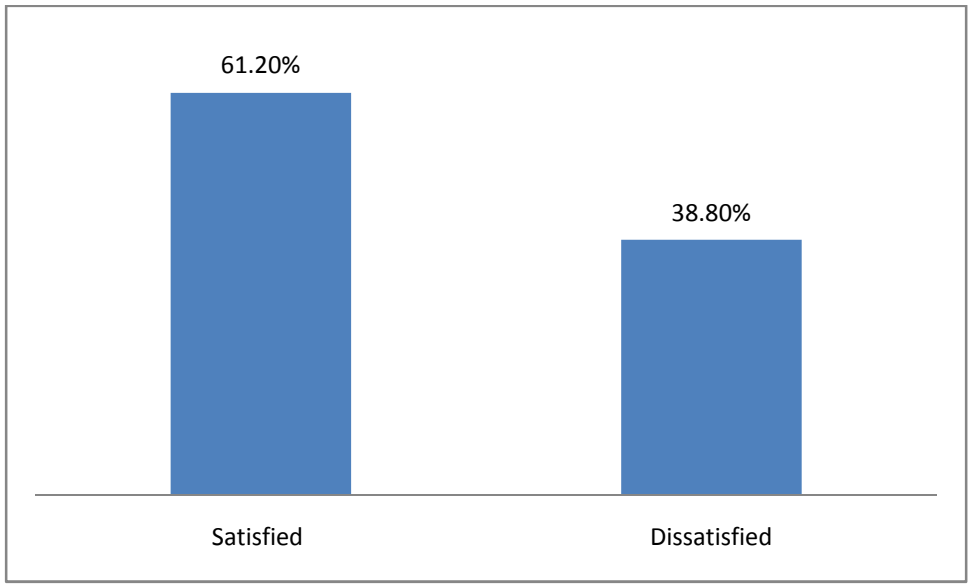
More than half 53 (54.6%) of clinician respondents perceived that they had high priority for patient satisfaction in their health facility

Likert response scale of eight items for clinician perception and satisfaction towards lab malaria diagnostic service revealed that, the highest mean rating score was found to be 4.4 for courtesy of clinical laboratory staffs and the lowest rating score was 3.4 for human resource to provide malaria lab diagnostic service (Table 6).

Table 6: Mean rating score for measuring items of satisfaction for clinicians in selected health centers in Awi Zone, Amhara National Regional State, North West Ethiopia, November to December 2013 (n=98).

Variables	Response Frequency (%)					Mean rating score
	Excellent	Very good	Average/ good	Below average/fair	Poor	
Routine test turnaround time for malaria	15(15.3)	45(45.9)	35(35.7)	3(3.1)	-	3.7
Quality/reliability of lab malaria result	17(17.3)	52(53.1)	25(25.5)	4(4.1)	-	3.8
Matching clinical data with lab results of malaria diagnosis	11(11.2)	53(54.1)	32(32.7)	2(2.0)	-	3.7
Availability of lab malaria test result	34(34.7)	41(41.8)	21(21.4)	2(2.0)	-	4.1
Courtesy of clinical lab staffs	46(46.9)	45(45.9)	6(6.1)	1(1.0)	-	**4.4**
Enough equipment to provide malaria lab service	21(21.4)	39(39..8)	23(23.5)	5(5.1)	10(10.2)	3.57
Enough supplies & reagents to provide malaria diagnostic lab service	24(24.5)	40(40.8)	22(22.4)	2(2.0)	10(10.2)	3.67
Enough human resource to provide malaria diagnostic lab services	13(13.3)	35(35.7)	34(34.7)	9(9.2)	7(7.1)	**3.4**

Note: mean rating calculated for responses of a single item and values of excellent (5points) to poor (1point).


61.20%
38.80%
Satisfied
Dissatisfied

95%CI=0.13-0.83) less likely to be satisfied when compared with those which trust the result as very reliable. Nevertheless; age, sex, marital status, ethnicity, work area, professional rank, current status, and work experience in the health profession field of clinicians had no statistically significant influence on satisfaction of clinicians (Table 7).

Table 7: Univariate and Multivariate analysis for some determinant variables of clinician perception and satisfaction in selected health centers, Awi Zone, Amhara National Regional State, North West Ethiopia, November to December 2013 (n=98).

variables	outcome		COR(95%CI)	P-value	AOR(95%CI)	P-value
	Satisfied(≥ 30)	Dissatisfied(≤ 29)				
	Freq (%)	Freq (%)				
Sex						
Male	29(58)	21(42)	1			
Female	31(64.6)	17(35.4)	1.32(.584-2.99)	0.504		
Work area						
Rural	39(60.9)	25(39.1)	1			
Urban	21(61.8)	13(38.2)	1.036(.44-2.43)	0.936		
Current status						
HO	4(40)	6(60)	1		1	
Nurse	46(63.9)	26(36.1)	2.65(.686-10.3)	0.158	2.25(.51-10.0)	0.287
Midwifery	10(62.5)	6(37.5)	2.5(.495-12.6)	0.268	3.12(.49-20)	0.231
Work experience in the health profession field						
1-2	18(52.9)	16(47.1)	1		1	
3-5	24(68.6)	11(31.4)	1.94(.73-5.2)	0.186	2.62(.82-8.43)	0.106
6-10	10(62.5)	6(37.5)	1.48(.44-4.996)	0.526	1.66(.43-6.36)	0.463
>10	8(61.5)	5(38.5)	1.42(.39-5.24)	0.597	2.01(.43-9.53)	0.377
Request for lab malaria diagnosis						
Always	35(55.6)	28(44.4)	1		1	
Sometimes	25(71.4)	10(28.6)	2.00(.83-4.85)	0.125	3.12(1.06-9.13)	0.038*
Trust lab malaria diagnosis result						
Very reliable	37(72.5)	14(27.5)	1		1	
Just reliable	22(50)	22(50)	0.38(.16-.89)	0.026	0.32(.13-.83)	0.019*
Not reliable	1(33.3)	2(66.7)	0.19(.02-2.26)	0.188	0.096(.01-1.36)	0.083

The value 1 is the reference category; * significant association

5.5 Key informant clinicians view on malaria diagnosis and other services conducted in their health centers /Qualitative finding.

Eleven health centers' head clinician respondents participated in this study. From these, 9 (81.8%) and 2 (18.2%) were males and females, respectively. More frequent age range of respondents was 18-25 (72.7%). Six (54.5%) were health officers while five (45.5%) were clinical nurses.

Almost all key informant respondents explained that *duty payment* was the main compliant raised from health professionals. These respondents also mentioned that *salary improvement especially for self upgraded professionals, lack of professional development, shortage of shelter for professionals especially those working in rural health centers, administrative health office not keeping the advantage of health professionals, less manpower and high workload especially for laboratory department, lack of (electricity, water supply, transportation, medical equipment and reagents), need for training and further benefit* were most common problems raised from health professionals. One respondent also mentioned that *health insurance* is a big issue raised by health professionals.

According to key informant respondents, among the complaints raised from patients was *time period to receive lab result*. Two of key informant respondents mentioned that there was compliant for false negative malaria result.

All key informants mentioned that client satisfaction is very important and given high priority in their health facility and two of these respondents described that *it measures our service quality with the standard, and it is a core measuring instrument for quality of service provided*.

Almost all key informant respondents also mentioned that patient satisfaction rating was improved in their health facility. They said that this improvement might be due to "professional commitment, assignment of additional lab professionals in few health centers which reduced lab turnaround time and improved result quality. Lab reagents availability were somewhat improved. Service provision is for 24 hrs in the health centers. According to these respondents *Health insurance was started for patients in the health facility in such a way that they pay 144 birr per annum and can have service free of charge including five of their families*. Health education was

provided and patients came into awareness for service delivered. One respondent said that more improvement might be seen in the future when Hospital building with better laboratory facility is finished and started its activity."

Nine key informants mentioned that their health facilities had initiated programs for improvement of patient satisfaction and have dedicated health professionals or staffs for monitoring and evaluation of patient satisfaction. According to one health professional respondent, one case worker was assigned and each case team members were responsible for monitoring patient satisfaction. As two respondents, manager or head of health center controls patient satisfaction and also there are committees which monitor patient satisfaction.

Based on this study, the health centers used different measurement techniques to measure client satisfaction, including annual surveys, management meetings and community engagements. They also use suggestion box, registration book, exit interview, and questionnaire. According to key informant clinicians, what they liked least about malaria diagnostic service in their laboratory was malaria diagnosis using RDTs. On the other hand what they liked most about was performing microscopy for malaria examination and participation in EQA program for malaria. Lab professionals developed SOP for malaria diagnosis and also show commitment and interaction or respect for patients, provide on time service delivery and providing awareness for patients concerning examination for malaria.

Based on the finding, key informants forwarded different recommendations for service improvement in the study area. Some of these recommendations include: *"construction or infrastructure should fulfill all the standards to cascade quality service and the problems rose by the health professionals as well as patients should be solved immediately. Patient satisfaction monitoring should be done early and their compliant should be solved immediately. Upgraded professionals should have payments based on their current professional salary scale and professional need should be fulfilled since it causes demoralization. Preventive techniques should be enhanced in the community since patient workload reduces their satisfaction on service delivered in the health facility."*

6. Discussion

The study reported herein aims to assess the perception and satisfaction of patients and health professionals about laboratory malaria diagnosis service in Awi Zone selected Health facilities, North West Ethiopia.

The overall 90.7% single item based patient satisfaction rate observed in this study was somewhat similar with the study conducted by Derua et al 2011 in Tanzania (90%) [2]. In the absence of similar published study on patients satisfaction in relation to malaria diagnosis in Ethiopia, we tried to compare our result with those available figures reported for the general and ART laboratories from eastern Ethiopia and Addis Ababa, respectively. Accordingly, the rate of satisfaction in the current study was higher than the study conducted in eastern Ethiopia on general lab service [28] and study done in public hospitals in Addis Ababa on ART service [29]. This might be due to population difference in the study.

In this study, Awi ethnic group were more satisfied than Amhara unlike a study conducted in Trinidad and Tobago which indicated that ethnicity had no influence on the degree of patients perception and satisfaction towards health care service [27]. Association of ethnicity in this study, which remains significant in the multivariate analysis model after controlling for other confounders, might be possible due to sample size difference that majority of participants were Awi ethnic group. Lending support to this finding, patients from rural residence were more satisfied in malaria diagnostic service than urban residents. The finding is inconsistent with the study conducted in eastern Ethiopia where they observed urban residents being more satisfied than their rural counterparts [28]. This could be due to higher number of participants' from rural residence.

Majority of patient participants in this study were illiterate and working in rural area, but surprisingly almost all perceived that they were well diagnosed upon giving blood for malaria diagnosis when they become febrile (89.3%). The reason for their satisfaction was mainly laboratory blood examination for confirmation of malaria assumes to be the best diagnostic method by the society. This was reflected in the perception assessment where they perceived that the right disease is obtained through laboratory investigation, a finding consistent with the

studies conducted in southwest Nigeria [23], qualitative study conducted in Ghana [25] and study conducted in North Eastern Tanzania [26].

This study also depicted that, waiting time to obtain malaria diagnostic result had association with patient satisfaction like the study conducted on ART lab service [29] and unlike study conducted in Trinidad and Tobago that waiting time had no influence on satisfaction [27]. Regarding this study, knowing malaria diagnosis after consulting clinicians rather than taking treatment by their own provided satisfaction for patients that coincides with the study conducted in North Eastern Tanzania that indicated knowing the malaria test result was statistically significantly associated with expressing satisfaction at interview [26].

In this study, Clinicians' satisfaction with malaria diagnostic service provided by their laboratories was higher as reported from a single item (95.9%) compared with similar study conducted in Tanzania (73.8%) [2]. Although the request for malaria smear examination to confirm malaria was somewhat similar, perception about reliability of lab result was lesser than this study, 41% in Tanzania and 52% in this study. This higher rate of satisfaction might be due to higher number of clinician participants in our study.

The current study revealed that only 15.4% of laboratory personnel had attended at least one refresher course, but this finding is not in agreement with similar study conducted in Tanzania (57.1%). This might be partly due to budget constraint in the region. Regarding specific training in malaria diagnosis, 38.5% of lab staffs have got training on malaria diagnosis. This finding is not comparable with similar study conducted in five administrative zones of Oromia, which showed that 24 % of lab staff received malaria microscopy training [21]. This variation might be due to differences in the regional focus on malaria diagnosis.

This study revealed that the large proportion of medical lab professionals (92.3%) use quality control or SOP to perform microscopy or RDT malaria diagnosis. This is because; all lab professionals (100% in this study) who have trainings on malaria and refresher courses are expected to have ability of developing SOP. On the other hand, the finding that almost 90% without having training also developed SOP is encouraging. This study is incomparable with similar study conducted in five administrative zones of Oromia, which has showed none of the surveyed laboratory facilities had formal quality assurance/quality control protocols for either

microscopy or RDTs [21]. This difference might be due to lack of training in earlier study compared with this study.

When data was analyzed using the mean score, almost 40 to 50% of all the study participants (patients and health professionals) had perception and satisfaction on the quality of lab diagnosis of malaria below the mean score. The observed satisfaction scores were 52.6%, 61.2%, and 50% for patients, clinicians and lab professionals, respectively. Low level of payment, lack of professional development/opportunity, lack of additional benefit and appreciation or recognition from management, unequal workload/ less manpower, electricity and water interruption, and even inappropriate physical facilities or working space were the major constraints identified in the study which is similar with the studies conducted in Tanzania, in seven countries of SSA, and a study done on lab service in Ethiopia, and also study conducted in SSA on salaries and incomes of health workers [2,11,15,20], respectively. These constraints have their own impact for improvement of quality lab service and motivation of health professionals like laboratory personnel and hence reducing the quality of their work or negligence might be enhanced.

Laboratory professional respondents strongly suggested that it is a must to take trainings and refresher courses since theoretical knowledge and practical skill are not similar, there might be new device /or recent information and diagnostic method. It is very essential to isolate problem on testing, quality improvement, and also to motivate, inspire/initiate laboratory professionals towards quality service. According to lab respondents for improvement of laboratory malaria diagnosis, reading materials like books and color atlas and enough supply of quality reagents and materials should be available, enough equipment and equipment maintenance personnel should be assigned at zonal level.

On the other hand, key informants in this study also described that besides the constraints listed above, late coming of patients to health facilities after developing sepsis yield death in similar manner with the study done in Zanzibar that malaria cases death occurred due to delay of mothers to bring their children to health facility. This might be due to mothers being distracted by work, on top of other care giving responsibility, and could also be financial constraint which might all affect their degree of satisfaction on the service given [30].

7. Strength and limitation of the study

Strength of the study:

- There is high response rate in this study
- Use of both quantitative and qualitative methods
- Study was conducted in the season where malaria case is high
- This study has tried to address satisfaction on three different study groups

Limitation of the study:

- Limited literatures on the same study
- Inadequate sample size especially for lab professionals
- The result from single item of satisfaction and computed variables create bias in literatures to address different aspects of satisfaction parameters

8. Conclusion

Majority of patients perceived, they were well diagnosed in facing fever when they provide blood for laboratory examination and satisfied when further lab investigations are conducted. Patients' ethnicity, residence, knowing malaria diagnostic result after consulting clinicians, and waiting time to receive malaria lab results were important predictors for satisfaction.

Majority of clinicians were satisfied with laboratory malaria diagnostic service in their health centers. Those clinicians that request lab malaria diagnosis less frequently specifically based on clinical sign and symptom of patients were more satisfied than those who request always for any febrile illness. This non specific request for any febrile illness caused excessive workload for lab professionals and might be a consequence for reagent consumption. When the mean score for satisfaction was used, the figures were low compared to the satisfaction rates based on single item. The majority of clinicians trust that laboratory malaria diagnosis result was very reliable while few of them was not considered as reliable due to high workload of lab personnel, poor state of microscope, shortage of reagents, electricity, water, updated knowledge or refreshment training provided were the major constraints or limiting factors raised from laboratory professionals that reduced quality lab malaria diagnostic service.

Presence of limiting factors in the health center laboratories were important predictors for satisfaction of lab professionals. Majority of health center laboratories in this study shows one or two laboratory professionals assigned and even human resource (lab professionals) to provide lab malaria diagnostic service had least mean rating score according to the respondents.

All health professionals including key informants have high priority for patient satisfaction and they do have measurement techniques for monitoring and evaluation of patient satisfaction periodically. And also they considered as a core measuring instrument for the quality of service provided.

9. Recommendation

According to the result of this study, the main predictive factors for perception and satisfaction were presence of constraints for malaria laboratory diagnostic service. Thus,

- Concerned bodies, FMOH and Regional Health Bureau should focus on laboratory infrastructure, electricity, water, manpower/ human resource, training and professional development and on duty payment for health professionals.
- Facility managers in collaboration with any concerned body should provide recognition for laboratories in the study area
- Any concerned body should focus on malaria endemic areas and support on preventive and diagnostic aspect
- The region should assign maintenance personnel at least in zonal level as poor status of equipment is identified as a challenge by key informants
- Laboratory professionals should focus on waiting time to provide lab malaria result.
- Clinicians should concentrate on clinical sign and symptom of patients to request malaria lab diagnosis and trust on the result to prescribe appropriate treatment.
- Service providers in general should provide awareness for patients to know malaria diagnosis after consulting clinicians to reduce self diagnosis and medication.

References

1. Pfeiffer K, Some F, Muller O, Sie A., Kouyate B., Haefeli W. E. et al. Clinical diagnosis of malaria and the risk of chloroquine self-medication in rural health centers in Burkina Faso, *Tropical Medicine and International Health 2008*; 13 (3):418–426.
2. Derua YA, Ishengoma DRS, Rwegoshora RT, Tenu F, Massaga JJ, Mboera LEG. et al. Users' and health service providers' perception on quality of laboratory diagnosis in Tanzania, *Malaria Journal* 2011; 10:78-85.
3. Government of India, manual on quality assurance of malaria laboratory diagnosis: rapid diagnostic tests, directorate of national vector borne disease control programme 2009.
4. Batwala V, Magnussen P, Nuwaha F. Are rapid diagnostic tests more accurate in diagnosis of plasmodium falciparum malaria compared to microscopy at rural health centres? *Malaria Journal 2010*; 9:349
5. D'Acremont V, Lengeler C, Mshinda H,Mtasiwa D,Tanner M,Genton B. Time To Move from Presumptive Malaria Treatment to Laboratory-Confirmed Diagnosis and Treatment in African Children with Fever. *PLoS Med* 2009; 6(1): 1-3
6. Orogade A. Current Issues in Clinical and Laboratory Diagnosis in Malaria, Ahmadu Bello University Teaching Hospital, Shika ZariaNigeria. *ISBN 2012*; 162-172 *http://www.intechopen.com/books/malaria-parasites/current-issues-in-clinical-and-laboratory-diagnosis-inmalaria*
7. Bisoffi Z, Sirima B, Angheben A, Lodesanis C, Gobbi F, Tinto H.et al. Rapid malaria diagnostic tests versus clinical management of malaria in rural Burkina Faso: safety and effect on clinical decisions. A randomized trial. *Tropical Medicine and International Health* 2009; 14 (5): 491–498
8. World Health Organization (WHO). The role of laboratory diagnosis to support malaria disease management: WHO technical consultation, Oct 2004; 25–26
9. Federal Ministry of Health (FMoH). Malaria Diagnosis and Treatment Guidelines for Health Workers in Ethiopia. 2nd Edition. Addis Ababa, July 2004
10. Petti CA, Polage CR, Quinn TC, Ronald AR, Sande MA. Laboratory medicine in Africa: a barrier to effective health care. *Clin Infect Dis 2006*; 42:377-382

11. Marinucci F, Majigo M, Wattleworth M, Paterniti AD, Hossain MB, Redfield R. Factors affecting job satisfaction and retention of medical laboratory professionals in seven countries of Sub-Saharan Africa, *Human Resources for Health* 2013, 11:38. http://www.human-resources-health.com/content/11/1/38
12. Olusegun PA. Improving laboratory service and work force in rural health facilities. *J Pak Med Stud. 2012*; 2(3):103-108
13. Amexo M, Tolhurst R, Barnish G, Bates I. Malaria misdiagnosis: effects on the poor and vulnerable. *Lancet 2004*; 364:1896-1898
14. Reyburn H, Mbatia R, Drakeley C, Carneio I, Mwakasungula E, Mwerinde O.et al. Over diagnosis of malaria in patients with severe febrile illness in Tanzania: a prospective study. *BMJ 2004*; 329:1212
15. Kassu A, Aseffa A. Laboratory services in health centres within Amhara region, north Ethiopia. *East Afr Med J* 1999; 76:239-242
16. Awi Zone. Bureau of Finance and Economic Development (BOFED), 2006 E.C.
17. Kahenya G. Challenges of scalling up laboratory services for diagnosis and monitoring tests of HIV/AIDS patients on anti retroviral therapy in Zambia, 2008.
18. World Health Organization (WHO). Malaria case management operation manual, 2009.
19. Michael L, Wilson MD. Laboratory Diagnosis of Malaria Conventional and Rapid Diagnostic Methods. *Arch Pathol Lab Med*. 2013;137:805–811
20. McCoy D, Bennett S, Witter S, Pond B, Baker B, Gow J.et al. Salaries and incomes of health workers in Sub-Saharan Africa. *The Lancet 2008*; 31: 675-681
21. Hailegiorgis B, Girma S, Melaku Z, Teshi T, Demeke L, Gebresellasie S.et al. Laboratory malaria diagnostic capacity in health facilities in five administrative zones of Oromia Regional State, Ethiopia. *Tropical Medicine and International Health 2010*; 15(12): 1449-1457
22. Zandbelt LC, Smets EMA, Oort FJ, Godfried MH, de Haes HCJM. Satisfaction with the Outpatient Encounter A Comparison of Patients' and Physicians' Views, J GEN INTERN MED 2004; 19:1088–1095.
23. Iwelunmor J, Airhihenbuwa CO, King G, Adedokun A. Contextualizing Child Malaria Diagnosis and Treatment Practices at an Outpatient Clinic in Southwest Nigeria: ISRN Infectious Diseases; A Qualitative Study, 2013.

24. Leslie T, Mikhail A, Mayan I, Anwar M, Bakhtash S, Nader M.et al. Over diagnosis and mistreatment of malaria among febrile patients at primary healthcare level in Afghanistan: observational study. *BMJ* 2012; 345:e4389
25. Ansah EK, Reynolds J, Akanpigbiam S, Whitty CJM, Chandler CIR. "Even if the test result is negative, they should be able to tell us what is wrong with us": a qualitative study of patient expectations of rapid diagnostic tests for malaria. *Malaria Journal* 2013, 12:258-68.
26. Chandler R, Mwangi R, Olomi R, Mbakilwa H, Whitty C, Reyburn H. Malaria over diagnosis: is patient pressure the problem? Oxford University press. *Health Policy and Planni, 2008*; 23:170–178
27. Singh H, Haqq ED, Mustapha N. Patients' perception and satisfaction with health care professionals at primary care facilities in Trinidad and Tobago: World Health Organization 1999; 77 (4), 1-5.
28. Teklemariam Z, Mekonnen A, Kedir H, Kabew G. Clients and clinician satisfaction with laboratory services at selected government hospitals in eastern Ethiopia, *BMC Research Notes* 2013, 6:15.
29. Mindaye T, Taye B. Patient's satisfaction with laboratory services at antiretroviral therapy clinics in public hospitals, Addis Ababa, Ethiopia. *BMC Research Notes 2012*, 5:184
30. Baltzell K, Elfving K, Shakely D, Ali AS, Msellem M, Gulati S, et al. Febrile illness management in children under five years of age: a qualitative pilot study on primary health care workers' practices in Zanzibar; *Malaria Journal* 2013, 12:37.
31. Central Statistical Agency (CSA). Census conducted in Ethiopia, 2007.
32. Allene Y. Awngi Grammar. In the Proceedings of the first national research symposium on sustainable development: a great concern in Africa: Debre Markos university 2010.
33. Ellen TP. Program Development and Evaluation, Analyzing Quantitative Data: University of Wisconsin-Extension; 1989.

Annexes

Annex I: English and Amharic Versions of Participant Information Sheet

ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF MEDICAL LABORATORY SCIENCES

You are invited to participate in a study to be conducted by MSc student Agajie Likie at Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Science. Please read the following statements and ask any unclear points before you agree to participate.

Introduction

The topic of this study is Patients' and Health Professionals' Perception and Satisfaction on Quality of Laboratory Malaria Diagnosis in Awi Zone; Amhara Nation Regional State, North West Ethiopia. Participation in this study is exclusively voluntarily. If you are not interested to participate or if you once decide to participate and withdraw yourself at any time, there will be no consequences and you will get all the services provided in the hospital with no problems. If you decide to participate, you have to sign on the consent permission template form.

What is expected from me as participant of the study?

As a participant of this study, you are expected to agree that some information will be collected. Thus, you are expected to give answers for some questions about quality of laboratory malaria diagnosis and socio-demographic conditions. You need to know that your results might be discussed with other appropriate individual out of this health facility. But your name and address will not be disclosed and rather an identification code will be used in such conditions.

How much time will I spent to participate in this study?

You will spend 15-30 minutes until the data is collected, the questionnaire is filled and the consent form is signed.

What are the risks of participating in this study?

Data collection will have no effect and pose no pain on you and the only thing you spend is just your time to fill the questionnaire.

How my information is to be kept in secrete?

All information that you give will be used for this study only.

Only limited numbers of professionals will have access to the information. All the information will be encoded in a computer and saved with password protection.

What are the benefits from participation?

Since this study is MSc student research, there will not be payments for participation. But your participation is important for the assessment of Patients and Health professionals Perception and Satisfaction on Quality of Malaria Diagnosis in Awi Zone; Amhara National Regional State, North West Ethiopia and to improve the service accordingly.

What are my rights as a participant of this study?

You have the right to withdraw yourself from the study at any time and all the services provided in the hospital will not be discontinued. You are also welcomed if you have any question for further explanations about the study. You can get the results of the analysis.

What can I do if I have a problem or a question?

Please direct any questions or problems you may encounter during this study to:

Agajie Likie

Department of Medical Laboratory Sciences, College of Health Sciences

Addis Ababa University

Mob: +251-91-1-90-98-94

Email: agalb.2000@yahoo.com

For additional information, please contact Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Sciences at: Telephone +251-1-12-75-51-70

Agree to participate? Yes ☐ No ☐

በአዲስ አበባ ዩኒቨርሲቲ፤ የጤና ሳይንስ ኮሌጅ

የህክምና ላቦራቶሪ ት/ክፍል

በአዲስ አበባ ዩኒቨርሲቲ፤ የጤና ሳይንስ ኮሌጅ የህክምና ላቦራቶሪ ት/ክፍል በሁለተኛ ዲግሪ ተማሪ የመመረቂያ ጥናት ላይ እንዲሳተፉ ተጋብዘዋል፡፡ እባክዎ በዚህ ጥናት ላይ ከመሳተፍዎ በፊት ከዚህ ቀጥሎ የሚገኘዉን ምንባብ በጥሞና ያንብቡ/ይመልሱ ፤ ግልፅ ያልሆነ ነገር ካጋጠመዎት ይጠይቁ፡፡

መግቢያ

የጥናቱ ርዕስ ህሙማንና የጤና ባለሞያዎች በወባ የላቦራቶሪ ምርመራ ላይና በጥራቱ ላይ ያላቸው አመለካከትና እርካታ ነዉ። እርሶ በዚህ ጥናት ላይ የሚኖሮት ተሳትፎ ሙሉ ለሙሉ በበጎ ፈቃደኝነት ላይ የተመሠረተ ነዉ፡፡በዚህ ጥናት ዉስጥ ላለመሳተፍ ከወሰኑ በዚህ የህክምና ቦታ ዉስጥ ያለወት ህላፊነት ወይም የሚሰጥዎት አገልግሎት አይቃረጥም፡፡በትናቱ ለመሳተፍ የሚስማሙ ከሆነ የስምምነት ቅጹ ላይ በጹሑፍ ወይም በጣት ፊርማዎትን ማስቀመጥ ይጠበቅቦታል፡፡

የጥናቱ ተሳታፊ በመሆኔ የሚጠበቅብኝ ምንድን ነዉ/ እን ፅናትዳ ቤንሻሻስ ይዴስ ማንዲስታው እንዳርይ

በዚህ ጥናት ለመሳተፍ የሚስማሙ ከሆነ መረጃ እንደሚሰጡ እና ለጥናቱ እንዲዉል መስማማት ይጠበቅብዎታል፡፡ የሚሰጡት መረጃ በዚህ የህክምና ቦታ ዉስጥ እና ዉጭ ለሚገኙ ለሥራዉ አግባብነት ላላቸዉ ሰዎች ቢነገር የማይቃወሙ መሆኑን መስማማት ይጠበቅቦታል፡፡ ይሁን እንጂ ይህ ዓይነቱ መረጃ የእርሶን ማንነት የሚገልጹ መረጃዎች ማለትም ስም፣ አድራሻ፣ የስልክቁጥር ና የመሳሰሉትን መረጃዎች አይጨምርም፡፡ ይልቁንም ለዚህ ጥናት አገልግሎት ብቻ የሚዉል መለያ ቁጥር ጥቅም ላይ እንዲዉል ይደረጋል፡፡ በተጨማሪም ስለ እርሶ አጠቃላይ የጤና ሁኔታ ለሚቀርቡ አንዳንድ ተጨማሪ ጥያቄዎች መልስ መስጠት ይጠበቅቦታል፡፡

በዚህ ጥናት መሳተፍ ምን ያህል ጊዜ ይፈጃል/ እን ፅናትዳ ቤንሻኚ ውኻ ጊዞ ዌያ?

የተዘጋጀዉን መጠይቅ ለመሙላት የስምምነት ቅጹ ላይ ለመፈረም 15-30 ደቂቃ ያስፈልጋል፡፡

በዚህ ጥናት መሳተፍ የሚአስከትላቸዉ ችግሮች ምንድናቸዉ/ እን ፅናትዳ ቤንሻኚ ያጋው (ሲፍፃው) ችግር ዝኮማ? ዝኩኒ እንዳር ችግራይ ሲፍፃ?

መረጃ በሚሰበሰብበት ወቅት ምነም አይነት ችግር አያስከትልቦትም ስለዚህም የሚያጡት ነገር ቢኖር መጠይቁን ለመሙልት የሚያጠፉት ጊዜ ብቻ ነዉ፡፡

የሕክምና መረጃ በሚስጥር ተጠብቆ መቆየት እንዴት ነዉ/ እክምኒ ሜሬጂው ምስቲር ዋትኝ ማንዲስቴ?

የሚሰጡት ማንኛዉም መረጃ የሚዉለዉ ለጥናቱ አላማ ብቻ ነዉ::ይህን ሊያገኙ የሚችሉ የተወሰኑ የጥናቱ ተባባሪ ሠራተኞች ብቻ ናቸዉ:: ከዚህም በላይ ስለ እርሶ ያለዉን ማንኛዉንም መረጃ የተለየ የይለፍ ቃል ባለዉ የኮፒዉተር የመረጃ ማህደር ዉስጥ እንድቀመጥ ይደረጋል::

በዚህ ጥናት መሳተፍ የሚያስገኛቸዉ ጥቅሞች ምንድን ናቸዉ/ እን ፅናትዳ ቤንቻሺ እንዳር ትከማሳ ያግፅፄ?

ይህ ጥናት የማስተርስ ዲግር መመረቂያ እንደመሆኑ መጠን ለተሳታፊዎች ገንዘብ አይሰጥም ለወደፊት በተመሳሳይ ሁኔታ ዉስጥ ላሉ ስራዎች መረጃ ላይ የተመሠረተ ህክምና ለመስጠት ያግዛል::

በዚህ ጥናት ተሳታፊ በመሆኔ መብቶቼ ምንድን ናቸዉ/ እን ፅናትዳ ቤንቻሻስ ይው ሜብት እንዳርይ?

በጥናቱ ዉስጥ ያሎትን ተሳትፎ በማንኛዉም ጊዜ የማቋረጥ ሙሉ መብትዎ የተጠበቀ ከመሆኑም በላይ ራሶን ከጥናቱ በማግለሎ ምክንያት የሚቀርቦት ምንም ዓይነት የህክምና አገልግሎት ወይም ጥቅም አይኖርም:: ከዚህም በተጨማሪ ጥናቱን በተመለከተ ማንኛዉንም ዓይነት ጥያቄ የመጠየቅና ገለፃ የማግኘት መብት አሎት::

ጥያቄ ካለኝ ወይም ችግር ቢያጋጥመኝ ምን ማድረግ ይገባኛል/ ካስታው ዝኩዋኒ አኹኪ ችግር ታምባኒ እንዳራይ ፄፔ?

ይህን ጥናት በተመለከተ ወይም ከዚህ ጋራ በተዛመደ መልኩ ስለሚያጋጥሙ ድንገተኛ ችግሮች ወይም ጥያቄ ካሎት በሚከተለዉ አድራሻ ይጠቀሙ::

አጋቸ ልኬ

የሕክምና ላብራቶሪ ሳይንስ ት/ክፍል፤ የጤና ሳይንስ ኮሌጅ፤ አዲስ አበባ ዩኒቨርሲቲ

ሞባይል፡ +251911 909894

ኢ-ሜይል: agalb.2000@yahoo.com

ለተጨማሪ መረጃ አዲስ አበባ ዩኒቨርሲቲ የሕክምና ላብራቶሪ ሳይንስ ት/ክፍል ይጠይቁ

ስልክ፡ +251-1-12-75-51-70

እስማማለሁ ☐

አልስማማም ☐

Annex II: English and Amharic Versions of Consent Form

This page contains an agreement signature to participate in the study entitled: Patients' and Health Professionals' Perception and Satisfaction on Quality of Laboratory Malaria Diagnosis in Awi Zone; Amhara Nation Regional State, North West Ethiopia. So please read the following points and sign your signature at the end in the space provided.

1. I understand the objective of the study in "Patients' and Health Professionals' Perception and Satisfaction on Quality of Laboratory Malaria Diagnosis in Awi Zone; Amhara Nation Regional State, North West Ethiopia" and I can communicate with the peoples that conduct the study when I want them.

2. I know that the information that I gave are going to be used for this study only.
3. I understand that, all the information given for the study and the results are confidential.
4. I understand that I will not get any money for my participation.
5. I understand that I have a right to stop from participation any time in the study.
6. All the information is explained by Mr./Mrs/Nurse.

Signature of the participant: _____

Address of the participant: _____

Date: _____

Please direct any questions or problems you may encounter during this study to:

Agajie Likie
Department of Medical Laboratory Sciences, College of Health Sciences
Addis Ababa University
Mob: +251-91-1-90-98-94
Email: agalb.2000@yahoo.com

For additional information, please contact Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Sciences at: Telephone +251-1-12-75-51-70

የተሳታፊ የስምምነት ቅጽ

ይህገፅ ህሙማንና የጤና ባለሞያዎች በወባ የላቦራቶሪ ምርመራ ላይና በጥራቱ ላይ ያላቸው አመለካከትና እርካታ - **በሚል ርዕስ ላይ ለሚከሄድጥናት ስለመሳተፍ የሚያመለክት የስምምነት ቅጽ ነዉ፡፡ ስለዚህ በዚህ ጥናት ዉስጥ ለመከተት / ለመሣተፍ / እባክዎን የሚከተለዉን ቅጽ አንብበዉ በመጨረሻ በተሰጠዉ ክፍት ቦታ ፊርማዎን ያኑሩ፡፡**

1. የጥናቱን ዓላማ ተገንዝቤአለሁ፤ጥናቱን የሚያከሄድዉን ሰዉ ስፈልገዉ ማግኘት እንደምችልም ተረድቻለሁ፡፡

2. መረጃ ተወስዶ ለጥናቱ ዓላማ እንደሚዉል ተረድቻለሁ፡፡

3. ለጥናቱ የሚሠጡመረጃዎችና ከጥናቱ የሚገኙ ዉጤቶች በሚስጥር እንደሚጠበቁ ተረድቻለሁ፡፡

4. ከዚህ ጥናት ገንዘብ በተለየ መልኩ እንደማላገኝ ተርድቻለሁ፡፡

5. ከዚህ ጥናትበፈለግሁ ጊዜ አቋርጬ መዉጣት እንደምችል ተረድቻለሁ፡፡

6. ይህ መረጃ በአቶ/ ወ/ሮ/ነርስ_____ተገልፆልኛል፡፡

የተሳታፊ ፊርማ፡ _____
ኮድ፡_____
ቀን፡ _____

<u>ችግር ካጋጠመዎት ወይም ጥያቄ ካለዎት፤</u>

አጋዥ ልኬ

የሕክምና ላብራቶሪ ሳይንስ ት/ክፍል፤ የጤና ሳይንስኮሌጅ

አዲስ አበባ ዩኒቨርሲቲ

ሞባይል+251911 909894

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ለተጨማሪ መረጃ አዲስ አበባ ዩኒቨርሲቲ የሕክምና ላብራቶሪ ሳይንስ ት/ክፍል ይጠይቁ

ስልክ+251-1-12-75-51-70

Annex III: Questionnaire (English version for health professionals and Awigna & Amharic translated for patients)

Part I: For Laboratory professionals

Please answer every question since all are valuable for this study:

S. N^{o}	Questions	Responses	Skip to
100	**Socio-demography**		
101	Name of Health facility	_____	
102	Participant code	_____	
103	Age	_____	
104	Sex	1) Male 2) Female	
105	Marital status	1) Single 2) Married 3) Divorced 4) Widowed 99) If other specify__	
106	Ethnicity:	1) Awi 2) Amhara 3) Tigire 4) Oromo 99) Other specify_____	
107	Work area:	1) Rural 2) Urban	
108	Level of profession?	1. Lab assistant 2. Lab technician 3. Lab technologist 99. Other specify___	
109	What is your responsibility in the lab?	1. Lab head 2. Unit leader 3. Subordinate 99. Other specify _____	
110	If you are lab head, how many lab personnel do you have?	1. One 2. Two. 3. Three. 4. Four 5. Five 99. Other specify____	
111	If you are lab head, how is the educational level of the laboratory personnel?	1. Diploma__(No of person ___)	

		2. Degree___(No of person ___) 99. Other_____(No of person ___)	
112	What type of diagnosis you usually practice to confirm malaria?	1.Microscopy 2.RDT 3.Both 99. Other specify_____	
113	If you choose “RDT” what is your reason?	1.No microscope available 2.No reagents for blood smear available 3.Easy procedure of RDT 4.Better performance of RDT than microscopy 99.Other specify_____	
114	How many years do you work in regard to your current level of education?	----------	
115	Do you have a quality control/SOP tool to perform microscopy or RDT malaria diagnosis?	1. Yes 2. No	
116	If your answer is No for (Q115), What are the possible reasons?		
117	Have you ever taken trainings about lab malaria diagnosis?	1. Yes 2. No	
118	If Yes for Q 117, how many times?	_____	
119	If Yes for Q 117, What changes in your level		

	of diagnosing malaria you got?		
120	If No for Q 117, what do you recommend?		
121	What are the effects of absence of training to quality of lab malaria diagnosis?		
122	Have you ever taken refresher courses?	1. Yes 2. No	
123	If Yes Q122, what course/s did you take and explain the advantages of refresher courses		
124	If No in Q122,what is your recommendation?		
125	How much you are experienced about lab malaria diagnosis?	1. Adequate 2. Medium 3.Inadequate 99.Other (specify) ____	
126	Are you satisfied with your profession/job?	1. Very satisfied 2. Satisfied 3. Neutral 4. Dissatisfied 5. Very dissatisfied	
127	If your answer above is dissatisfied, what is your reason? **(More than one answer is possible)**	1. High workload 2. Less salary/payment 3. Routine work 99. Other specify_____	
128	Have you heard of any issues/problems from your patients about laboratory malaria diagnostic services?	1.Yes If yes, go to ⟶ 2. No 3. Don't know	**Q 129**
129	How often?	1. Always 2. Usually 3. Sometimes 4. Rarely 5. Never	
130	In your opinion, how patient satisfaction is important in your organization?	1. High priority 2. Mid-level priority 3. Low priority 4. Don't know	

131	In your opinion, how patient satisfaction ratings were changed in malaria diagnostic services at your organization in the past year?	1. Improved considerably 2. Improved somewhat 3. Has remained about the same 4. Has declined somewhat 5. Has declined considerably 6. Don't know	
132	What are the major constraints of the lab quality malaria diagnosis? **(More than one answer is possible)**	1.Inappropriate physical facility or working space 2.Supply of reagents are not available 3.Lack of equipment, maintenance and repair 4.Electricity and water interruption in the laboratory 5.Less manpower 6.Under qualified professionals 7.Lack of training 8.Lack of understanding about benefit of quality laboratory diagnosis 99.Other specify_____	
133	What trainings and refresher courses regarding to malaria diagnosis or other lab services do you need in the future?		
134	What do you recommend to improve the general laboratory malaria diagnosis and other lab services?		

Please put a tick (✓) in the column which resembles your opinions most closely only once

	Questions	Excellent	Very good	Average/ good	Fair	Poor
135	Quality/reliability of lab malaria results					
136	Matching lab results of malaria diagnosis with clinical data					
	Communication					
137	Polite interaction with clinician for service delivery					
	Resource					
138	Has enough equipment to provide laboratory services efficiently?					
139	Have enough supplies & reagents to provide malaria diagnostic laboratory services efficiently?					
140	Have enough human resources to provide malaria diagnostic laboratory services efficiently?					
	Challenge	**Strongly Agree**	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**
141	Excessive / unequal workload					

142	Lack of professional development						
143	Lack of appreciation/ recognition from management						
144	Poor working condition						
145	Lack of benefit/ training, incentive, etc/						

Part II: For Clinicians

Please answer every question since all are valuable for this study:

S. N^{o}	**Questions**	**Responses**	**Skip to**
200	**Socio-demography**		
201	Name of Health facility	_____	
202	Participant code	_____	
203	Age	_____	
204	Sex	1) Male 2) Female	
205	Marital status	1) Single 2) Married 3) Divorced 4) Widowed 99) Other specify_____	
206	Ethnicity:	1) Awi 2) Amhara 3) Tigire 4) Oromo 99) others specify_____	
207	Work area:	1) Rural 2) Urban	
208	What is your profession/ rank?	1. BSc nurse 2. Diploma nurse 3. Assistant nurse 4. Health officer 99. Other specify_____	

209	What is your current status?	1. GP 2. HO 3. Nurse 4.midwifery 99. Other specify _____	
210	What is your current position in this health facility?	_____	
211	How many years have you been working in the health profession field?	1.1-2 years 2. 3-5 years 3. 6-10 years 4. More than 10 years 99. other specify _____	
212	How many years do you work in this health facility?	1. 1-2 years 2. 3-5 years 3. 6-10 years 4. More than 10 years 99.other specify _____	
	Malaria specific questions		
213	How often do you request lab malaria diagnosis?	1.Always (frequently) 2.Sometimes (less frequently) 99.Other specify_____	
214	If you request laboratory "always", what is your reason?	1.To confirm malaria 2.For differential diagnosis 3.Upon patient request 99.Other specify_____	
215	If you request laboratory less frequently, what is your reason?	1.Based on clinical sign and symptom of patients 2.Only when laboratory is open 3.Only if patients ask 4.When managing fewer patients 99.Other specify_____	

216	How much you trust laboratory malaria diagnosis results?	1. Very reliable 2. Just reliable 3.Not reliable 99.Other specify_____	
217	If you choose "very reliable" in question "216", what is your reason?	1.The lab is competent, motivated and skilled staffs 2.The lab has adequate equipment 3.The lab uses more than one testing methods for malaria diagnosis 99. Other specify _____	
218	If you choose "just reliable" in question "216", what is your reason?	1.Complexity of identifying malaria parasites microscopically 2.Incompetent lab personnel 3.Lab personnel are over worked 4.Poor state of microscopes and / or reagents 99.Other specify _____	
219	If you said lab results are not reliable in question "216", why?		
220	Are you satisfied with lab malaria diagnostic service?	1. Very satisfied 2. Satisfied 3. Neutral 4. Dissatisfied 5. Very dissatisfied	
221	If you say "dissatisfied in Q220", why?		
222	Have you heard of any issues/problems from your patients about laboratory malaria diagnostic services?	1.Yes If yes, go to ⟶ 2.No 3.Don't know	**Q223**

223	How often?	1. Always 2. Usually 3. sometimes 4. Rarely 5. Never	
224	In your opinion, how important is patient satisfaction within your organization?	1. High priority 2. Mid-level priority 3. Low priority 4. Don't know	
225	In your opinion, how patient satisfaction ratings changed in malaria diagnostic services at your organization in the past year?	1. Improved considerably 2. Improved somewhat 3. Has remained about the same 4. Has declined somewhat 5. Has declined considerably 99. Don't know	

Please rate your lab services by putting tick (✓) in the column which resembles your opinions only once

	Questions	**Excellent**	**Very good**	**Average/ good**	**Below Average**	**Poor**
	TAT					
226	Are you satisfied with routine test turnaround times for Malaria?					
227	If turnaround times are rated below average/poor, please indicate specific test(s)					
	Practice towards Service					
228	Quality/reliability of laboratory malaria results					
229	Matching clinical data with laboratory results of malaria diagnosis					
230	Availability of laboratory malaria test results / results not missing					

	Communication					
231	Courtesy of clinical laboratory staff friendly, helpful, knowledgeable and able to answer your questions.					
	Resource					
232	Availability of enough equipment to provide laboratory services efficiently					
233	Availability of enough supplies & reagents to provide malaria diagnostic laboratory services efficiently					
234	Availability of enough human resources to provide malaria diagnostic laboratory services efficiently					
235	**Work Load** How do you rate your health facility laboratory service workload?	Very high	High	Fair	Low	Very low

Part III: For patients/care takers (ለታካሚዎች የተዘጋጀ መጠይቅ):

S. Nº	**Questions**	**Responses**	**Skip to**
300	**Socio-demographic characteristics**		
301	Name of Health facility		
302	Participant code		
303	Age: **ድማሚ/እድሜ**	_____	
304	Sex: **ፆቲ/ፆታ**	1) Male **ሻርጂ/ወንድ** 2) Female ኹና/ሴት	

305	Marital status: ትዳሩ አኺኒ/የትዳር ሁኔታ	1) Single ትዳራ ጋው/ያላገባ/ች 2) Married ትዳር ቄና/ያገባ/ች 3) Divorced ትፍኹ/ትፍስቲት/የተፋታ/ች 4) Widowed ዄራ ክሩት/በሞት የተለየ/ች 99) if other specify__ እሊው ያኹኒ ጌሌፃን /ሌላ ካለ ይግለጹ	
306	Ethnicity: ቤራሳብ/ብሄር	1) Awi አዊ 2) Amhara አሚኺሪ/አማራ 3) Tigire ትግሪ/ትግሬ 4) Oromo ዋራሙ/ኦሮሞ 99) others specify_____ እሊው ያኹኒ ጌሌፃን//ሌላ ካለ ይግለጹ	
307	Work area: እንፅኺው ስፍሪ/የስራ ቦታ	1) Rural ጌዬር/ገጠር 2) Urban ኬቴም/ከተማ	
308	Level of education ክንቲው ዴሬጂ/የትምህርት ደረጃ	1.Illiterate ማይም/ቻዊ/ያልተማረ/ች 2.Primary education እምፕላንቲ አች/የመጀመሪያ ደረጃ 3.Secondary education ላኺንቲ አች/ሁለተኛ ደረጃ 4.College/university education ኮሌጅ/ዩኒቨርሲቲ 99.OtherSpecify /አሊው ዝኩኒ ጌሌፃን//ሌላ ካለ ይግለጹ	
309	Employment ክፅር (ክፅሩ አኺኒ)/የስራ ሁኔታ	1.Farmer ግባር/ገበሬ 2.Merchant ጊኒኒ/ነጋዴ 3.Government employee ምንግስቱ ክፅር/የመንግስት ሰራተኛ 4.Non-government employee ምንግስቱ ጋው ክፅር/የግል ስራ 99.Otherspecify/እሊውያኹኒጌሌፃን//ሌላካለይግለጹ--------	
310	What is your main clinical symptom? ኩ ቹዋ ቕንዚው ምልኻት/ምልክት እንዳርይ?/ዋና የበሽታ ምልክትዎ ምንድን ነዉ	1.Fever አካላቱ እንኩዊንት/ትኩሳት 2.Headache ኃሪ ቕንዛ/የራስ ምታት 3.Chills ክዝክዛ ዊዊኝ 4.Sweat ላቡፅኝ 5.Vomiting ጃላፅኝ	

		6.Joint pain አካላት ምትኚ 99.Otherspecify/እሊውያኸኒጌሌፃን//ሌላካለይግለጹ_____	
311	How do you know about malaria diagnosis? ምንድራሺ ምርማሪውሳ ውቴቶ ማሌኑ (ታቻኑ) ዋትኝይ?/የወባ ምርመራን እንዴት አወቁ	1.By your selves እንትኝርትኝስ/በራስዎ ጊዜ 2.After consulting a clinician አኪሞ (ቲኑሳ ሞይቲኔ) ካሲሻስ/የህክምና ባለሙያ በማማከር 3.After consulting a lab personnel /ላቦቶሪውሳ ማራማራንቴ ካሲሻስ/የላቦራቶሪ ባለሙያ በማማከር 99.Ifotherspecify_እሊውዝኩኒጌሌፃን//ሌላካለይግለጹ_____ ___	
312	When do you feel well diagnosed in facing fever? /አካላት እንኩዊነታኒ (ትኩሳቲስ እምስቴኒ) እንቶጂስ ቹንዜ ማሊኑሳ ፄጌራው ዋኒ?/ትኩሳት ሲያጋጥምዎት በደንብ የታከሙ ያህል የሚሰማዎት መቼ ነዉ	1.Upon giving blood for lab malaria diagnosis ማራማርስትሻስ ብሬ ምንድራሺው ላቦራቶሪስ ይናኒ/ለላቦራቶሪ ምርመራ ደም ሲሰጡ 2.Upon buying drugs simply from pharmacy ማራማርስትናውሌስ እጆ ፋርማሲዬስ ጀውናኒ/መድሃኒት ሲገዙ 3.Upon seen by a clinician without lab diagnosis ላቦራቶሪስ ማራማርስትኒቴስ ክላ አኪም ማራማራኒ /ያለ ላቦራቶሪ ምርመራ በሀኪም ብቻ ሲታዩ 99.If other specif/እሊው ዝኩኒ ጌሌፃን//ሌላ ካለ ይግለጹ_____	
313	How long do you wait to receive lab malaria diagnosis results?/ምንድራሺው ላቦራቶሪ ምርማሪው ውቴት ዋሳ ላካ ጊስ ታምቤ?/የወባ ላቦራቶሪ ዉጤት በምን ያህል ጊዜ ዉስጥ ይቀበላሉ	1.Within 30 minutes 30 ዳኪካስ/በ30 ደቂቃ ዉስጥ 2.Thirty minutes to one hour 30 ዳኪካዬስ እምፕል ሳቶ ኺስታ/ከ30 ደቂቃ እስከ አንድ ሰዓት 3.After one hour እምፕል ሳትዬስ ፋሌንጋ/ከ1 ሰዓት በኃላ 99.If other specify_____እሊው ዝኩኒ ጌሌፃን//ሌላ ካለ ይግለጹ	
314	How do you feel about the waiting time to receive lab malaria diagnosis result?/ምንድራሺው	1.Right ልኪ/ክኾክቺ/ትክክለኛ	

	ላቦራቶሪ ምርማሪው ውቴት ታምብምባ ዊዳውሳ ሳቶ ካንቱኽስ እንዳራ ኔ?/የወባ ላቦራቶሪ ዉጤት ለመቀበል ሲጠብቁ ምን ይሰማዎታል	2.Short ፅሊ/አጭር 3.Long ሚንች/ረጅም 99.If other specify_____እሊው ዝኩኒ ጌሌፃን//ሌላ ካለ ይግለጹ	
315	Are you satisfied with laboratory malaria diagnostic services? ምንድራሺው ላቦራቶሪ ምርማሪው ግልጋሎቲስ ዴስቴኒ ማ?/በላቦራቶሪ ምርመራዉ ረክተዋል?	1. Very satisfied ማልኝ ደስቲኒ 2. Satisfied ዴስቲኒ 3. Neutral ዴስ ናያኪ፤ ኪፊስታያኪ 4. Dissatisfied ኪፊስታ 5. Very dissatisfied ማልኝ ኪፊስታ	
316	If you say “Dissatisfied to Q315” what is your reason?_____ጃሊኒ ካሲስ ኩ ዙርዊ እላ/ጋሪኻ ያኹኒ ኩሳ ምክኒያቶ ጊሊፅ /የተራ ቁጥር Q315 መልስዎ አልረካሁም ከሆን ምክንያትዎ ምንድን ነዉ	_____	
317	If you say “Satisfied to Q315”,what is your reason?_____ ጃሊኒ ካሲስ ኩ ዙርዊ ይጋ ያኹኒ ኩሳ ምክኒያቶ ጊሊፅ /የተራቁጥር Q315 መልስዎ ረክቻለሁ ከሆነ ምክንያትዎ ምንድን ነዉ		
Rating score for patients opinion to the service provided in the health facilities			

318	Did this health facility staffs help you with everything you need help when you are sick with febrile illness? ቑንዳስቴታ አኪምኾ ካታኒ አኪምካ እርዳታናማ?	1. All the time ይጋ ሴርኮ	2.Most of the time ይጋ ሚንቾ ጊዘ	3. **Sometimes** ፋያፋያማ	**4. never** እምፕላኒውላ እላ	
319	How sensitive were the staffs to your worries and concerns when you were in this health facility? ቑንዳስቴታ አኪምኾ ካታኒ አኪምካ ክ-ቑንዛዳ ሻኹሺናማ?	1.Very sensitive አይሎ ሻኹሺና	2.Sensitive ሻኹሺና	3.Don’t know አን አቓያ/እንቓናዴ	4.Notvery sensitive ማልኝ አማቖስታላ እሺና	5.Notsensitive at all **ሻኹላ እሺና**
	Questions	**Excellent**አንዲየዋ ጉዲ	**Very good**ማልኝ ጉዲ	**Average/good**ጉዲ	**Below Average**ይጉዋው ዝኮ	**Poor** ጉዳ ጋው

	Accessibility					
320	Easy to access the service ቼርስታኑላ ግልጋሎቴ አግፅኾስ					
321	Waiting time for the service አግልግሎቴ አግፅኾስ ቱሮ ማንዲኻ					
322	Respectfulness of health professionals አኪምካ ቹንዳስቴሞ ኬቤርፅኻ					
323	Encouraged to ask any information አዋኪ ሜሬጂ ዴስ ንካማ ካሲኻ					
324	Phlebotomy services for malaria laboratory test/examination ምንድራሺ ብሪዉ ማራማርዪ ስፍሪ					
325	Availability of laboratory malaria test ምንድራሺ ላቦራቶሪው ምርምሪስ አግስትኻ					
326	Perception about quality of laboratory results ላቦራቶሪው ውቴት አምንኻፅኻ					
327	Willingness to conduct laboratory investigation ላቦራቶሪውሳ ምርምሬ ካስኻፅኻስ ፋይኻ					

328	Availability of service providers in working hours እንፅኺ ሳታስ ግልጋሎቴ እያንኩ አቕ እንፅኺ ሻናዳ አግስትሻ					
	Communication					
329	Health professionals language to communicate አኪምካ አኪምስታንትካሊ ቱትጋኑ ኮንኪ					
330	The response to your requests, and problems from lab personnel ላቦራቶሪው እንፃኽስታንቲ እንት ካስቴውስ እያው ዙርዒ					
331	Explanation about prescribed malaria drug አኪሙሳ ትዛዞ ኽይትሻፃማ ድኹሻ					
332	How satisfied with the care you received from this health facility staffs? አኪምኾዳ ፄውስታይኹ እርዳቲስ ዴስቲኒማ?	Very satisfied ማልጋ ዴስቲኒ	Satisfied ዴስቲኒ	Neutral ዴስ ናያኪ፤ ኪፊስታያኪ	Dissatisfied ኪፊስታ	Very dissatisfied ማልጋ ኪፊስታ
333	What service related improvements can you recommend? ግልጋሎቲሊ እምትኾኽስ አሼሼልሻፅሻ ዝኩኽ እንዳሪ?					
334	Other questions and comments? ሊው ካሲ አኹኪ ካንቲ ዝኩኒ ድቕዊ					

Part IV. Key informants interview questions

I. Background information

1. Name of Health facility_____

2. Participant code_____

3. Age: 1) 18-25 2) 28-35 3) 38-45 4) 48-55 5) ≥ 55

4. Sex: 1) Male 2) Female

5. Current Status/ Position of key informant_____

6. Work experience _____

II. Satisfaction and perception questions

7. Have you heard any compliant/problems from your health professionals in the service delivery in the past years and even currently?

8. Have you heard of any issues/problems from your patients about laboratory malaria diagnostic services? And even other laboratory services?

9. In your opinion, how patient satisfaction ratings changed at your organization in the past year?

1o.In your opinion, how important is patient satisfaction within your organization?

11. Has your organization initiated programs to improve patient satisfaction within the past year?

12. Does your organization have managers/staff dedicated to patient-satisfaction matters?

13. How often does your organization conduct surveys to evaluate patient satisfaction?

14. Which measurement technique is used to evaluate patient satisfaction?

15. What do you like least about malaria diagnostic laboratory service in your laboratory?

16. What do you like most about malaria diagnostic laboratory service in your laboratory?

17. Is there any death of patients with malaria in the past years and even currently?

18. Is the death due to low perception and satisfaction of patients and clinicians towards lab service?

19. Is the death due to misidentification of malaria species and mistreatment provided?

20. What service related improvements can you recommend?

Annex IV: Declaration

I the undersigned declare that this thesis is my original work in partial fulfillment of the requirements for Master of Science Degree in Clinical Laboratory Science (Health Laboratory Management and Quality Assurance). I also declare that it has never been presented in this or any other university and that all resources and materials used in the thesis have been duly acknowledged.

Name of the student: _____

Signature: _____

Place of submission: Department of Medical Laboratory Science, College of Health Science, Addis Ababa University

Date of submission: _____

This thesis has been submitted for examination with my approval as a university advisor

Name of the advisor: _____

Signature: _____

Place of submission: Department of Medical Laboratory Science, College of Health Science, Addis Ababa University

Date of submission: _____

Name of the advisor: _____

Signature: _____

Place of submission: Department of Medical Laboratory Science, College of Health Science, Addis Ababa University

Date of submission: _____