



Assessment of Knowledge, Attitude and Practices of Medical Laboratory Professionals on the Use of Internal Quality Control for Laboratory Tests among Selected Health Centers in Addis Ababa Ethiopia

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Abstract

Objective: To assess Knowledge, Attitude and Practices of medical laboratory professionals on the use of Internal quality control (IQC) for laboratory tests among selected Health centers.

Methods: Cross sectional Study design was employed to assess Knowledge, Attitude and Practices (KAP) of IQC for laboratory tests and the questionnaires was circulated to collect the data and finally the data was entered, cleaned and analyzed using SPSS version 19.0 software. Tables and graphs were used to summarize the results. The chi-square test was employed to assess the association between variables. A p-value of less than 0.05 was considered as statistically significant.

Result: From a total of 175 study participant majorities (81.7%) had better Knowledge about preparing in house made IQC and 18.3% have no knowledge about preparing in house made IQC. 98 (68.5%) of the study subject haven't faced failed result for IQC and 45 (31.5%) were faced failed result. Study participant attitude was classified as bad, good, very good and excellent among this 4 (2.3%) have bad, 79 (45.1%) have good, 38 (21.7%) have very good and 54 (30.9%) have excellent attitude towards IQC. About 32 (18.3%) of the study participant had not perform IQC.

Conclusion: In this study despite the study participants have better Knowledge and Attitude about IQC, majority have poor documentation Practice. Hence, a lot of educational and motivation activities and improvement of IQC practice are needed to promote the use IQC and reduce rate of error for laboratory results.

Keyword: Knowledge Attitude Practice; Internal quality control; Step wise laboratory improvement process toward accreditation

Abbreviations: IQC: Internal Quality Control; IRB: Institutional Review Board; ISO: International Organization for Standardizations; KAP: Knowledge, Attitude and Practices; LQMS: Laboratory Quality Management System; SLIPTA: Improvements Process Towards Accreditation; SPSS: Statistical Package for Social Science; WHO-AFRO: World Health Organization -African Regional Office

Introduction

Internal quality control (IQC) is a set of procedures undertaken by laboratory staff for the continuous monitoring of operations and the results of measurements in order to decide whether results are reliable enough to be released [1]. Ideally, controls should be assayed with each analytical run and placed randomly through the run to detect analytical imprecision. Controls should also have assay values within clinically significant ranges [2].

Studies of laboratory errors have documented that a higher percentage of errors occur in the pre-analytic and post-analytic processes than in analytic processes. The figures often quoted are 45% for errors in pre-analytic processes, 10% for analytic errors, and 45% for post analytic errors (actual estimates, 45.5%, 7.3%, and 47.2%, respectively). As a consequence of this expected distribution of errors, laboratories are urged to focus their attention on pre-analytic and post-analytic processes to improve patient safety [3].

According to ISO15189 (International) requirements "The laboratory shall design internal quality control systems that verify the attainment of the intended quality of results [4,5].

Taken together, internal quality control is an integral part of the medical laboratory testing procedures that should be strictly followed as per set guidelines of each laboratory [5,6]. In Ethiopia, there are some

initiatives to prepare selected hospital and Health Center laboratories for accreditation based on the WHO-AFRO check list [7,8]. This activity which is believed to improve the quality of the medical laboratory service [9,10]. However, to the best of our knowledge, no such studies have been published describing the Knowledge, Attitude and Practices on use of internal quality control (IQC) for clinical laboratory tests in Ethiopia.

The aim of this study was, therefore, to assess Knowledge, Attitude and Practices on use of IQC among selected Health centers in Addis Ababa.

Materials and Methods

Study setting and area

The study was conducted in Addis Ababa which is the capital city of Ethiopia. Addis Ababa has a population size of 2,738,248 million with annual growth rate of 2.1 [11]. The city divided into ten sub-cities and 99 kebeles (Lowest level administrative unit in the city). The city has 58 Health centers during the study period which are found in 10 sub

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cities and 25 were old and the rest were new Health Centers. All old health centers were participated in Step wise Laboratory Improvements Process towards Accreditation (SLIPTA) implementation.

Study design and period

Cross sectional Study design was employed to assess Knowledge, Attitude and Practices of Medical laboratory professionals towards use of Internal Quality Control (IQC) for Clinical Laboratory Tests among Selected Health Centers in Addis Ababa, Ethiopia from December 2014 to May 2015.

Source population

The source population was all Health centers laboratory in Addis Ababa.

Study population

The study population was all laboratory professionals who are working in the selected health centers and willing to participate in the study, during the study period.

Sample size determination

All medical laboratory professionals who were working in selected health center during the study period were included in the study.

Sampling procedures and sampling technique

Convenient sampling method was used to select 30 laboratories from the 10 sub cities. Among these 30 selected health centers, 15 of them were selected from health centers which are participated on SLIPTA and the rest 15 was selected from those, which are not participated on SLIPTA. Age, sex, education level, duration of work experiences in the laboratory, responsibility in the laboratory, quality management training, participation Step wise Laboratory Improvements Process Towards Accreditation (SLIPTA) implementation, laboratory professional individual feeling about internal quality control (IQC) as bad when scored <50.0%, good when scored 70%, very good when scored 85% and excellent when scored >85%. Average frequency of IQC, documentation of IQC results, In house preparation of IQC were tools used to measure knowledge, attitude and practice of the study participants [12,13].

Data analysis

Data was entered, cleaned and analyzed using SPSS version 19.0 software. Descriptive statistics was computed for most of the study variables. Frequency distribution tables and graphs were used to describe the findings. P-value less than 0.05 were taken as statistically significant when looking for associations between dependent and independent variables.

Ethical consideration

Ethical clearance and permission was obtained from Institutional Review Board (IRB) of School of clinical laboratory sciences, Addis Ababa University and Addis Ababa Health Bureau and permission was sought from the respective health institutions before the data collection process started.

The study participants was informed about the purpose of the study and the importance of their participation in the study by contributing information that may help in assessing the Knowledge, Attitude and Practices of internal quality control for laboratory tests. The study participants was also informed that they can skip a question or

questions that they did not want to answer fully or partly and also to stop the interviewing process at any time if they want to do so. Then after assuring the confidential nature of responses and obtaining informed consent from the study participants interviewing was proceed with strict privacy. Confidentiality of the data was maintained throughout the study by keeping hard copies in lockers and electronic files pass word protected.

Results

Socio-demographic characteristics of respondents

A total of 175 laboratory professionals were participated in this study, the median age of the respondents was 25 (25-29 years). The majority (54.9%) of the study participants were found between 25-29 years age group. Most of the respondents 97 (55.4%) were male and regarding education, the majority of the respondents (58.9%) were diploma level qualification. Regarding their responsibilities in the department, the majority 122 (69.7%) of the respondents were staff members involved in routine laboratory activities. Among the study subjects, more than half 104 (59.4%) of participants were work at SLPTA participated laboratory. The majority 103 (58.9%) of the respondent had taken laboratory quality manage training. Knowledge of laboratory professionals working, among the study participant majorities (81.7%) had better Knowledge about preparing in house made IQC. 45 (31.5%) of the study participants had faced failed result. 21 (46.6%) of the study participants, their decision was to immediately reject the result, while 24 (53.3%) repeated the test before rejecting the result. Regarding Attitude of laboratory professionals working in the study area, the study participant feeling was categorized as bad, good, very good and excellent. Based on this category the majority, 79 (45.1%) had good feeling towards IQC and majority 170 (97.1%) were believe performing internal quality control is necessary (Table 1).

Practice of laboratory professionals on IQC, majority 143 (81.7%) of them were perform IQC. However only 86 (49.1%) were documented their result for IQC test. Average frequency of IQC for the total of tests was 64 (57.6%) batch, 24 (21.6%) daily, 6 (5.4%) were monthly, 17 (15.3%) weekly. About 53 (47.8%) of the respondents were accepted those frequencies, their main reason for this was cost, workload, difficulty to perform IQC for some tests, accuracy of test within the same batch is similar and which accounts 30.2%, 5.6%, 3.8%, 49% respectively (Table 2).

Participants were also asked about the reason why items are not tested for IQC, Of 175 respondents, the respond was indicated that 22.9% due to work load, 14.9% difficulty to prepare, IQC materials for some tests, 28.6% IQC materials are expensive, 13.7% due to lack of supply, 6.3% don't have enough time to do IQC and patient sample, 10.3% lack of staff members and rest 3.4% mentioned different reasons (Figure 1).

Regression analysis was made to see the association between different factors with Knowledge, of study participants towards IQC. The analysis was made between socio demographic characteristics of laboratory professionals and the outcome variables. The finding revealed that age has significant association with knowledge of study participants. Those participants whose age was 25-29 year have better knowledge about preparing in house made IQC (AOR=3.429, 95% CI=1.127-10.431). Regarding sex, males have better knowledge compared to females, (AOR=3.380, 95% CI=1.165-9.809). Furthermore, who have degree; have better knowledge about preparing in house made IQC compared to those who have diploma. (AOR=5.726, 95% CI=1.029-31.879) and

Variable	Frequency	Percent
Age		
20-24	61	34.9
25-29	96	54.9
30-34	13	7.4
≥ 35	5	2.9
Sex		
F	78	44.6
M	97	55.4
Educational level		
Diploma	103	58.9
Degree	64	36.6
Postgraduate	8	4.6
Work experience		
<1 yr	15	8.6
1-3 yr	78	44.6
3-5 yr	36	20.6
>5 yr	46	26.3
Responsibility		
Dpt. Head	28	16
Quality officer	15	8.6
Safety officer	10	5.7
Staff	122	69.7
SLPTA participated		
No	71	40.6
Yes	104	59.4
LQM training		
No	72	41.1
Yes	103	58.9
Possibility of Preparing in-house IQC		
No	32	18.3
Yes	143	81.7
Acceptability of IQC Frequency		
No	58	52.2
Yes	53	47.8
Reason to accept frequency		
Cost	16	30.2
Difficulty	2	3.8
Enough	6	11.3
Similar	26	49
Workload	3	5.6
Decision for failed results		
Reject	21	46.6
Repeat	24	53.3
Feeling		
Bad	4	2.3
Good	79	45.1
very good	38	21.7
Excellent	54	30.9
Necessity of IQC		
No	5	2.9
Yes	170	97.1

SLIPTA=Stepwise Laboratory Improvement Process Towards Accreditation, LQM=Laboratory Quality Management, Reference categories are indicated by 1; Significant Associations are indicated by*

Table 1: Socio demographic characteristics, Attitudes and knowledge of medical laboratory professionals working in selected HCs in AA, 2015 (n=175).

study participants who have better work experience (≥ 5 years) found having better knowledge about preparing in house made IQC compared to those who have less experience. (AOR=0.207, 95% CI=0.024-1.796). In addition participants who are working at laboratories which are

Practice	Frequency	Percent
Perform IQC		
No	32	18.3
Yes	143	81.7
In house		
No	76 (n=143)	53.1
Yes	67 (n=143)	46.8
Failed result		
No	98 (n=143)	68.5
Yes	45 (n=143)	31.5
Documentation		
No	89 (n=175)	50.9
Yes	86 (n=175)	49.1
Average frequency of IQC		
Batch	64 (n=111)	57.6
Daily	24 (n=111)	21.6
Monthly	6 (n=111)	5.4
Weekly	17 (n=111)	15.3

IQC: Internal Quality Control

Table 2: Practice of laboratory professionals working in selected HCs in AA, 2015 (n=175)

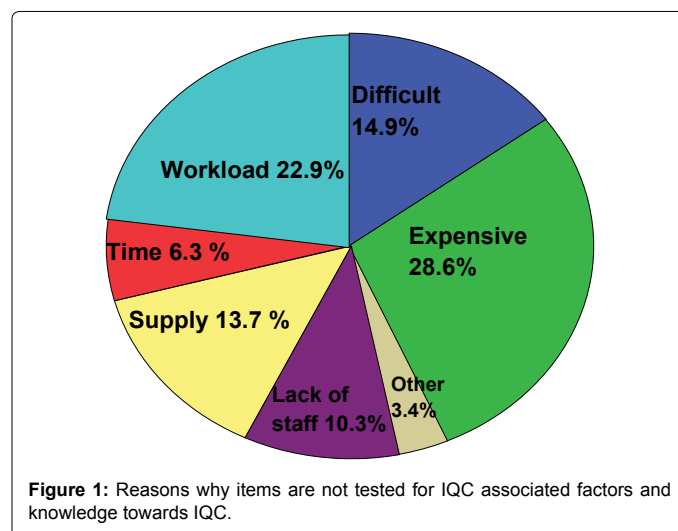


Figure 1: Reasons why items are not tested for IQC associated factors and knowledge towards IQC.

participated in SLMTA have better knowledge about preparing in house made IQC compared to participants who are working at laboratories which are not participated in SLPTA (AOR=3.547, 95% CI=1.093-11.513) (Table 3).

When regression analysis was done associated factors and practice towards IQC between socio demographic factors and have been performed IQC thorough participant's experience, the finding indicated that educational level, work experience and participating in SLIPTA, were found to be significantly associated. However, there were no significant associations of age, sex, responsibility and taking LQM training of the respondents.

As shown in Table 2 there was a statically significant association between educational status and IQC practices, those who have degree and post graduate education qualification have better practice compared to diploma level. (AOR=20.696 and 0.473, 95% CI=2.331-183.731 and 0.015-15.036) respectively. Similarly, it was found that the respondents who have long working experience have better practices compared to short work experience. Analysis also showed that those participant who are work at SLIPTA participated laboratory have practices towards IQC

Variables	Knowledge towards preparing in house made IQC		COR	AOR
	No	Yes		
Age				
20-24	22 (12.6%)	39 (22.3%)	1	
25-29	9 (5.1%)	87 (49.7%)	5.453 (2.301-12.920)*	3.429 (1.127-10.431)
30-34	1 (0.6%)	12 (6.9%)	6.769 (0.824-55.604)	6.223 (0.577-67.122)
≥ 35	0	5 (2.9%)	9E+008 (0.000)	4E+008 (0.000)
Sex				
Female	21 (12%)	57 (32.6%)	1	
Male	11 (6.3%)	86 (49.1%)	2.880 (1.291-6.427)*	3.380 (1.165-9.809)
	Educational level			
Diploma	28 (16%)	75 (42.9%)	1	
Degree	4 (2.3%)	60 (3.4%)	5.600 (1.862-16.845)*	5.726 (1.029-31.879)
Postgraduate	0	8 (4.6%)	6E+008 (.000)	3E+008 (0.000)
Work experience				
<1year	6 (3.4%)	9 (5.1%)	1	
1-3year	14 (8%)	64 (36.6%)	3.000 (0.918-9.805)	1.117 (0.227-5.497)
3-5year	7 (4%)	29 (16.6%)	2.762 (0.736-10.362)	0.937 (0.166-5.281)
≥ 5year	5 (2.9%)	41 (23.4%)	5.600 (1.397-22.441)*	0.207 (0.024-1.796)
Responsibility				
Staff	30 (17.1%)	92 (52.6%)	1	
Safety officer	0	10 (5.7%)	5E+008 (0.000)	1E+008 (0.000)
Quality officer	0	15 (8.6%)	5E+008 (0.000)	2E+008 (0.000)
Dpt. head	2 (1.1%)	26 (14.9%)	4.239 (0.950-18.924)*	2.393 (0.305-18.788)
SLIPTA participated				
No	25 (14.3%)	46 (26.3%)	1	
Yes	7 (4%)	97 (55.4%)	7.531 (3.036-18.683)*	3.547 (1.093-11.513)
LQM Training				
No	13 (7.4%)	59 (33.7%)	1	
Yes	19 (10.9%)	84 (48%)	0.974 (0.447-2.125)	0.463 (0.171-1.255)

SLIPTA=Stepwise Laboratory Improvement Process Towards Accreditation, LQM=Laboratory Quality Management, Reference categories are indicated by 1; Significant Associations are indicated by*

Table 3: Knowledge about IQC and associated factors of MLTs working in selected HCs in AA, 2015 GC.

than participant who are work at not participating at SLIPTA laboratory (AOR=21.854, 95% CI=3.774-12.541) (Table 4).

Discussion

Even though no similar studies were published to compare the findings, the majority 96 (54.9%) of study participants were found in 25-29 years age groups. Most of the respondents 97 (55.4%) were male and similarly highest proportion of the respondents 103 (58.9%) were diploma.

The study subject was from different position/ responsibility, which include department head, Quality officer, safety officer and staff member. Among these the majority 122 (69.7%), were staff members. Among the study subject 104 (59.4%) of participants were work at SLIPTA participated laboratory, this finding shows that around half of the study participants were working at laboratories which are not participating at SLIPTA. And also majority (58.9%) of the respondent were took laboratory quality manage training from this majorities were department head and Quality officer, this is more or less similar with study done by Azhar K et al. [14].

Among the study participant the majority (81.7%) had better Knowledge about possibility of preparing in house made IQA. About 45 (31.5%) of the study participants were faced failed result and their decision was immediately reject the result 21 (46.7%), and repeat the test before rejecting the result 24 (53.3%), this reports also similar with study reported by Mario et al. [14] and Abaynesh et al. [15].

In this study, about 79 (45.1%) have good, feeling towards IQA. The

majority (81.7%) of the study participant perform IQC through their experience. However only 86 (49.1%) were documented their result but when we see different guidelines, the laboratory shall document its quality control results 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 [4].

In laboratory operations, control samples are analyzed during each analytical run to evaluate method performance [16]. Even though no such kinds of studies are published in Ethiopia, in this study the finding showed that the highest proportion of average frequencies for all tests that the study participants done was every batch 64 (57.6%). The major reason for this was cost, workload, difficult to perform, lack of staff, accuracy of test within the same batch is similar and others [17-19]. According to this study, age have significant association with knowledge of the study participants. Those study participants whose age is ≥ 30 have better knowledge about preparing in house made IQC than <30 years old. Also males have better knowledge compared to females. Furthermore study subjects who have degree and post grade have better knowledge about IQC compared to those who have diploma. And study participants who have longer work experience (≥ 5 years) found having better knowledge about IQC compared to those who have shorter experience. In this study, participants who are working at laboratories which are participated in SLIPTA have better knowledge about IQC compared to participants who are working at laboratories which are not participated in SLIPTA, According to SLIPTA program "performing IQC is one requirement meet quality laboratory and achieves stars [17]. In general, according to the finding age, sex, educational level,

Variables	Perform IQC		COR	AOR
	No	Yes		
Age				
20-25 years	7 (4%)	54 (30.9%)	1	
26-30 years	22 (12.57%)	74 (42.3%)	0.436 (0.174-1.094)	0.042 (0.008-0.220)
31-35years	2 (1.1%)	11 (6.3%)	0.713 (0.130-3.903)	0.259 (0.019-3.549)
≥ 36years	1 (0.5%)	4 (2.3%)	0.519 (0.051-5.321)	0.033 (0.001-1.004)
Sex				
Female	18 (10.3%)	60 (34.3%)	1	
Male	14 (8%)	83 (47.4%)	1.779 (0.821-3.854)	2.798 (0.813-9.628)
Educational level				
Diploma	3 (1.7%)	61 (34.9%)	1	
Degree	27 (15.4%)	76 (43.4%)	0.138 (2.092-24.949)*	20.696 (2.331-183.731)
Postgraduate	2 (1.1%)	6 (3.4%)	0.147 (0.203-5.602)*	0.473 (0.015-15.036)
Work experience				
<1year	9 (5.1%)	6 (3.4%)	1	
1-3year	20 (11.4%)	58 (33.1%)	4.275 (1.351-13.525)*	0.404 (0.064-2.556)
3-5year	0	36 (20.6%)	2E+009 (0.0001)	5E+008 (0.000)
≥ 5year	3 (17.1%)	43 (24.6%)	21.500 (4.621-104.736)*	1.206 (0.061-24.006)
Responsibility				
Staff	28 (16%)	94 (53.7%)	1	
Safety officer	0	10 (5.7%)	5E+008 (0.000)	2E+008 (0.000)
Quality officer	0	15 (8.6%)	5E+008 (0.000)	2E+008 (0.000)
Dpt head	4 (2.2%)	24 (13.7%)	1.787 (0.572-5.586)	0.860 (0.082-9.063)
SLIPTA participated				
No	24 (13.7%)	47 (26.8%)	1	
Yes	8	96 (54.85%)	6.128 (2.56-14.669)*	21.854 (3.774-12.541)
LQM Training				
No	15 (8.6%)	57 (32.6%)	1	
Yes	17 (9.7%)	86 (49.1%)	1.331 (0.616-2.878)	0.577 (0.187-1.776)

SLIPTA=Stepwise Laboratory Improvement Process Towards Accreditation

LQM=Laboratory Quality Management, Reference categories are indicated by 1; Significant Associations are indicated by*

Table 4: Practice about IQC and associated factors of MLTs working in selected HCs in AA, 2015 GC.

work experience, SLIPTA participation has significantly association with Knowledge towards IQC. Surprisingly, taking LQM training has no association with Knowledge. In this study, educational level, work experience, participation in SLIPTA, were found to be significantly associated with having better practices about preparing in house made IQC for routine laboratory tests [20-26]. However, there were no significant associations of age, sex and taking LQM training and responsibility in this study.

Educational qualification status of the respondents was associated with IQC practices; the finding indicates that those respondents who have degree and post graduate of master degree educational qualification have better practice towards IQC as compared to diploma level. Similarly, it was found that the respondents who have longer working experience have better practices compared to less work experience and also those participant who are work at SLIPTA participated laboratory have better practices towards IQC than participant who are work at not SLIPTA participated laboratory. Some reports also supported this idea [27-31].

Conclusion

As conclusion, based on the findings of this study, the following conclusions can be drawn: In this study despite the study participants

have better Knowledge and Attitude about IQC, majority have poor documentation Practice, this may affect negatively to attain the objectives quality laboratory and also it may clarify that better Knowledge and Attitude does not always leads to good IQC Practice. The major factors for good IQC practice in this study shows educational level, work experience, responsibility, participate in SLIPTA program, LQMS training facility, Hence a lot of educational and motivation activities and improvement of IQC practice are needed to promote the use IQC and reduce rate of error for laboratory results.

The limitation of this study was, even though the sample size was too small, more likely to be of great interest to the scientific community who read the journal attracted by the findings to carry out rigorous researches in this thematic area and also different researchers can use the finding of this paper as reference for further similar study.

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