Addis Ababa University

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Assessment of knowledge, Attitude , Practice (KAP) and associated factor of clinical laboratory proffessionals in use of IQC for laboratory tests among selected public and private Hospitals in Addis Ababa

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This is to certify that the thesis prepared by Marta Ayele, entitled: Assessment of knowledge, Attitude and Practice (KAP) of clinical laboratory proffessionals in use of IQC for laboratory tests among selected public and private Hospital in Addis Ababa and submitted in partial fulfillment of the requirements for Master of Science degree in Clinical Laboratory Sciences (clinical Laboratory Management and Quality Assurance special track) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abbreviations

AAU- Addis Ababa University

CLIA -Clinical Laboratory Improvement Amendments

EQA -External Quality Control

GCLP- Good Clinical Laboratory practice

IQC- Internal Quality Control

ISO- International standard orgination

KAP- Knowledge, Attitude and Practice

NABL- National Accreditation Board for testing and Calibration Laboratory

PI -Principal Investigator

QA- Quality assurance

QM-Quality Management

WHO- World Health Organization

Abstract

Background: A well-organized Laboratory Quality Assurance Program includes Internal Quality Control (IQC) procedures, External Quality Assessment (EQA) programs and Laboratory Quality Management (LQM). IQC is a set of procedures that are used in daily routine work to control daily variance of test results, problems are identified immediately and the method is brought back on track. So it needs professionals' knowledge and commitment. Internal quality control (IQC) in laboratory is a crucial part of quality processes.so that poor practices of professional on IQC affect the result of patients. That is why this study raises the question of KAP of laboratory professionals in use of IQC among selected public and private hospitals in Addis Ababa.

Objective: To assess knowledge, Attitude and Practice of clinical laboratory proffessionals and associated factors in use of IQC for laboratory tests among selected public and private Hospital in Addis Ababa, Ethiopia.

Methods: A cross sectional study was conducted using questionnaire to assess KAP of laboratory professionals and its associated factors in use of IQC among selected public and private hospitals in Addis Ababa from February 2020 to April 2020.A total of 250 laboratory professionals from selected public and private Hospitals were participated in the study. Pre-tested and self-administered questionnaire were used .Data entry and analysis were performed by using SPSS version 20 software. Descriptive statistics, such as mean, median, analysis were used. Association of different factors with KAP of laboratory professionals were done using the Binary logistic regression and level of statistical significance was set at $p<0.05$

Results: From the total of two hundred fifty participants, (response rate, 100%) 147 (58.8%) were male. In this study 220(88.0%), 224(89.6%) and 168(67.2%) study participants had good knowledge, positive attitude and good practice towards IQC, respectively. The mean number of test menu was 29.16 (SD +2.38), minimum 21 and maximum 33.from their available number of tests no one practice IQC for more than 80% of the tests, around half (52.8%) of the personnel practice IQC for only 50-65% of the available tests.

Conclusion: Even though majority of participants had good knowledge and attitude towards IQC, around one third of them had poor practice on IQC in the laboratory, there reasons for majority participant were shortage of QC material. There was no significant difference on KAP of laboratory professionals from public and private hospitals towards IQC. No risk factors were observed for poor knowledge and negative attitude towards IQC. Practice for all test had significant association with LQM training, duration of training and having schedule for IQC.

1. Introduction

1.1 back ground

Laboratory services are vital and major part of all health systems. Their purpose is to improve the health status of the population by giving evidence base for detection; management and prevention of diseases. The health laboratory services include all those laboratories that provide support to preventive, promotive, rehabilitative and curative health services (1).

Laboratory testing includes such scopes clinical chemistry, hematology, immunology, immunohematology, microbiology, and molecular biology. Medical laboratory science professionals generate accurate laboratory data that are needed to aid in detecting cancer, heart attacks, diabetes, infectious mononucleosis, and identification of bacteria or viruses that cause infections, as well as in detecting drugs of abuse. And also, we control testing quality and consult with other members of the healthcare team (2).

Medical laboratory science professionals, often called medical laboratorians, are vital healthcare detectives, and providing laboratory information from laboratory analyses that helps physicians in patient diagnosis and treatment, as well as in disease monitoring or prevention (2).

Laboratory quality can be explained as accuracy, reliability and timeliness of reported test results. The laboratory results must be as accurate as possible, all process of the laboratory operations must be reliable, and reporting must be timely in order to be useful in a clinical or public health setting (3).

Even though, countries were developed or less developed all laboratories requires a quality assurance programme to make sure that test results are reliable and reproducible? Quality Assurance is defined as a continuous process which includes series of activities for improving and maintaining optimum level of quality of health care services that includes mainly; setting standards and protocols, communicating standards, developing indicators, monitoring compliance with standard and solving problems by team approach. A well-organized Quality Assurance Programme includes Internal Quality Control (IQC) procedures, External Quality Assessment (EQA) programmes and Quality Management (QM). IQC is a set of processes that are used in daily routine work to control daily change of test results, problems are identified immediately and the method is brought back on

track. The purpose of quality assurance procedures in all phases of health laboratory activities has gained increasing attention in recent years (4, 5).

QC monitors activities related to the examination (analytic) phase of testing. The target of QC is to detect, evaluate, and correct errors due to test system failure, environmental conditions or operator performance, before patient results are reported. QC is the part of quality management focused on fulfilling quality requirements (ISO 9000:2000) simply put, it is examining "control" materials of known substances along with patient samples to monitor the accuracy and precision of the complete analytic process. In 1981, the World Health Organization (WHO) used the term "internal quality control" (IQC), which it defined as "a set of procedures for constantly assessing laboratory work and the emergent results". The terms QC and IQC are sometimes used interchangeably; habitual setting and country may influence preferences for these terms (6).

Internal quality control is intended to ensure that there is continual evaluation of the reliability of the work of the laboratory and that control is exercised before the release of test results. However, it is firstly a check of precision (i.e. reproducibility) but not necessarily accuracy (5). A well-developed IQC program will continuously monitor the performance of an assay to ensure the reported results are accurate, reliable, and reproducible(7). Effective quality assurance identifies errors at an early stage before they lead to incorrect test results. Laboratory personnel need to be aware of the errors that can occur in all the three phases of specimen processing (5).

The error detection rate of an IQC system can be increased by using; appropriate IQC material and appropriate intervals and interpreted using appropriate IQC ranges with appropriate IQC rule (8).

For medical Laboratory professionals Good Clinical Laboratory Practices (GCLP) outline the principles and procedures to be followed in patient care so as to give consistent, reproducible, auditable, and reliable laboratory results which contribute to good patient care and promote a positive attitude toward testing from a patient's perspective (9).

Key elements of clinical governance for hospital laboratory test include the principles of best practice by the medical laboratory professional that promote good clinical outcomes, safety, reliability, suitability and efficiency. Internal quality control (IQC) in laboratory is a crucial part of this processes.so that poor practices of professional on IQC affect the result of patients (10).

As stated, internal quality control has great importance for patient care.so as we are interested to assess the KAP of medical laboratory professionals in use of IQC among public and private hospitals in Addis Ababa which gives great number of patient care in the city.

1.2 Statement of the problem

Currently, there are many challenges facing laboratories, such as increased workload and scope of testing, usually with no additional resources or staffing. In addition, implementation of automated platforms for higher throughput and increasing use of auto-verification requires close monitoring of systems to ensure accurate results are reported.

Studies of laboratory errors have documented that a greater percentage of errors occur in the pre examination and post examination processes than in examination processes. The figures often mentioned are 45% for errors in pre-examination processes, 10% for examination errors, and 45% for post examination errors (actual estimates, 45.5%, 7.3%, and 47.2%, respectively) based on a study done in 2006 (11).studies from Sub-Saharan Africa revealed that major factors affecting the laboratory services were staff shortages, low motivation, lack of training, lack of internal quality control (IQC) (12).

In 99% accuracy, one percent error can be quite large in a system where many events occur, such as laboratory testing (3). Studies have estimated a 2.7%–13% risk of an adverse event occurring following a laboratory error. Most of the time, such errors can also affect client confidence, resulting in deterioration of laboratory reputation. 7%–13% of errors in the total testing process occur within the examination phase. An audit of IQC practice conducted in 2006 showed a wide variation in the laboratory approach to implementation, review and troubleshooting of IQC across the UK, Some of the variation in practice may affect the effectiveness of laboratory IQC, and thus the adequacy of a laboratory to monitor system performance (8).

Some study found that laboratory professional IQC knowledge and attitude which is not interpreted into an equivalent practice as demonstrated by poor documentation may affect result of patients (13).It is well known that quality of laboratory service is dependent on technical skills, quality management systems and the motivation of human resources.

Moreover as Ethiopia is one of Sub Saharan Africa country, laboratory infrastructure and quality assurance activities remain weak and there is little information available on KAP of medical laboratory professionals on IQC in Addis Ababa city administration. Therefore, this study was conducted to assess KAP of medical laboratory professionals in use IQC in selected public and private hospitals of the city.

1.3 Significant of the study

- As far as our search, there was no research out put on this area not only in Addis Ababa as well in the country. So the output finding of this research will help policy makers, stake holders and other participant of the health care system a base line data about the KAP of IQC by medical laboratory professionals in the city.
- IQC is a vital for monitoring day to day laboratory result before releasing and also it's one requirement to fulfill ISO15189; 2012 standard. So, the outcome of this study will help as, an input for training need assessment.
- This study also helps for hospitals, us a source of information about IQC.

2. Literature review

2.1 Internal quality control

As WHO 1981 report the main objective of internal quality control (IQC) is to ensure day-to-day consistency' 'James O 2003 says that Quality is often described as doing the right thing right'. The quality of IQC depends on `doing the right IQC right'. The first right indicates performing IQC with the correct number of control measurements and applying the correct statistical control rules. The second right refers to implementing IQC correctly by selecting appropriate control materials, calculating the control data properly, setting control limits correctly, interpreting the control data correctly and responding to control signals properly. Doing the right IQC has to do with planning and design. Doing QC right has to do with implementing the QC design properly (14, 15).

There was a study done in Washington USA that discus the expected increase in the number of unacceptable patient results reported during the presence of an undetected out-of-control error condition is a performance measure that is affected by changes in QC-testing frequency. A worst-case expected increase in the number of unacceptable patient results reported can be estimated. The laboratory thus has the ability to design QC strategies that limit the expected number of unacceptable patient results reported (16).

An audit of internal quality control practice and process done by housley et al in England in which 54 laboratories were audited and found that, seven sites processing IQC at fixed times of the day (1 at daily set-up/maintenance; 1 at 08:00 h and 16:00 h; 1 at 3 or 4 hourly intervals [day time only] and 1 at 24 h intervals), 19 sites indicated that they process IQC at fixed time intervals (range 1–24 h). Three sites indicated that IQC material is processed after a fixed number of samples (1 after every 30 samples for all analytes, 1 after every 50 samples for all analytes and 1 after every 100 samples for electrolytes and albumin). Seventy percent of labs who responded had no policy detailing IQC practices during on-call/out-of-hours periods, and of these, eight labs specifically detailed how IQC practice differs between the routine working day and out-of-hours periods (17).

A study done on Quality control in hematology laboratory found that Cost is among the factors influencing the participation in both internal and external quality control programs. Since many laboratories attribute lack of IQC practices to shortage of resource, several studies tried come up with alternative approaches of using fresh whole blood samples. A combination of commercial

controls (three levels) and retained or fresh patient blood specimens can be used for monitoring of accuracy and precision on a long- and short-term basis (18).

A study done by Ayehu et al in 2018, found that False negative AFB findings were significantly associated with lack of Internal Quality Control (IQC) measures .Only 9(16.9%) of the laboratories did weekly internal quality control measures for new AFB reagents by comparing known positive and negative control smears (19).

In Ethiopia a study done by Abaynesh et al in 2012 showed that there was a lack of accuracy and precision in measurements from these laboratories. A regular survey on medical laboratories should be conducted questioning the accuracy and precision of their analyses in order to sustain improvements in the quality of services provided by participating laboratories for the benefit of patients. Laboratory Quality Management Systems appreciate the need for regular quality control and quality assessment structures in medical laboratories (20).

2.2 Knowledge, Attitude, Practice

According to ISO 15189 guide line the laboratory must prepare its own IQC policy and standard practice guidelines, prospectively. The final goal is promoting our medical laboratory service quality, achieving a good cost-effectiveness outcome, and providing the best patient care. It could effectively cut down the probability of false rejection and increase the chance of error detection. When the results of IQC exceed the control provision, there should be technical processes to make corrections and effective mechanisms to prevent the recurrence by the medical laboratory professionals (21).

ISO 15189 recommended that the laboratory shall design internal quality control procedures that verify the achievement of the intended quality of results. The laboratory shall document its quality control plan in detail, including the levels of quality control materials run each day, frequency of performing QC, types of QC materials and the QC acceptance criteria customized for each examination procedure based on that procedure's capabilities (21).

A Study done in Lahore on Knowledge, Attitude and Practice of Quality Assurance among Medical Laboratory Technologists shows that there was a significant gap among knowledge, attitude and practice scores (F ratio = 37.786, $p < 0.001$). 78% participants of the study claimed that they obtained knowledge about QA through job experience. It was also found that the main constraint to the

application of QA program in laboratory was lack of training facilities in laboratories. As this study discus only 10% MLTs had good knowledge, 44% MLTs showed good attitude, and only 6% showed good practice of implementation procedures of QC in Laboratory (22).

This study also found that higher mean knowledge, Attitude and practice scores (2.67±0.57 , 3.00±0.00 and 2.00±1.00) were observed respectively in the group having more working experience (8.6-16.5 years) than with low work experience the mean knowledge, attitude and practice score were (1.91±0.45, 2.23±0.72 and 1.31±0.47) respectively of group with low working experience (0.5-8.5 years).

Another study done in Iran on Association between Knowledge, Attitude and Performance of the Employees with Quality Assurance System Implementation by the Employers showed that knowledge, attitude and performance of the employees for implementation and observation of QA system and its indicators were more increased and positive with increased level of the laboratorians academic degrees (23).

A study done in Addis Ababa health centers by dereje et al indicated that majorities (81.7 %) had better Knowledge about preparing in house made IQC and 18.3 % have no knowledge about it. All in all 98 (68.5%) of the study participants did not face failed result for IQC while 45 (31.5%) had faced failed result. When study participant's feeling was classified as bad, good, very good and excellent, 4 (2.3%) had bad, 79(45.1%) had good, 38 (21.7%) had very good and 54(30.9%) have excellent attitude towards IQC. About 32 (18.3%) of the study participants had never performed IQC while 143(81.7%) of them declared that they perform IQC (13).

A study done in Addis Ababa by Eyob et al found that more than 33% of laboratory professionals do not practice IQC activity. 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 (24).

3. Objectives

3.1. General Objective:

To assess knowledge, Attitude and Practice of medical laboratory professionals and associated factor in use of IQC among selected public and private hospitals in Addis Ababa Ethiopia.

3.2. Specific objectives:

- To assess knowledge of Medical laboratory professionals towards using IQC
- To assess attitude of Medical laboratory professionals towards using IQC
- To assess practice of medical laboratory proffessionals towards using IQC
- To determine factors associated with KAP of medical laboratory professionals towards using IQC
- To compare private and public hospitals toward KAP of laboratory professionals in use of IQC

4. Methods

4.1 Study area

The study was conducted in Addis Ababa which is the capital city of Ethiopia. It is also the largest city in the country by population, with a total population of 3,384,569 according to the 2007 Ethiopian central statistics agency census. However, it is believed that this number was inaccurate when recorded and underestimated the city's population. The city has through recent years seen a robust annual growth rate, and population counts as of 2017 are growing closer to 4 million. This capital city holds 527 square kilometers of area in Ethiopia. The population density is estimated to be near 5,165 individuals per square kilometer available (25).In Addis Ababa city administration there were be 546 medical laboratory professionals in a total of forty four hospitals. From total, 31 are private hospitals with number of 186 and 13 are public hospitals with 360 medical laboratory professional respectively (26).

4.2 Study design and period

A cross- Sectional study was conducted to assess KAP of laboratory professionals in use of IQC among selected public and private hospitals in Addis Ababa from February 2020 to April 2020.

4.3 populations

4.3.1 Source population

All Medical laboratory professionals working in public and private hospitals of Addis Ababa city administration.

4.3.2 Study population

The study populations were all medical laboratory professionals willing to participate and included in selected public and private hospitals in Addis Ababa.

4.4 Eligibility criteria

Laboratory professionals who are Volunteer and sign consent form were eligible for collecting data.

4.5 variables

4.5.1 Dependent variables

- KAP towards IQC

4.5.2 Independent variables

-Socio-demographic characteristics (age, sex, level of education, work experience, Training on LQMS, type of facility, Duration of training and Having IQC policy)

4.6 Sample size and sampling Technique

4.6.1 Sample size

The sample size was calculated using single population proportion formula. Assuming proportion of practice level 81.7% from previous study, with margin of error 5%, 95% of confidence interval, since this results the larger sample size among knowledge and attitude and the sample size is 199.

The sample size $n= (z\ \alpha/2)^2 p\ (1-p)/d^2$

Where n = Sample size

$(Z\ \alpha/2)^2$ =at 95% confidence interval Z value = 1.96

p = Proportion of occurrence of the event to be studied 18.3%

d= Margin of error at (5%)

n=199

By including 10% non-response rate the final sample size was 220 but, to increase the reliability of the study we were increase our final sample size in to 250.A total of two hundred fifty laboratory professional was included in this study.

4.6.2 Sampling technique

Within the ten sub city of Addis Ababa city administration there were thirteen (13) public and thirty one (31) private hospitals with a total number of 360 and 186 medical laboratory professionals respectively. We were select six (6) public and fourteen (14) private hospitals and all laboratory professionals in selected hospitals were included conveniently. We were participate **165** from public and **85** from private hospitals proportionally, since the number of professionals were not similar. The list of selected hospitals were found in annex-IV

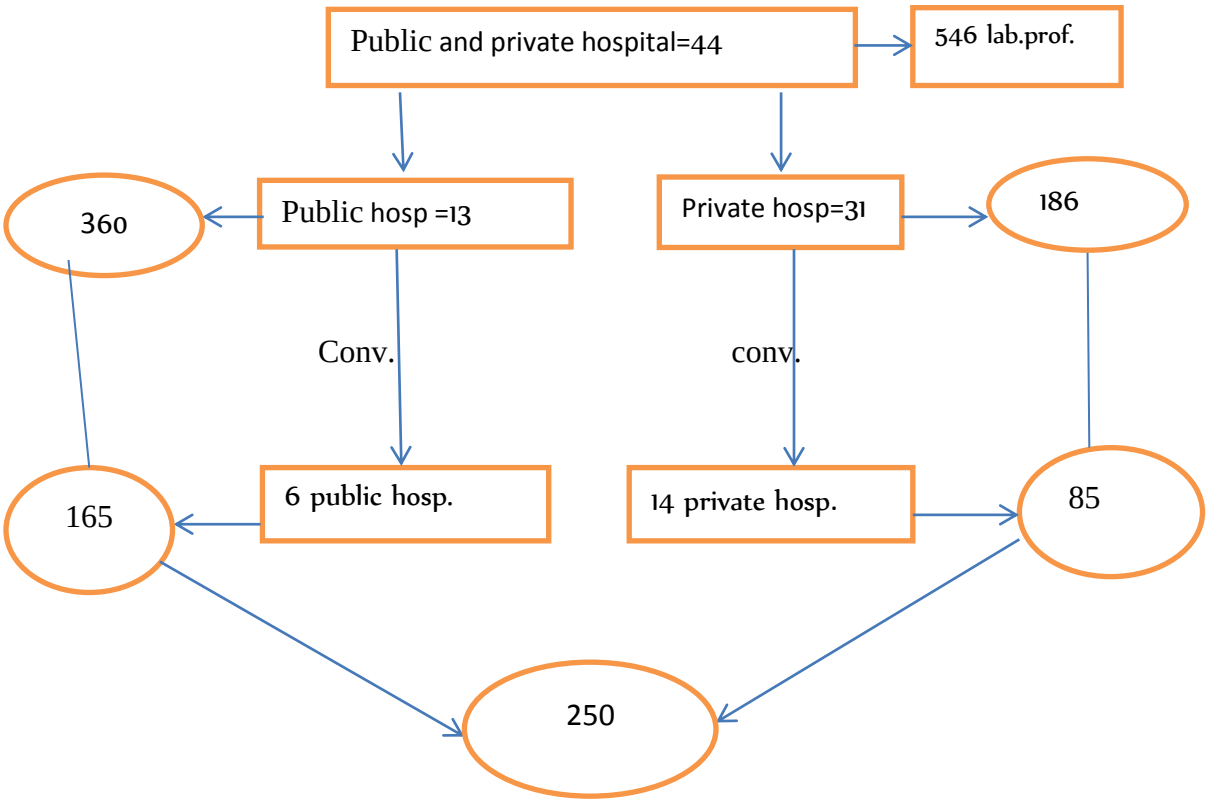

Figure 1: Schematic Presentation of the Sampling Procedure

4.7 Data collection procedure

Data were collected from volunteer laboratory professionals by using standardized pre-tested and self-administered questionnaires after obtaining informed consent from the participants. Data collection tool was prepared in English considering that all laboratory professionals are above certificate level of education. The questionnaires were distributed and collected by well-trained data collector/interviewer who have laboratory professional back ground. The data which was collected daily were encoded to computer in the same day.

4.8 Data quality assurance

To collect the intended data we were used 25(10%) pre tested structured questionnaire. The pretest was done in minilik II hospital those were excluded in actual study. After preparing, consistency checking of the questionnaire we were trained data collector. The data collectors was oriented by the principal investigator on the objectives of the study and how to interview, fill the questionnaire, observe some documents and handle questions while asking the participants. During the data collection process each questionnaire were checked daily in the morning by the principal investigator for its completeness.

4.9 Data management and analysis

Knowledge was measured by using mean score (those who score above the mean value score as good or poor those who score below the mean).Attitude was measured by using five linkert scale ranging from strongly agree to strongly disagree. The scores were divided into two as positive attitude for score above the mean and negative attitude for score below the mean. Practice was assessed based on mean score classification was made as good practice or poor practice. Different weight was given for each type of questions used to measure KAP.

Data was entered into SPSS (version 20) for analysis. Data qualities were monitored by cross-checking 10% of the data entered in to the database against the original paper-based questionnaire. Data was presented using tables and graphs. Descriptive statistics, including frequency, median, percentile, proportion and 95% confidence intervals (95% CIs), were performed where appropriate. Association of different variables with dependent variable was done using the Binary logistic regression. P–values below 0.05 were considered significant.

4.10 Ethical considerations

Ethical clearance to conduct the study was obtained from the Department of Research and Ethics Committee (DREC) from the department of medical laboratory science, Addis Ababa University and Addis Ababa regional laboratory scientific and ethical review committee. Informed consent was collected from all participants during the interview. All study subjects were explaining the purpose of the study and their right to anonymity. All the information obtained from the study subjects were coded to maintain confidentiality.

4.11 Dissemination of the result

The final result of the study will be submitted and presented to Department of Medical Laboratory Sciences, AAU, which could serve as a reference material to researchers and experts. In addition, a copy of this material will be given to Addis Ababa city administration health bureau and respective health institutions. The result will also be disseminated through publication in peer reviewed local and international journals and through presenting it in relevant workshops and seminars

4.12 Operational Definition

Knowledge: knowledge of IQC is awareness of the purpose, types, How performed, When performed and in-house QC.

Good Knowledge: the level of knowledge was categorized as good for those who scored above the mean

Poor/insufficient Knowledge: the level of knowledge was categorized as poor/insufficient for those who scored less than the mean.

Attitude subject's opinion, feelings or idea towards, importance of doing IQC for patient, recording result of IQC, training on LQMS increase the competence, Monitoring of IQC performance and IQC for qualitative tests.

Positive Attitude: Attitude score above the mean. **Negative Attitude:** Attitude score below the mean. **Practice:** Practice is overt behavior, habit or a custom of laboratory professionals follow up or carries out in his/her daily activities to perform IQC **Good Practice:** practice scores that fall above the mean. **Poor Practice:** practice scores that fall below the mean.

5. Results

5.1 Socio-demographic characteristic of participants

This study was conducted in public and private hospital of Addis Ababa. Data was collected from two hundred fifty laboratory professionals working in the selected hospitals. Of the two hundred fifty questionnaires all were returned after properly filled by the participants, (response rate, 100%).Among these participants 147 (58.8%) were male. The age range was from 21 to 51 years with a mean ± Standard Deviation (SD) age of 31.68 ±4.98 years. Almost half(52.0%) of the participants were between the age of 21-30.Laboratory professionals represented from public (66.0%) and private hospital(34.0%).Among the participated professionals less than 10% had managerial responsibilities in the laboratory. Most laboratory professionals (62.4%) had a Bachelor degree and only 36 (14.4%) had a master's degree. Additionally, half (49.6%) had senior level (5-10 years) experience. Only 164(65.6%) professionals took LQM training during their work experience (Table 1).

Table1.Socio-demographic characteristic of medical laboratory professionals working in selected public and private Hospitals in Addis Ababa, 2020 (n=250)

Variables	Frequency	Percent
Sex		
Male	147	58.8
Female	103	41.2
Age by years		
21-30	130	52.0
31-40	107	42.8
41-50	12	4.8
>50	1	0.4
Educational level		
Diploma	58	23.2
First degree	156	62.4
Master's degree	36	14.4
Type of facility		

Public	165	66.0
Private	85	34.0
Responsibilities		
Dpt. Head	5	2.0
Quality officer	12	4.8
Safety officer	7	2.8
Staff member	226	90.4
Years of experience		
<2	25	10.0
2-5	55	22.0
5-10	124	49.6
>10	46	18.4
Have LQM training		
Yes	164	65.6
No	86	34.4
Lab has IQC frequency		
Yes	134	53.6
No	116	46.4
Analysis of IQC performance monthly		
Yes	79	31.6
No	171	68.4
Laboratory has IQC policy		
Yes	168	67.2
No	82	32.8

5.2 General KAP of laboratory professionals on Internal Quality Control

The overall mean scores were then further divided into two categories to reflect the level of KAP among laboratory workers. These were: poor –below the mean, good –above the mean. When we change the mean score from one point, the mean knowledge, attitude and practice of laboratory professionals towards IQC was 0.79, 0.88 and 0.65, respectively.

In this study 220(88.0%), 224(89.6%) and 168(67.2%) study participants had good knowledge, positive attitude and good practice towards IQC, respectively.

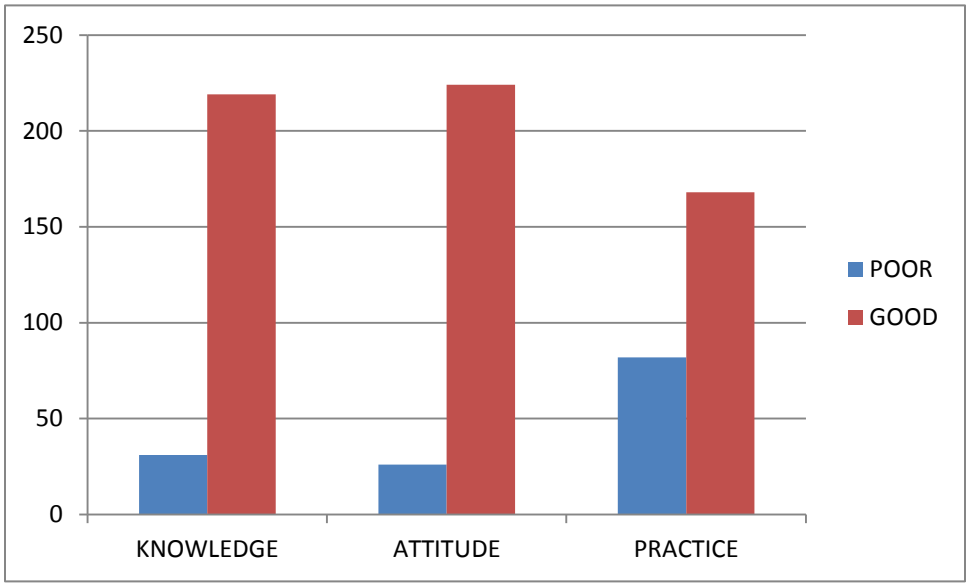

Fig1. General KAP of laboratory professionals on Internal Quality Control in hospitals of Addis Ababa, 2020

5.3 Knowledge of laboratory professionals towards Internal Quality Control

In different ways most 247 (98.8%) had basic knowledge about IQC. but most of them do not know specifically the purpose of IQC. Only 101(40.4%) know IQC by learning in medical schools.however,139(55.6) knows IQC by training.14 (5.6%) laboratory professionals do not know when IQC was performed for tests. about in house IQC only 178(71.2%) had knowledge about its purpose (Table 2). (Fig1).

Table2. Knowledge of laboratory professionals towards IQC working in selected public and private Hospitals in Addis Ababa, 2020 (n=250)

Questions	Variables	Response N=250	Percent (%)
Do you know about IQC?	Yes	247	98.8
	No	3	1.2
what is the purpose of IQC	Detect errors	109	43.6
	Evaluate performance	123	49.2
	Compare different labs	18	7.2
How do you know about IQC?	By learning	101	40.4
	By training	139	55.6
	By reading SOP	10	4.0
How many types of IQC do you know?	One	86	34.4
	Two	145	58.0
	Three	14	5.6
	Four	5	2.0
When do you IQC performed?	Routinely	96	38.4
	Periodically	140	56.0
	Don't know	14	5.6
Do you know about in-house quality control	Yes	178	71.2
	No	72	28.8

5.4. Laboratory professionals' knowledge and associated factors

When we use binary logistic regression as far as our data collection there was no statistical significant association(p-value>0.05) between knowledge of laboratory professionals towards IQC with age, Sex , Educational level, Type of facility , Years of experience and having LQM training in Addis Ababa hospitals of both public and private facilities (Table 3).

Table 3.Laboratory professionals' knowledge and associated factors on IQC at Hospitals in Addis Ababa, 2020(n=250)

Variables	Knowledge level		COR(95%CI)	AOR(95%CI))	p-value
	Poor N(%)	Good N(%)			
Sex					
Male	18(12.2)	129(87.7)	.945(.434-2.058)	1.926(.313-2.740)	.890
Female	12(11.6)	91(88.3)	Reference	-	-
Age by years					
21-30	11(8.4)	119(91.5)	.462(.090-2.380)	2.691(.088-5.414)	.725
31-40	17(15.8)	90(84.1)	.944(.190-4.698)	1.960(.159-5.80)	.965
41-50	2(16.6)	10(83.3)	Reference	-	-
Educational level					
Diploma	3(5.2)	55(94.8)	.226(.054-.940)	2.592(.023-15.395)	.753
First degree	20(12.8)	136(87.2)	.609(.236-1.575)	3.624(.147-2.660)	.524
Master's degree	7(19.4)	29(80.6)	Reference	-	-
Type of facility					
Public	23(13.9)	142(86.1)	1.805(.741-4.395)	1.812(.115-5.746)	.835
Private	7(8.2)	78(91.8)	References	-	-
Years of experience					
<2	1(4)	24(96)	.232(.027-2.005)	1.410(.035-4.87	.480
2-5	4(7)	51(93)	.437(.119-1.599)	1.657(.121-3.57	.627
5-10	18(15)	106(85)	.946(.367-2.439)	1.055(.342-3.255	.926
>10	7(15.2)	39(84.8)	References	-	-
Have LQM training					
Yes	23(14)	141(86)	1.841(.756-4.482)	.508(.040-6.394)	.600
No	7(8)	79(92)	Reference	-	-
IQC policy					
Yes	24(14.3)	144(85.7)	2.111(.827-5.387)	1.558(.574-4.227)	.384
No	6(7.3)	76(92.7)	Reference		

5.5. Attitudes of laboratory professionals towards internal quality control

Based on our attitude score, respondents were categorized into having Negative and positive attitude on IQC. Based on this, 26(10.4%) had a Negative attitude towards IQC (fig 1).One hundred sixty six

participants (66.45%) strongly agree that performing IQC is necessary for laboratory tests. No-one disagrees about the necessity of performing IQC for tests. Almost similar response was reported on purpose, of recording result of IQC on a document. Half of (55.2%) participant think performing IQC have value for professional skill up. Eleven (4.4%) had a negative attitude on Monitoring of IQC performance. Ten (4.0%) study participants had an attitude that No need of doing IQC for qualitative test (Table 4).

Table4. Attitude of laboratory professionals towards IQC working in selected public and private Hospitals in Addis Ababa, 2019 (n=250)

Variables	Value	Number	Percent
Do you think Performing IQC is necessary?	Strongly agree	166	66.4
	Agree	74	29.6
	Neutral	10	4.0
	Disagree	0	0.0
	Strongly disagree	0	0.0
Do you believe recording result of IQC is necessary?	Strongly agree	165	66.0
	Agree	75	30.0
	Neutral	10	4.0
	Disagree	0	0.0
	Strongly disagree	0	0.0
Do you think performing IQC have value for professionals?	Strongly agree	138	55.2
	Agree	91	36.4
	Neutral	21	8.4
	Disagree	0	0.0
	Strongly disagree	0	0.0
Do you think training of personnel on LQMS increase the competence on IQC	Strongly agree	160	64.0
	Agree	73	29.2
	Neutral	17	6.8
	Disagree	0	0.0
	Strongly disagree	0	0.0
Monitoring of IQC performance is not important	Strongly agree	11	4.4
	Agree	0	0.0
	Neutral	31	12.4

No need of doing IQC for qualitative test	Disagree	87	34.8
	Strongly disagree	121	48.4
	Strongly agree	10	4.0
	Agree	2	0.8
	Neutral	31	12.4
	Disagree	82	32.8
	Strongly disagree	125	50.0

5.6. Laboratory professionals 'attitude and associated factors on IQC

As far as our data collection there was no significant association(p-value>0.05) between attitude of laboratory professionals towards IQC with age, Sex , Educational level, Type of facility , Years of experience and having IQC training in both public and private facilities (Table 5).

Table5. Laboratory professionals' attitude and associated factors on IQC in Addis Ababa hospitals, 2020 (n=250)

Variables	Attitude level		COR (95%)	AOR(95% CI)	p-value
	Positive N (%)	Bad N (%)			
Sex					
Male	94(91.2)	9(8.8)	.732(.313-1.714)	1.826(.336-2.029)	. 677
Female	130(88.4)	17(11.6)	Reference	-	-
Age by years					
21-30	118(90.7)	12(9.2)	1.119(.133-9.428)	1.200(.085-17.023)	.893
31-40	95(88.8)	12(11.2)	1.389(.165-11.732)	0.958(.085-10.834)	.973
41-50	11(84.6)	2(15.4)	Reference	-	-
Type of facility					
Public	150(90.9)	15(9.1)	.673(.294-1.537)	2.641(.162-2.541)	.527
Private	74(87.1)	11(12.9)	Reference	-	-
Responsibilities					
Dpt. Head	4(80)	1(20)	2.348(.246-21.667)	2.875(.264-31.335)	.386
Quality officer	10(83.3)	2(16.6)	1.855(.382-9.009)	1.360(.233-7.929)	.732
Safety officer	6(85.7)	1(14.3)	1.545(.178-13.430)	1.291(.104-15.993)	.842
Staff member	204(90.3)	22(9.7)	Reference	-	-
Years of **experience**					
<2	25(100)	0	.000	.000	.998
2-5	51(92.7)	4(7.3)	.643(.162-2.553)	.404(.056-2.926)	.369
5-10	107(86.3)	17(13.7)	1.303(.451-3.764)	1.062(.226-4.981)	.940
>10	41(89.1)	5(10.9)	Reference	-	-
Have LQM training					
Yes	146(89.1)	18(10.9)	1.202(.500-2.889)	1.016(.332-3.109)	.978
No	78(90.7)	8(9.3)	Reference	-	-

5.7 Practice of study participants towards IQC

Only 49(19.6%) study participants practice /do IQC for tests in the weekend and night time. 176(70.4%) study participant perform IQC for all tests in daily manner as needed by the manufacturer. The others 74(29.6%) do not perform IQC for all tests in daily manner. Their major reason was that is due to Shortage of IQC. Only 156(62.4%) laboratory professionals document the IQC result that they perform for the test (Table 6).

The overall practice score was classified into two levels as, poor practice and good practice. Since we used weighted point score method for assessing mean of KAP, Based on our operational practice score 168 (67.2%) study participants had good practice towards IQC for medical tests (Fig 2).

Table 6.practice of laboratory professionals towards IQC working in selected public and private Hospitals in Addis Ababa, 2020 (n=250)

Variables	Value	Number	Percent
Do you practice/do IQC in the weekend/at night time	Yes	49	19.6
	No	201	80.4
Do you perform IQC for all tests that you assigned daily	Yes	176	70.4
	No	74	29.6
If no what is the reason	Workload	20	27.1
	Shortage of IQC	44	59.4
	Loss of attention	10	13.5
Do you document IQC results for all tests perform IQC	Yes	156	62.4
	No	94	37.6

5.8. Laboratory professionals 'practice and associated factors on IQC

When we tried to do binary logistic regression for IQC practice for all test, there was statistically significant association between IQC practice for all test and have schedule for IQC ,when trained quality management and have LQM training (p-value<0.05). (Table7).

Table7. Laboratory professionals' IQC practice for all tests and associated factors in Addis Ababa hospitals, 2020 (n=250)

Variables	Practice level		COR(95%CI)	AOR(95% CI)	p-value
	Good N(%)	Poor N(%)			
Sex					
Male	69(66.9)	34(33.1)	1.016(.595-1.737)	.120(0.287-2.738)	.835
Female	99(67.4)	48(32.6)	Reference	-	
Educational level					
Diploma	40(68.9)	18(31.1)	1.350(.529-3.447)	.340(0.026-19.789)	.841
First degree	101(64.7)	55(35.3)	1.350(.529-3.737)	.616(0.10-29.22)	.474
Master's degree	27(75)	9(25)	Reference	-	-
Type of facility					
Public	111(67.3)	54(32.7)	.990(.567-1.729)	.516(0.070-5.106)	.638
Private	57(67.1)	28(32.9)	Reference	-	-
Have schedule for IQC					
Yes	92(68.6)	42(32.4)	.867(.511-1.472)	1.656(0.037-0.993)	**.049**
No	76(65.5)	40(34.5)	Reference	-	-
When trained LQM					
Within 1 year	61(67.7)	29(22.3)	1.833(.193-17.371)	3.187(1.001-10.58.7)	**.043**
Before 2 years	55(63.9)	31(36.1)	2.341(.247-22.181)	3.065(1.800-25.517)	**.015**
Before 3 years	36(90.0)	14(10.0)	1.217(.116-12.752)	1.671(0.515-5.486)	.161
Before 4 years	16(66.6)	8(34.4)	Reference	-	-
Have LQM training					
Yes	111(67.6)	53(32.4)	.936(.539-1.633)	3.266(2.352-29.200)	**.008**
No	57(66.3)	29(33.7)	Reference		
IQC policy					
Yes	114(67.8)	54(32.2)	.914(.552-1.599)	.419(0.350-6.610)	.576
No	54(65.8)	28(34.2)	Reference		

In this study figure 2.showed that poor knowledge, negative attitude and poor practice of laboratory personnel towards IQC is similar in public and private hospitals in Addis Ababa (Fig .2)

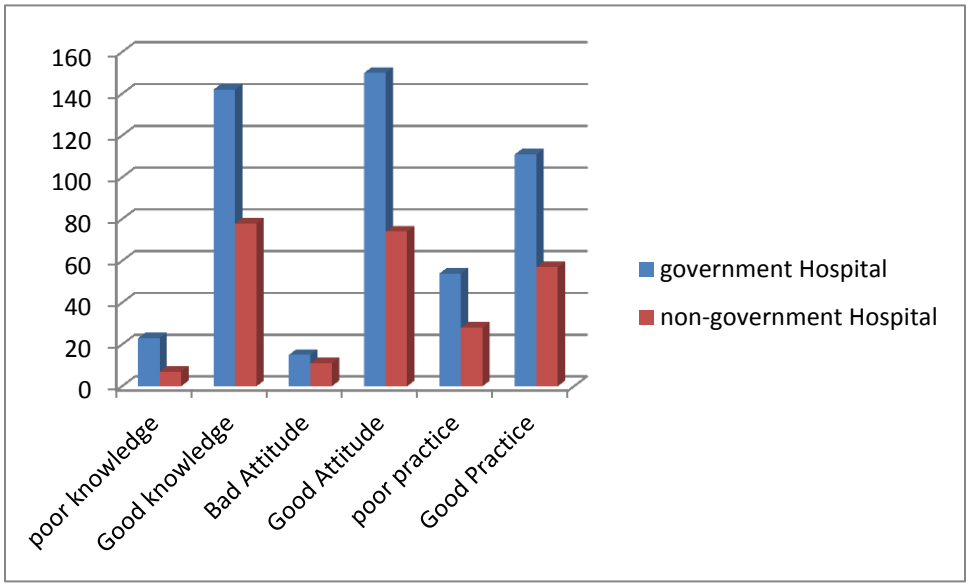

Fig 2.Comparison of KAP among laboratory personnel's in public and private hospitals towards IQC in Addis Ababa

The mean number of test menu available in each personnel facility was 29.16 (SD +2.38), minimum 21 and maximum 33.from their available number of tests no one practice IQC for more than 80% of the tests. Around half (52.8%) of the personnel practice IQC for only 50-65% of the available Laboratory tests (fig3)

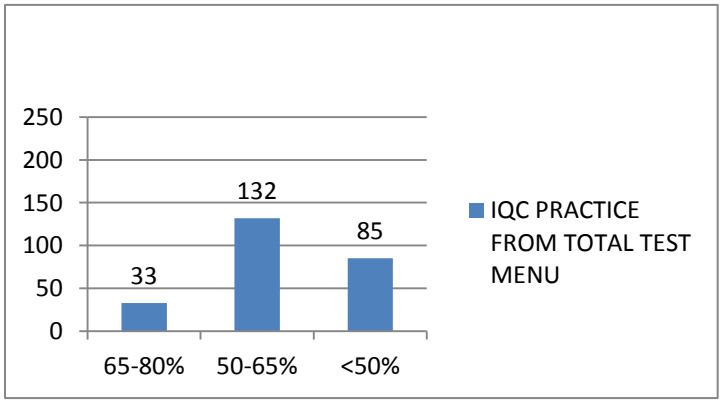

Fig 3.IQC practice of laboratory personnel from their total test menu in Addis Ababa Hospitals

6. Discussion

This study offers information on the knowledge, self-reported attitudes and practices towards IQC among medical laboratory professionals in the Addis Ababa hospitals. The major limitation of this paper is that scarcity of similar paper to discuss with our finding. QC testing is performed within a laboratory to monitor and ensure the reliability of test results produced by the laboratory. Control materials (usually liquid controls) are used to monitor the test system and verify that quality patient test results have been attained. A total of two hundred fifty study participants were included from both public and private hospitals of Addis Ababa. This finding entails that there is a significant gap in IQC practice among medical laboratory professionals in Addis Ababa.

It is a well-known fact that knowledge can influence professional practices regarding IQC among laboratory personnel. In this study no significant gap was observed in knowledge and attitude of Medical Laboratory professionals about IQC.

In this study, around half 130 (52.0%) of study participants were found in 21-30 year age groups. One hundred forty seven (58.8%) respondents were male. Similarly highest proportion of the respondents 156 (62.4%) had first degree. Regarding educational level, our finding disagrees with previous study by Dereje Mamuye which found majority of participants was diploma (13).This may be due to the fact that through time personnel try to educate themselves through different approach. Based on proportional sample size calculation from the total participants 165(66.0%) were work in public hospitals.

In this study personnel responsibility was divided into department head, Quality officer, safety officer and staff member. From the included participants the majority 226 (90.4%), were staff members. Among the study subject 124(49.6%) of participants had senior level experience (5-10 years). And also 164 (65.6%) of the respondent were took LQM training .Most of the socio demographic findings were in line with dereje M et al. which was done some years before our study.

Knowledge deficit regarding IQC among laboratory personnel's may result in substandard care, ineffective service provision, inefficient resource use, and impact on health outcomes as well as increasing the risk of disease transmission. Internal Quality control (QC) is one of the most important impacts on laboratory testing—it ensures both precision and accuracy of patient sample

results. When quality control works effectively, it is able to find and correct flaws in the analytical processes of a lab before potentially incorrect patient results are released (11).

In this study, majority 220(88.0%) participants had good knowledge towards IQC. This finding was higher than the finding of dereje et al; this might be due to the time difference the two studies conducted and majority of the participant in this study had first degree and trained on LQM. This study indicated that around one personnel from ten laboratory professionals had poor knowledge on IQC of laboratory tests. So it might affect the laboratory result and quality management system when this personnel works alone in night or weekend time of the hospital working hour. Laboratory professionals had gained knowledge on IQC through training 139(55.6%).This finding indicate that by trained all laboratory professionals we had the chance to increase the knowledge of staff. Fourteen (5.6%) of study participants do not know when they could perform IQC. These groups of personnel might not take LQM training.

Regarding the attitude of laboratory professionals towards IQC we found that 224(89.6%) had positive attitude, which were also consistent with the study conducted in Lahore, which showed that 84% of laboratory personnel had good attitude towards quality assurance (22).

But, this finding were not consistent with the study conducted in Iran which report 25.1% had negative attitude towards quality assurance system (23).This difference could be due to differences in the study participant's professions education level, knowledge level of participants, country development stage and the study site. Additionally before the study was conducted there was a huge movement in the city towards the general quality management system in the health sector which might create good knowledge and attitude towards IQC.

The study showed that 66.4% of the respondents strongly agreed on Performing IQC is necessary, additionally 29.6% of them agree on the importance of IQC. Based on quality management system guideline there was no question on the importance of doing IQC for laboratory tests. So these findings were in line with this quality management guide line developed by global laboratory initiatives (21).

Majority of the study participants had agreed on the recording result of IQC is necessary, performing IQC have value for professionals and training of personnel on LQMS increase their competence on IQC. On different quality management guide line and quality policies of WHO no questions raised

on the importance, recording and professional development and confidence purpose of IQC (14). In general personnel's might have good attitude towards IQC in different way like thought supportive supervision and mentorship, the great challenge was that on practice.

In our study no risk factor for poor knowledge and attitude towards IQC by laboratory personnel were not found which was different from other literature. These might be due to the sample size of our study. Additionally at the time period that the study was conducted there was a good mentorship from the regional laboratories for both public and private hospitals.

In this study IQC Practical score had statistically significant association with having schedule for IQC, the time the personnel took quality management training and having LQM training which was disagree with the study conducted in Addis Ababa, by Dereje Mamuye. These was the real association that when we refresh personnel their practice towards IQC will increase.

7. Limitation and strength of the study

Strength

- ✓ This study is the first in its kind to assess the KAP of laboratory professionals towards IQC who are working in Addis Ababa public and private hospital laboratories.
- ✓ The study was generated representative data since it addressed medical laboratory professionals from all sub cities in Addis Ababa and sample size is almost 50%.

Limitation

- ❖ Due to proportional sample size calculation we could not able to recruit equal participants from public and private hospitals
- ❖ Lack of related literature was also one of the major challenges that we faced during the study period.
- ❖ Since the study design used was cross-sectional, the finding regard to factors associated with knowledge and practice might not be necessary casual.

8. Conclusion

Internal quality control is a process for checking that the uncertainty at validation does not deteriorate after validation, that is, when the method is in routine use. We found a deficiency in practice of IQC for all laboratory tests which were mentioned in their facility test menu. Even though majority of participants had good knowledge (88.0%) and attitude (89.6%) towards IQC, around one third (32.8%) of them had poor practice on IQC in the laboratory, there reason for majority participant were shortage of QC material. Additionally there was no significant difference on KAP of laboratory professionals from public and private hospitals towards IQC. Up to our data here was no risk factor for poor knowledge and negative attitude towards IQC. Practice for all test had significant association with LQM training, Duration of training and having schedule for IQC.

9. Recommendation

- We therefore recommend that the city administration should give training, mentorship and supportive supervision for both public and private hospitals.
- The universities should include laboratory quality management system with in their curriculum.
- Refretioment training on IQC both for qualitative and non-qualitative tests should be given
- Depth study should be conducted to gate more enough and important data towards IQC for all facilities including clinics and health centers
- The responsible body should be availing enough QC material for all tests.

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11. Annexes

Annex I: English Versions of Participant Information Sheet

My name is Marta Ayele. I am currently a student of Addis Ababa University, School of Medical laboratory Sciences Now, I am carrying out a study entitled 'Assessment of knowledge, attitude and practice of laboratory professionals in use of IQC among public and private hospital in Addis Ababa, Ethiopia.''

You are invited to participate in this study. Please read the following statements and ask any unclear points before you agree to participate. If you agree to be included in this study, I will like to ask you to sign on a document to show your agreement.

Introduction

The topic of this study is "Assessment of knowledge, attitude and practice of laboratory professionals in use of IQC among public and private Hospital in Addis Ababa, Ethiopia

Internal quality control (IQC) remains the fundamental component of most laboratory QA programs and provides documented evidence that the laboratory's results are accurate and acceptable for release.

Participation in this study is exclusively voluntarily. If you decide to participate, you have to sign on the consent/ permission template form and you may obtain a copy of this information sheet.

Confidentiality and privacy

The information in your records is strictly confidential. The information will be encoded in a computer and will save with password protection.

Benefits of participation

By participating, you will get no financial benefits. Even though there is no direct benefit due to participation in this study, the findings of the study is useful for better management of you. **Rights of participants** your participation is completely voluntary, and you can refuse to participate or withdraw from the study at any time. Refusal to participate will not result in loss medical care provided or any other benefits.

Agree to participate? Yes-------- No-------

Annex II Consent form to participants on the study of assessment of KAP of laboratory professionals in use of IQC among public and private Hospitals in Addis Ababa, Ethiopia.

I have read the information stated on the topic above and verbal discussion from the supervisor and clearly understood the purpose and expected benefit of the research. I hereby need to guarantee with my signature below that I have decided to voluntarily take part in the study without any forceful act by the research coordinators to contribute my part for the successful completeness of the research on KAP of Medical laboratory professionals towards IQC.

Participant Signature_____

I thank you for your cooperation

Annex-III: Questionnaire

Structured self-administered questionnaires for the Assessment of knowledge, attitude and practice of Medical Laboratory professionals in use of IQC among Hospitals in Addis Ababa Ethiopia, 2020

PART-I: SOCIO-DEMOGRAPHIC CHARACTERSTICS OF THE RESPONDENTS			
No	Questions	Coding classification	Code
1	Sex of the respondent	Male = 1 Female = 2	
2	Age in completed years	Age in completed years_____	
3	What is your educational level on your Profession?	Diploma = 2 First degree = 3 Master's degree = 4 PhD/Sub specialty=5	
4	Type of facility Employed?	public hospital = 1 private hospital = 2	
5	What are your responsibilities in this laboratory?	1. Dpt. head 2. Quality officer 3.Safety officer 4. Staff member	
6	How many years of experience do you have?	_____ years	
7	Have you ever been participated in any training Of Quality assurance or LQM?	Yes=1 No=2	
8	If 'yes' how long did you take the training?	<1year=1 1year=2 2 year=3 3 year & above =4	

9	Do your lab has IQC frequency schedule for each test?	1Yes 2 No	
10	Do you analysis IQC performance monthly?	1 Yes 2 No	
11	Does your laboratory have IQC policy?	1Yes 2 No	
12	Where do you get IQC materials?	----------	

PART-2: Questions about knowledge of Medical Laboratory professionals towards IQC

Please circle the code best fits for your answer.

No	Questions	Coding classification	Code
1	Do you know about IQC?	1=yes 2=No	
2	If "yes "what is the purpose of IQC	1=Detect errors 2= evaluate prof. performance 3=compare d/t labs	
3	How do you know about IQC?	1=by learning 2=by training 3=by reading SOP	
4	How many types of IQC do you know?	1=1 2=2 3=3 4=4	
5	Write types of IQC?		
6	When do you IQC performed?	1=Routinely 2=periodically 3=Don't know	
7	Do you know about in-house quality control	1=Yes 2.=No	
8	If your answer is yes, for which test do you use	----------	
	Questions on attitude		
1	Do you think doing IQC is important for patients?	1=strongly agree 2=Agree 3=Neutral 4=disagree 5=strongly disagree	
2	Do you think Performing IQC is necessary?	1=strongly agree 2=Agree 3=Neutral 4=disagree 5=strongly disagree	
3	Do you believe recording result of IQC is	1=strongly agree 2=Agree	

	necessary?	3=Neutral 4=disagree 5=strongly disagree	
4	Do you think performing IQC have value for professionals?	1=strongly agree 2=Agree 3=Neutral 4=disagree 5=strongly disagree	
5	If yes, what is your reason?		
6	Do you think training of personnel on LQMS increase the competence on IQC	1=strongly agree 2=Agree 3=Neutral 4=disagree 5=strongly disagree	
7	Monitoring of IQC performance is not important	5=strongly disagree 4=disagree 3=neutral 2=agree 1= strongly agree	
8	No need of doing IQC for qualitative test	5=strongly disagree 4=disagree 3=neutral 2=agree 1= strongly agree	
	General Questions on practices		
1	Do you practice/do IQC in the weekend/at night time	1=Yes 2= No	
2	Do you perform IQC for all tests that you assigned daily	1=Yes 2 =No	
3	If your answer for no-3 is NO, what is the reason	1=workload 2=shortage of IQC 3=other specify	
4	Do you document IQC results for all tests that you assigned daily	1=yes 2=No	

Questions on practices

Which type of test items are performed, have IQC done and frequency of IQC in your laboratory? (Please tick √)

No	Test items	Items which are included in your test menu	Items which are tested for IQC	Items which are not tested IQC	**Frequency of IQC**			
					usually	sometimes	Rerely	Never
	Hematology							
	CBC							
	Blood Film							
	Hematocrit							
	Peripheral blood morph.							
	Immo-hematology							
	Blood group							
	CD4							
	Viral load							
	Cross match							
	Clinical Chemistry							
	Liver function test							
	Renal function test							
	Bacterology							
	AFB							
	GenXpert							
	DBS							
	Gramstain							
	Wait –mount-direct							
	KOH							

	Serology							
	HIV Ab testing							
	HBsAg test							
	HCV anti body test							
	H.pylori							
	RPR							
	CRP							
	RF							
	ASO							
	Pregnance							
	Urinaysis							
	Urine microscopy &dipistic							
	Parasitology							
	Occult occult							
	H,pylori Ag test							
	CULTURE							
	Urine culture							
	Stool culture							
	Blood culture							
	Ear &eye discharger							
	Body fluid culture							

Note-always=day to day, sometimes=every week, rarely=monthly/when problem occur, Never=when we don't perform IQC

Annex-IV .list of selected health facilities

s.no	Hospital name	Sub city	Address
1	Tirunesh Beijing	Akaki	00251-11-432125
2	TASH	Kirkos	00251-11-3712020
3	Zewditu	Kirkos	00251-11-5518085
4	St paulos	Gulele	00251-11-2750125
5	Alert	Kolfe	00251-11-3711199
6	Yikatit 12 Hosp.	Arada	00251-11-150665
7	Teklehaymanot	Arada	00251-11-234576
8	Betezata Hosp.	Kirkos	00251-11-543288
9	Land mark	Lideta	00251-11-5525463
10	Addis hiwot	Yeka	00251-11-6180449
11	Bethel Hospital	Kolfe	00251-11-3720125
12	Haleluya Hospital	Akaki	00251-11-4786636
13	Yordanos Hosp.	Arada	00251-11-621341
14	Amen Hosp	Adis ketema	00251-11-333592
15	Tezena Hosp.	Kolfe	00251-11-3711210
16	Girum Hosp.	Kolfe	00251-11-2757676
17	Biruk Hosp.	Nifas silk Lafto	00251-11-132166
18	Sainte hosp.	Ledeta	00251-11-445667
19	Kadisco Hosp.	Bole	00251-11-6298904
20	Cadisco Hosp.	Bole	00251 -11- 673462

Declaration

The undersigned declares that this thesis was complies with the regulations of the University and meets the accepted standards with respect to originality and quality. PI also agrees to accept responsibility for the scientific ethical and technical conduct of the research and for provision of required progress reports.

Marta Ayele (B.Sc.)

Signature: _____

Date of submission: _____

This thesis has been submitted with our approval as advisors.

Advisor: Fatuma Hassen (BA,BSc, MPH, PhD fellow)

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

Advisor: Habtamu Molla (MSc, PhD candidate)

Signature:_____

Date: _____

Place: Addis Ababa, Ethiopia.