# Factors affecting quality of laboratory services in public and private health facilities in Addis Ababa, Ethiopia

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## ABSTRACT

### Background

Quality laboratory service is an essential component of health care system but in Sub-Saharan Africa such as Ethiopia, laboratories quality system remains weak due to several factors and it needs more attention to strengthen its capacity and quality system.

### Methodology

A cross sectional study was conducted using a questionnaire to assess factors affecting the quality of laboratory service at private and public health institutions in Addis Ababa.

### Results

A total of 213 laboratory professionals participated in the study and 131 (61.5%) participants had bachelor degree. Majority, 133 (62.4%), of the professionals did not attend any work related training. Seventy five (35.2%) respondents believed that their laboratories did not provide quality laboratory services and

the major reported factors affecting provision of quality services were shortage of resources (64.3%), poor management support (57.3%), poor equipment quality (53.4%), high workload (41.1%), lack of equipment calibration (38.3%) and lack of knowledge (23.3%). Moreover logistic regression analysis showed that provision of quality laboratory service was significantly associated with result verification (AOR=9.21, 95% CI=2.26, 37.48), internal quality control (AOR= 6.11, 95% CI=2.11, 17.70), turnaround time (AOR=5.11, 95% CI=1.94, 13.46), shortage of equipment (AOR=7.76, 95% CI=2.55, 23.66), communication with clinicians (AOR=3.24, 95% CI=1.25, 8.41) and lack of job description (AOR=3.67, 95% CI=1.319, 10.22).

***Conclusion***

In conclusion, the major factors that affecting the quality of laboratory service were associated with poor human resource management, poor resources provision, poor management commitment, ineffective communication system and lack of well-established quality management system.

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## INTRODUCTION

In Sub-Saharan Africa, the major challenge for delivering quality health service is the lack of reliability of medical laboratory services[1]. Quality laboratory service is essential for a wide range of diagnosis, treatment and monitoring in health care delivery. But due to lack of awareness on the laboratory service role in many developing countries, laboratory services have shortage of resources, poor management system[2-3,] lack of quality assurance program, shortages of equipment, shortage of training and poor staff motivation system[4].

Poor quality laboratory services lead to unnecessary expenditures, misery in human lives and suffering, and producing wrong data in disease prevalence due to misdiagnosis. The results are over-treatment and overuse of antibiotics for inappropriate clinical circumstances which leads to the emergence of drug resistant microorganisms include multi-drug resistant TB[5]. Likewise patient safety is also influenced by the frequency and seriousness of errors that occur in the health care system[6].

It is well known that quality of laboratory service is dependent on technical skills, quality management systems and the motivation of human resources[7]. However, the first barrier for quality improvement at health care system is human capacity development, which continues to be a gap in implementing health programs including laboratory services[8], in addition several barrier are identified in laboratory services, including lack of laboratory supplies, poor quality management system, absence of laboratory standards and policy[9]. Besides lack of access to reliable diagnostic services and under-resourced laboratory infrastructure in developing countries are another challenges for quality of diagnoses which lead to inadequate treatment, increased morbidity, and inaccurate determination of the burden of disease[10].

Moreover, studies from Sub-Saharan Africa revealed that major factors affecting the laboratory services were staff shortages, poor communication system, inadequate equipment, low motivation, lack of training[11], lack of internal quality control (IQC), power supply interruption, equipment failure, and poor infrastructure. Furthermore, another limitation for establishing an efficient laboratory system in developing countries was a lack of resources and a system for implementing, managing, and monitoring laboratory activities[9].

To tackle these factors, several efforts are continued in sub-Saharan Africa however there are still numerous challenges hindering the quality of laboratory services as well as health care system. Moreover as Ethiopia is one of Sub-Saharan Africa country, laboratory infrastructure and quality assurance activities remain weak[12] and there is little information available on factors affecting quality of medical laboratory services. Therefore, this study was conducted to assess factors affecting the provision of quality of laboratory services and provide baseline information to policy and decision makers.

## MATERIALS AND METHODS

### Study design

A descriptive cross sectional study was conducted using questionnaire to assess factors that affecting the provision of quality of medical laboratory services in public (owned by government) and private (owned by private and non-government organization) health facilities from December 2013 and February 2014 in Addis Ababa, Ethiopia. The estimated population size of Addis Ababa was 2.74 million[13] and according to 2011 Health and Health Related Indicators report the city had 42 public and private hospitals, 37 health centers and 394 laboratory professionals[14]. Health institution that have functional laboratories and willing to participate were included in the study.

### Sampling procedures

A single population proportion formula was used for determination of the sample size considering the following assumptions: proportion of 50% taken due to absence of similar previous study, level of significance = 0.05, Marginal of error (d) = 5%, Z ($\alpha$/2) = Z-score at 95% confidence interval = 1.96.

$$n=[Z_{a/2}^2 \times p(1-p)]/d^2$$

$$n=[1.96^2 \times 0.5(1-0.5)]/0.05^2=384$$

$$n=384$$

According to Health and Health Related Indicators there were 394 laboratory professionals in Addis Ababa[14], therefore, the correction factor was done using the finite population formula (nf) from a target population (N) and the sample size was reduced according to the following formula:

$$nf=n/(1+n/N)$$

$$nf=384/(1+384/394)=194$$

$$nf=194$$

Considering 10% of non-response rate, the sample size for laboratory professionals was 213. Finally sample size was allocated proportionately for 30 voluntary and eligible health facilities according to number of laboratory professionals working in their laboratories and laboratory professionals were selected for the interview using random sampling method.

### Data collection procedures

Structured questionnaire was used for data collection. It included different questions, such as socio-demography, education background, work experience, motivation, communication, training, quality assurance activities, and factors affecting quality of laboratory service.

All laboratory professionals having more than a years experience and willing to participate were included in the study. Trained and experience laboratory technologists interviewed laboratory professionals using questionnaire for data collection. Principal investigator involved in overall controlling activities of data collections and assisting data collectors during the process of data collection.

## Data management and statistical analysis

All data were coded and fed into SPSS version 16 statistical software and data were checked for completeness and consistency of variables. Descriptive statistics were computed to calculate the frequency and percentage, and bivariate analysis were also conducted to assess the presence of associations between dependent variable and the independent variables. Dependent variable is provision of quality laboratory services; defined as the ability of a laboratory service to satisfy stated or implied needs of a specific customer or fulfils requirements, and the independent variables are socio demography variables, education background, work experience, motivation, communication, training, workload and quality assurance practices *(Job descriptions, supplies & reagents management, equipment calibration & maintenance, result verification, Internal quality control activities practice and turnaround time customer management and services interruption).*

Moreover multiple logistic regressions were carried out to control the confounding factors, and variables which had a p-value less or equal to 0.05 in bivariate analysis were included in the multivariate logistic regression model. Odds ratio with 95% confidence interval were used to measure the strength of association between potential affecting factors and provision of Quality laboratory services.

## Ethical consideration

Before any attempt to collect data, ethical clearance was obtained from Institutional Review Board (IRB) of School of Medicine, Addis Abba University. Each participant was informed about the purpose of the study, the right to refuse to participate in the study, and anonymity and confidentiality of the information gathered.

## RESULTS

### Socio-demographic characteristics

A total of 213 laboratory professionals participated in this study from 13 public and 17 private health institutions in Addis Ababa, and 130 (61%) of the respondents were employed in public health institutions and majority 135 (63.4%) of participants were male. One hundred and twenty-one (56.8%) of respondents were between 20-30 years old with an average age of 32 years. One hundred thirty one (61.5%) were Medical Laboratory Technologist (Bachelor Degree) referred to as highly trained laboratory professionals and 82 (38.5%) were Medical Laboratory Technicians (Diploma) referred to as mid-level trained laboratory professionals.

In terms of work experience, 179 (84.0%) the respondents had 3 and above years of experience

| Table 1 | Socio-demographic characteristics of laboratory professionals working in public and private health institutions in Addis Ababa Ethiopia (n=213) |
|---|---|
| **Variable** | **Frequency (%)** |
| **Sex** | |
| Male | 135 (63.4%) |
| Female | 78 (36.6%) |

| Age group | |
|---|---|
| 20-30 Years | 121 (56.8%) |
| 31-40 Years | 59 (27.7%) |
| 41-50 Years | 18 (8.5%) |
| 51-60 Years | 15 (7.0%) |
| **Educational level (profession)** | |
| Diploma (Laboratory Technician) | 82 (38.5%) |
| Bachelor Degree (Laboratory Technologist) | 13 (161.5%) |
| **Working organization** | |
| Public | 130 (61.0%) |
| Private | 83 (39.0%) |
| **Working experience in laboratory fields** | |
| 1-2 Years | 34 (16.0%) |
| 3-5 Years | 61 (28.6%) |
| 6-10 Years | 48 (22.5%) |
| >10 Years | 70 (32.9%) |
| **Position** | |
| Laboratory head | 20 (9.4%) |
| Supervisor | 33 (15.5%) |
| Expert | 152 (71.3%) |
| Quality Officer | 8 (3.8%) |

| Laboratory discipline | |
|---|---|
| General laboratory | 127 (59.6%) |
| Clinical chemistry | 28 (13.1%) |
| Hematology | 23 (10.8%) |
| Parasitology | 15 (7.0%) |
| Microbiology | 11 (5.2%) |
| Immunology/Serology | 9 (4.2%) |

and they worked as head, supervisor, quality officer and expertise and 127 (59.6%) of the professionals worked at general laboratory which perform basic chemistry, hematology, parasitology, microbiology and serology tests and the remaining professionals work at Clinical Chemistry, Hematology, Parasitology, Microbiology and Immunology laboratories (Table 1).

### Motivation and communication

Most 187 (87.8%) of the laboratory professionals were not satisfied with their salary and 178 (83.6%) respondents indicated that there was no system for staff recognition, and 133 (62.4%) of the laboratory professionals did not attend any task specific training and 128 (60.1%) continuing education program. A total of 150 (70.4%) of the laboratory professionals had high workload while 125 (58.7%) of the respondents indicated a shortage of human resources in their laboratories. In addition 110 (51.6%) of the laboratory professionals did not have job descriptions for the task assigned. Concerning communication, the laboratory professionals indicated that there were no systems to communicate with laboratory staff, upper management, and clinicians with respondents 126 (59.2%), 120 (56.3%) and 75 (35.2%) respectively (Table 2).

### Quality assurance practices

In terms of quality assurance practice, findings from our study revealed that 85 (39.9%) laboratory professionals did not perform equipment calibration & maintenance as per instruction and 91 (42.7%) of the respondents also indicated that there was supplies and reagents interruption and the available supplies and reagents had also poor quality. Likewise, internal quality control (IQC) was not conducted regularly as stated by more than 33% of the respondents besides 34 (16.0%) and 55 (25.8%) of the laboratory professionals did not participate on external quality assessment (EQA) and quality improvement activities respectively, is shown in Table 3.

Table 3 shows that 33 (15.5%) laboratory professionals did not verify laboratory results and 70 (32.9%) of respondents claimed that laboratory results were not released within predefined turnaround time. Laboratory documentation (documents and records) system were not practiced as per standard by 45 (21.1%) the laboratory professionals. One hundred twenty-one (56.8%) laboratory professionals also indicated that customer services management system was poor in their respective laboratories.

**Table 2** — Knowledge & laboratory management activities reported by laboratory professionals working in public and private health institutions in Addis Ababa, Ethiopia (n=213)

| Variable | Frequency (%) |
|---|---|
| **Knowledge on laboratory quality system essentials** | |
| Yes | 197 (92.5%) |
| No | 16 (7.5%) |
| **Laboratory communication with Clinicians** | |
| Yes | 138 (64.8%) |
| No | 75 (35.2%) |
| **Laboratory communication with upper management** | |
| Yes | 93 (43.7%) |
| No | 120 (56.3%) |
| **Laboratory communication among laboratory staff** | |
| Yes | 126 (59.2%) |
| No | 87 (40.8%) |
| **Laboratory staff satisfied with their salary** | |
| Yes | 26 (12.2%) |
| No | 187 (87.8%) |
| **System for employees recognition** | |
| Yes | 35 (16.4%) |
| No | 178 (83.6%) |

| Attending of continuing education program | |
|---|---|
| Yes | 85 (39.9%) |
| No | 128 (60.1%) |
| **Attending of laboratory refreshment training** | |
| Yes | 80 (37.6%) |
| No | 133 (62.4%) |
| **Job descriptions for assigned task** | |
| Yes | 103 (48.4%) |
| No | 110 (51.6%) |
| **Availability of quality and adequate equipment in laboratory** | |
| Yes | 93 (43.7%) |
| No | 120 (56.1%) |
| **Availability of quality and adequate supplies & reagents** | |
| Yes | 122 (57.3%) |
| No | 91 (42.7%) |
| **Adequate number of staff for laboratory services** | |
| Yes | 88 (41.3%) |
| No | 125 (58.7%) |
| **Laboratory workload** | |
| High | 150 (70.4%) |
| Fair | 63 (29.6%) |

| Table 3 | Quality assurance practices and provision of laboratory services reported by laboratory professionals working in public and private health institutions in Addis Ababa, Ethiopia (n=213) |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Variable | Frequency (%) |
|----------|---------------|
| **Laboratory documentation (documents and records)** | |
| Yes | 168 (78.9%) |
| No | 45 (21.1%) |
| **Adherence to the standard operating procedures** | |
| Yes | 143 (67.1%) |
| No | 70 (32.9%) |
| **Customer services management** | |
| Yes | 92 (43.2%) |
| No | 121 (56.8%) |
| **Equipment calibration & maintenance** | |
| Yes | 128 (60.1%) |
| No | 85 (39.9%) |
| **Laboratory quality improvement activities** | |
| Yes | 158 (74.2%) |
| No | 55 (25.8%) |
| **External quality assessment activities** | |
| Yes | 179 (84.0%) |
| No | 34 (16.0%) |

| Internal quality control activities | |
|---|---|
| Yes | 141 (66.2%) |
| No | 72 (33.8%) |
| **Providing diagnostic services for all requested tests** | |
| Yes | 139 (65.3%) |
| No | 74 (34.7%) |
| **Providing uninterrupted laboratory services** | |
| Yes | 92 (43.2%) |
| No | 111 (52.1%) |
| No information | 10 (4.7%) |
| **Laboratory result verification** | |
| Yes | 180 (84.5%) |
| No | 33 (15.5%) |
| **Laboratory results reported within turnaround time** | |
| Yes | 143 (67.1%) |
| No | 70 (32.9%) |
| **Laboratory safety practices** | |
| Yes | 140 (65.7%) |
| No | 73 (34.3%) |
| **Utilization of personal protective equipment** | |
| Yes | 164 (77.0%) |
| No | 49 (23.0%) |

| Provision of quality laboratory services | |
|---|---|
| Yes | 138 (64.8%) |
| No | 75 (35.2%) |

Seventy-three (34.3%) laboratory professionals did not monitor laboratory safety practices and 69 (23%) the professionals did not use personal protective equipment (PPE) during working in laboratory.

### Factors affecting provision of quality laboratory services

Regarding to factors that affecting the quality assurance practice, our finding discovered that high workload, shortage of resource, poor management supports, poor staff motivation, lack of knowledge, high workload equipment failure, shortage of supplies and reagents were the major factors that affecting the quality assurance practice at the laboratories, is shown in Table 4.

As regard to laboratory services, 75 (35.2%) laboratory professionals believed that their laboratories did not provide quality of laboratory services as per the standards and 74 (34.7%) respondents indicated that their laboratories did not provide diagnostic services for all requested tests, in addition to this, 111 (52.1%) of respondents also reported that there were laboratory services interruption in their respective laboratories due to several reasons.

Concerning to factors that affecting the provision of quality laboratory services, our finding showed that shortage of resources was rated highest factor influenced the provision of quality laboratory services to a great extent by 64.3% and the second and third highest ranked factors were lack of management supports and poor equipment quality and rated by 57.4% and

53.4% respectively. Moreover high workload, lack of equipment calibration, lack of knowledge and skills and poor staff motivation were the major factors that affecting the provision of quality of laboratory services in this study, is shown in Figure 1.

### Logistic regression analysis result

Logistic regression analysis showed that provision of quality laboratory services was significantly associated with laboratory result verification (adjusted odds ratio (AOR)=9.21, 95% CI=2.26, 37.48), shortage of equipment (AOR= 7.76, 95% CI= 2.55, 23.66), internal quality control (AOR= 6.11, 95% CI=2.11, 17.70), results turnaround time (AOR=5.11, 95% CI=1.94, 13.46), communication with clinicians (AOR= 3.24, 95% CI= 1.25, 8.41) and lack of job description (AOR= 3.67, 95% CI= 1.319, 10.22).

Laboratory professionals, who did not verify laboratory results were found to be 9.2 times more likely to provide poor quality laboratory services when compared with those who verify laboratory results.

Laboratory professionals who did not practice internal quality control activities were 6 times more likely to provide poor quality laboratory services compared to regular practice. Moreover laboratory professionals who did not report results within defined turnaround time were 5 times more likely to provide poor quality laboratory services when compared with those who report results within turnaround time, is shown in Table 5.

| Table 4 | Factors affecting quality assurance practices reported by laboratory professionals working in public and private health institutions in Addis Ababa, Ethiopia (n=213) | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | Shortage of resources | Lack of knowledge | Poor staff motivation | High workload | Poor management support | Equipment failure | Factors unknown |
| Documents and records (n=45) | 21 (46.7 %) | 6 (13.3 %) | 20 (44.4 %) | 24 (53.3 %) | 21 (46.7 %) | - | 5 (11.1 %) |
| Customer services management (n= 121) | 39 (32.2 %) | 22 (18.2 %) | 39 (32.2 %) | 34 (28.1 %) | 39 (32.2 %) | - | 5 (4.1 %) |
| Equipment calibration & preventive maintenance (n=85) | 36 (42.4 %) | 29 (34.1 %) | 33 (38.8 %) | 23 (27.1 %) | 35 (41.2 %), | - | - |
| Laboratory quality improvement activities (n=55) | 12 (21.8 %) | 8 (14.5 %) | 39 (70.9 %) | 24 (43.6 %) | 39 (70.9 %) | - | 5 (9.1 %) |
| Internal quality control activities (n=72) | 35 (48.6 %) | 12 (16.7 %) | 30 (41.7 %) | 18 (25%) | - | - | - |
| External quality assessment activities (n=34) | 11 (32.4 %) | 10 (29.4 %) | 4 (11.8 %) | - | 11 (32.4 %) | - | 9 (26.5 %) |
| Laboratory result verification (n=33) | 14 (42 %) | 3 (9.1 %) | 11 (33.3 %) | 7 (21.2 %) | - | - | 3 (9.1 %) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Laboratory results reported within turnaround time (n=70) | 43 (61.4 %) | - | 30 (42.9 %) | 49 (70 %) | - | 48 (68.6 %) | - |
| Laboratory safety practice (n=73) | 30 (41.1 %) | 16 (21.9 %) | 18 (24.7 %) | 21 (28.8 %) | 30 (41.1 %) | - | 4 (5.5 %) |
| Utilization of personal protective equipment (n=49) | 46 (93.8 %) | 3 (6.2 %) | - | - | - | - | - |

**Note:** *Since respondents provided more than one answer, the total percentage of responses was more than 100%.*

| **Figure 1** | **Factors affecting the provision of quality laboratory services in public and private health institutions in Addis Ababa, Ethiopia** |
|---|---|
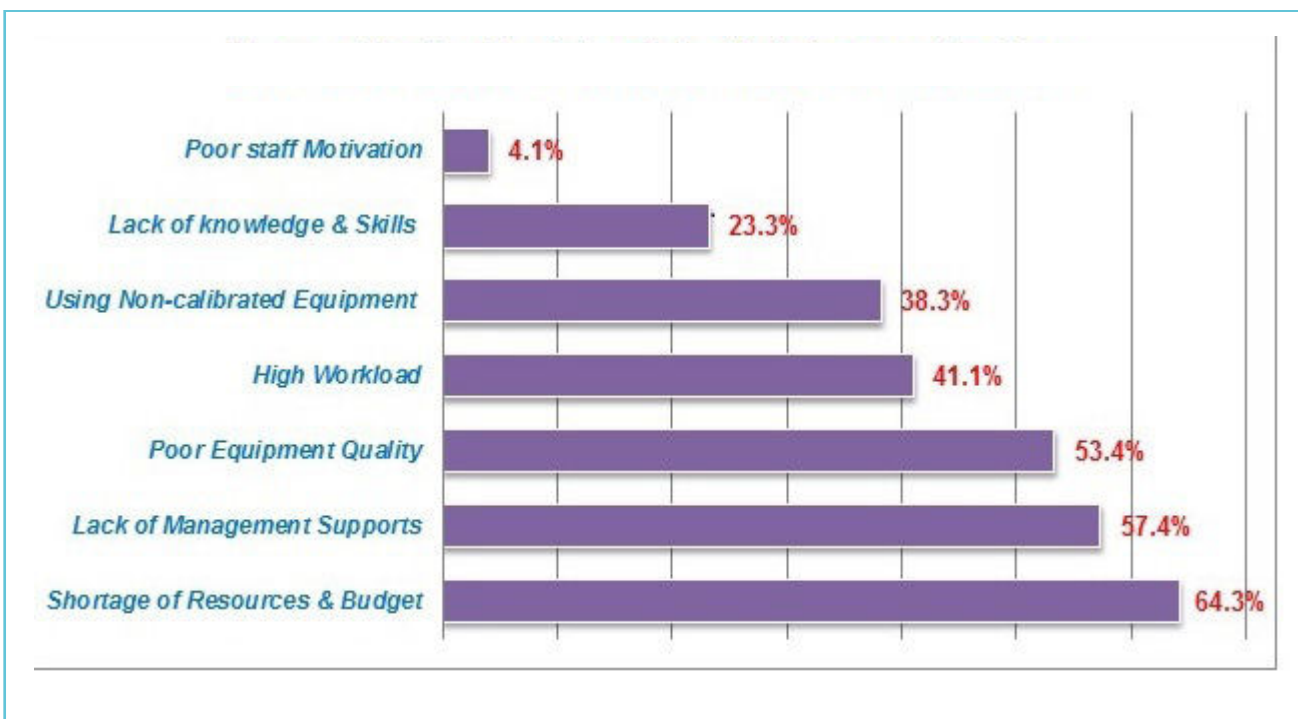


**Note:** *Since respondents provided more than one answer, the total percentage of responses was more than 100%.*

| Table 5 | Logistic regression analysis showing the association between provision of quality laboratory services and covariates in public and private health institution laboratories in Addis Ababa, Ethiopia | | | |
|---|---|---|---|---|
| **Variable** | **Provision of quality laboratory services** | | **Crude odds ratio (95 % CI)** | **Adjusted odd ratio (95 % CI)** |
| | **Yes** | **No** | | |
| **Profession** | | | | |
| Lab Technician | 63 | 20 | 1 | 1 |
| Lab Technologist | 75 | 55 | 2.310 (1.253, 4.258) | 0.701 (0.255, 1.925) |
| **Work Experience** | | | | |
| 1-2 Years | 27 | 7 | 1 | 1 |
| 3-5 Years | 39 | 22 | 0.611 (0.195, 1.911) | 1.114 (0.242, 5.122) |
| 6-10 Years | 24 | 24 | 0.636 (0.248, 1.631) | 1.558 (0.325, 7.481) |
| >10 Years | 48 | 22 | 0.733 (0.137, 3.938) | 0.947 (0.204, 4.409) |
| **Satisfaction with salary** | | | | |
| Yes | 24 | 2 | 1 | 1 |
| No | 114 | 73 | 7.684 (1.763, 33.491) | 5.926 (0.719, 48.81) |
| **Providing uninterrupted services** | | | | |
| Yes | 76 | 15 | 1 | 1 |
| No | 62 | 60 | 4.903 (2.540, 9.465) | 1.938 (0.677, 5.549) |
| **Communication with clients** | | | | |
| Yes | 105 | 33 | 1 | 1 |
| No | 33 | 42 | 4.050 (2.221, 7.384) | 3.238 (1.246, 8.414)* |

| Communication with upper management | | | | |
|---|---|---|---|---|
| Yes | 69 | 24 | 1 | 1 |
| No | 69 | 51 | 4.050 (2.221, 7.384) | 0.320 (0.106, 0.961) |
| Job descriptions | | | | |
| Yes | 85 | 18 | 1 | 1 |
| No | 53 | 57 | 5.079 (2.701, 9.548) | 3.672 (1.319, 10.22)* |
| Enough equipment | | | | |
| Yes | 82 | 11 | 1 | 1 |
| No | 56 | 64 | 8.519 (4.129, 17.579) | 7.76 (2.548, 23.659)* |
| Enough supplies & reagents | | | | |
| Yes | 88 | 34 | 1 | 1 |
| No | 50 | 41 | 2.122 (1.198, 3.760) | 1.113 (0.458, 2.701) |
| Adherence to SOP | | | | |
| Yes | 107 | 36 | 1 | 1 |
| No | 31 | 39 | 3.739 (2.044, 6.842) | 1.028 (0.364, 2.905) |
| Clients' satisfactions assessment | | | | |
| Yes | 81 | 11 | 1 | 1 |
| No | 57 | 64 | 8.268 (4.009, 17.053) | 2.261 (0.851, 6.007) |
| Equipment calibration & maintenance | | | | |
| Yes | 99 | 29 | 1 | 1 |
| No | 39 | 46 | 4.027 (2.222, 7.296) | 0.605 (0.207, 1.767) |

| Laboratory results verification | | | | |
|---|---|---|---|---|
| Yes | 131 | 49 | 1 | 1 |
| No | 7 | 26 | 9.930 (4.050, 24.346) | 9.21, (2.263, 37.482)* |
| Internal quality control activities practice | | | | |
| Yes | 111 | 30 | 1 | 1 |
| No | 27 | 45 | 6.167 (3.302, 11.518 | 6.105, (2.105, 17.70)* |
| Results reported within turnaround time | | | | |
| Yes | 114 | 29 | 1 | 1 |
| No | 24 | 46 | 7.534 (3.972, 14.290) | 5.111 (1.94, 13.464)* |

*\* The odds ratio indicated that there was significant association between provision of quality laboratory service and independent variables.*

## DISCUSSION

The majority of laboratory professionals work under high workload without job descriptions, continuing education and training. However Baidoun and Zairi pointed out that education, training and motivation are major factors for implementation of quality system[15] and non-trained professionals can be costly to the laboratory system due to inaccurate test results. In addition to this, more than 83% of the professionals were not satisfied with their salary and staff recognition system, as well as poor communication system, this is in agreement with studies done by Lyons et al[16] and Al-Enezi et al[17]. However it is well understood that motivation could be brought with simple letter of recognition[18] and effective communication also contributes to quality of services[19].

Moreover it is well documented that implementation of laboratory standards helps laboratories to demonstrate a well-functioning quality management system, technical competence, and customer-focused services that contribute to health care services[20]. But this study found out that documentation system, result verification & reporting system, equipment calibration & maintenance, quality control activities, customer management and laboratory safety were not implemented as per the standards. So poor quality management system directly affects the provision of quality laboratory services as well as patients and health care services at large.

Besides this, our study discovered that the major factors that affecting provision of quality laboratory services were high workload, shortage of resource, poor management supports, poor staff motivation, lack of knowledge and skills, high workload, equipment failure and lack of calibration, shortage of supplies and reagents. It was comparable with previous studies done by Wanjau et al., Alash'le et al., Birx D et al., and Bates et al. who found that major factors

affecting laboratory services were lack of lack of resource[9,19], equipment failure, poor management system[9], shortage of staff, low staff motivation, lack of knowledge[19,21] and lack of training[11]. Furthermore, another study done in Ethiopia revealed that lack of equipment maintenance, shortage of reagents and supplies, poor laboratory management and lack of follow-up were identified as factors[22].

Additionally, the study also revealed that provision of quality laboratory services had statistically significant association with internal quality control, result verification, result report time, communication, equipment and job description. This clearly indicates that there existed a negative relationship between factors affecting quality laboratory service and provision of quality laboratory service and it implied that the variables affect delivery of quality laboratory service to health sector programs and patient satisfaction.

In general the major findings from this study were factors associated with human resource, resources, infrastructure, quality management system, and polices, and these challenges facing laboratory systems in resource-poor settings like Ethiopia. Together, these factors compromise the provision of quality laboratory services and quality health care services delivery as well as public health provision. So improving laboratory quality systems requires political commitment, financial support, and strong support and follow up from the health system leaders, and competent and motivated laboratory staff.

## CONCLUSION

In conclusion, most of the laboratories did not have well established laboratory quality management system, system for staff recognition, and continuing education/training program. The major factors affecting the provision of quality

laboratory services were shortage of resources, lack of management supports, poor equipment management system, high workload, lack of competent staff, low staff motivation, ineffective communication system and lack of well-established quality management system. In addition poor internal quality control practice, absence of result verification system, delay of result reporting time, and lack of job description were affected the provision of quality laboratory services.

As laboratory services is an essential component of the health care system, laboratory capacity building and quality management system implementation will enable to provide quality and reliable services for disease treatment and prevention. Therefore, government and stakeholders should understand and address the factors affecting the provision quality laboratory service and they should work together for strengthening laboratory quality assurance and accreditation program.

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*What is known about this topic?*

- Laboratory service is an essential component of health care system with a wide range of diseases diagnosis, treatment and monitoring services.

- There are many factors affecting provision of quality laboratory services in developing countries especially in sub-Sahara African.

- Efforts to improve laboratory capacity and quality system in resource-limited countries are very limited and access to reliable laboratory testing remains limited in many countries. This results in delayed diagnosis, misdiagnosis, & inappropriate treatment and leads to increase morbidity and mortality.

*What this study adds*

- There are several factors affecting provision of quality laboratory services in public and private health institution in Addis Ababa Ethiopia.

- There is need for a government and stakeholders to be supporting and strengthening laboratory quality system since it is an essential component of health care system.

- Additionally this study adds knowledge and information on factors affecting the provision of quality of laboratory services in health care system to health policy and decision makers and provides useful baseline information for all efforts that will be made to improve quality laboratory services in futures.

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