Knowledge, Attitude and Practice of Quality Assurance Among Medical Laboratory Technologists Working in Laboratories of Lahore
Kanwal Azhar, MSc, MT; Asim Mumtaz, MBBS, MPhil; Muhammad Ibrahim, Toqeer Ali Butt, MSc, MT; Sajid Azeem Qureshi, MD, DCP

ABSTRACT
Background and Objective: A medical or clinical laboratory is expected to provide information about the health of a patient to be appropriate for the diagnosis, treatment, and prevention of disease. Quality system is very important and depends upon the efforts and commitment of staff for its implementation. Quality system in laboratory cannot be achieved if not properly practiced. The objective of this study was to assess the knowledge and attitude of Medical Laboratory Technologists working in laboratories of Lahore, regarding quality assurance and to identify the factors affecting the practices of quality assurance.

Subjects and Methods: Medical Laboratory Technologists (MLTs) having degree of B.Sc Medical Laboratory Technology working in different laboratories/hospitals of Lahore were included in this study. The questionnaires were distributed among MLTs working in different laboratories/hospitals of Lahore. The questionnaire was made to monitor MLTs knowledge, attitude and practice about the concepts of quality assurance. A census technique was used to sample the MLTs. The questionnaires were distributed to (60) MLTs working in laboratories/hospitals of Lahore and 50 responded to these questionnaires. The response rate of MLTs to the questionnaire was 83.3%.

Results: The study population consists of 58% female and 42% male participants. The mean age of participant MLTs was 24.2±3.4 (range 21-40) years. The participants were divided into group A & B according to the age. Group A had 82% MLTs of age range from 20-25 years. Group B consisted of 18 % MLTs of >25 years old. The mean working experience of the MLTs was 2.4±2.9 (range 0.5 to 15) years. 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 constraints to the application of QA program in laboratory was lack of training facilities in laboratories.

Conclusion: We concluded that there is a deficiency in curriculum and training of B.Sc MLT about implementation of Quality Assurance and Quality Control in Laboratory.

Keywords: Medical Laboratory Technologists, Quality Assurance, Quality Control,
Resources, Technical Competence, Technical Procedures, and Problem solving mechanism [9]. The laboratory has an ethical obligation to produce reliable and reproducible analytic measurements and observations that are timely and cost effective. For this, quality system is very important and depends upon the efforts and commitment of staff for its implementation. Quality system in laboratory cannot be achieved if not properly practiced.

The critical factors facilitating the development of quality system in laboratory include the availability of knowledgeable and regularly trained laboratory personnel and participation in External Quality Assessment Scheme (EQAS) involving quality assurance activities [10].

Good awareness about the importance of the knowledge and skills required for the new role of MLTs can improve the role of laboratories [11]. Schmitz et al specified the need of proper quality system in laboratory for assurance of quality of the tests and analyses they carry out required for precise diagnosis and appropriate treatment of patients [12]. For proper Quality Assurance system in each laboratory Snehlatha et al [13] proposed that there should be a standardized system involving a laboratory manager, supervisor, technicians and assistants, well trained and motivated MLTs to maintain high quality review of the performance. Positive attitude of laboratory professionals about quality assurance plays important role in laboratory system as Loke et al [14] found a significant correlation between employees' positive attitude to QA with their organizational commitment. MLTs positive attitudes towards QA require continuing education tools about QA implementation [15].

Aim of this study was to assess the knowledge and attitude of MLTs regarding QA working in laboratories of Lahore.

SUBJECTS AND METHODS:
MLTs having degree of B.Sc MLT working in different laboratories/hospitals of Lahore were included in this study. Written consent was taken from these MLTs for inclusion in the study. Those workers having degree other than B.Sc MLT or MLTs having education less than B.Sc MLT were excluded from the study. The questionnaires were distributed among MLTs working in different laboratories/hospitals of Lahore. The Questionnaire comprised of 65 questions and two open questions. Out of these 20 were about knowledge, 10 about attitude and 35 about practice. Before beginning the main survey, a pilot study was performed with 10 randomly selected respondents to check the reliability and validity of the questionnaire and it was modified accordingly. The questionnaire was made to monitor MLTs knowledge attitude and practice about the concepts of quality assurance like pre-analytical, analytical and post-analytical stage, equipment and instrumentation, reagents, procedures, facilities, educational programs, specimen collection and transportation, safety, reporting and recording areas. A census technique was used to sample the MLTs. Therefore, the questionnaires were distributed to 60 MLTs working in various laboratories/hospitals of Lahore and 50 responded to these questionnaires. The response rate of MLTs to the questionnaire was 83.3%.

STATISTICAL ANALYSES
The data was entered and analyzed by using standard SPSS software version-17 (SPSS Inc, Chicago) for statistical analysis. Continuous variables were expressed in the form of Mean ± SD. To signify the gap between three variables like knowledge, attitude and practice, Paired t-test was used. P value of <0.05 was considered significant.

RESULTS
58% female and 42% male MLTs were included in the study group with mean age of 24.2±3.4 (range 21-40) years. The participants were divided into group A & B according to the age. Group A had 82% MLTs of age range from 20-25 years. Group B consisted of 18 % MLTs of >25 years old. The mean working experience of the MLTs
was $2.4 \pm 2.9$ (range 0.5 to 15) years. Ninety four per cent of MLTs had working experience between 0.5-8.5 years and 6% had working experience between 8.6-16.5 years. Observational rate of knowledge, attitude and practice of MLTs was classified on the basis of their score. They were categorized as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>Poor</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>Average</td>
<td>50-75%</td>
</tr>
<tr>
<td>Good</td>
<td>&gt;75%</td>
</tr>
</tbody>
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**Table 1: Scoring criteria for knowledge, attitude and practice**

The data showed that 14% MLTs had poor, 76% had average, while only 10% MLTs had good knowledge about implementation of QC in Laboratory. There was a statistically significant difference ($P<0.05$) of knowledge between the three groups of MLTs. The 16% MLTs showed poor, 40% showed average and 44% MLTs showed good attitude towards implementation procedures of QC in Laboratory. Attitude was not statistically different ($P>0.05$) among the three groups of MLTs. The 66% MLTs had poor, 32% had average and only 6% showed good practice of implementation procedures of QC in Laboratory. There was a statistically significant difference ($P<0.05$) of practice between the three groups of MLTs.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Attitude</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Average</td>
<td>Good</td>
</tr>
<tr>
<td>Poor</td>
<td>Average</td>
<td>Good</td>
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<tr>
<td>Poor</td>
<td>Average</td>
<td>Good</td>
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**Table 2: Distribution frequencies of knowledge, attitude and practice scores of MLTs**

![Figure 1: Box plot showing means of variables (knowledge, attitude and practice) scores](image)

There was a significant gap among all three scores (F ratio = 37.786, $p= 0.000$). The knowledge score (60.60 ±13.65) and attitude score (69.8±16.72) of MLTs working in labs/hospitals of Lahore showed a significance gap ($p= 0.001$) whereas there was also a significant gap ($p= 0.000$) between attitude (69.80±16.72) and practice (43.91 ± 14.76).

The participants of the study were divided into two groups on the basis of their working experience. An increase in mean knowledge, attitude and practice scores of MLTs was observed with increase in working experience.

Higher mean knowledge score ( 2.67±0.57 ) was observed in the group having more working experience (8.6-16.5 years) then the mean knowledge score (1.91±0.45) of group with low working experience (0.5-8.5 years). Higher mean attitude score ( 3.00±0.00 ) was observed in the group having more working experience (8.6-16.5 years) then the mean attitude score (2.23±0.72) of group with low working experience (0.5-8.5 years). Higher mean practice score ( 2.00±1.00 ) was observed in the group having more working experience (8.6-16.5 years) then the mean practice score (1.31±0.47) of group with low working experience (0.5-8.5 years).

The data of the open question 1 showed that only 22% of MLTs believed that they gather information about implementation of QA in Laboratory from B.Sc course while 78% were of the view that their curriculum didn’t guide them about implementation of QA procedures rather they acquired knowledge from their working experience.

**DISCUSSION**

Knowledge, attitude and practice studies focus on a certain topic and are unique to a particular setting and designed for a specific issue. The Knowledge possessed by a community refers to their understanding of that topic. Attitude highlights their concept toward the subject, as well as any preconceived ideas they may have towards it.
Practice refers to the ways in which they demonstrate their knowledge and attitudes through their actions.

In this study a significant gap was observed in knowledge, attitude and practice scores of Medical Laboratory Technologists (MLTs) about Quality Assurance (QA) and Quality Control (QC). The knowledge (60.60 ±13.65) and attitude score (69.8±16.72) of MLTs working in labs/hospitals of Lahore showed a significance gap ($p = 0.001$) whereas there was also a significant gap ($p< 0.001$) between attitude (69.80±16.72) and practice (43.91 ± 14.76). Similar pattern of results was observed by Dargahi H et al (2007).

Regarding working experience, 94% MLTs had 0.5-8.5 years of working experience and 6% had 8.6-16.5 years of working experience. Medical Laboratory Technology is a relatively new emerging field in Allied Health Sciences in Pakistan so the number of highly experienced qualified MLTs is short. This study showed that mean knowledge, attitude and practice of MLTs about QA in laboratory increased with increasing years of experience while a previous study reported no significant difference in knowledge, attitude and practice of employees with increased experience.[16]

Among those MLTs who have some knowledge about QA and its implementation in laboratory, 78% claimed that they obtained this knowledge through on job experience and also acknowledged that the content of B.Sc MLT curriculum didn’t guide them about practice of QA in laboratory. These findings also match with a previous study which reported that graduation training of MLTs was almost lacking in laboratory application of their knowledge and they obtain this most often by on-job experience.[17]

40% of MLTs considered inadequate training facilities during B.Sc studies as the main limitation to QA and QC application in laboratory. 26% believed that main reason in lack of application of QA and QC procedures was inadequate laboratory infrastructure during B.Sc training. 22% considered unavailability of control material while 12% considered lack of qualified staff, the main constrain in application of QC in laboratory work. Proper training of MLTs in order to improve laboratory practice is recommended previously [18] our results also support this recommendation. Plebani et al (2008) concluded that the curriculum for laboratory medicine residents should include such fundamental logics that can easily translate basic concepts into knowledge and attitude along with implementation of results of knowledge into practice.

MLTs usually do more complex tasks. They evaluate test results, develop, modify procedures, establish and monitor programs to ensure the accuracy of tests. Some MLTs supervise clinical laboratory technicians. With increasing automation and the use of computer technology, the work of MLTs has become less hands-on and more analytical. The complexity of tests performed, the level of judgment needed, and the amount of responsibility workers assume depend largely on the amount of education and experience they have. So it is suggested that Bachelor's degree programs in MLTs should include comprehensive outlines of QA strategies and protocol courses in chemistry, microbiology, hematology, histology, instrumentation, immunology, and molecular genetics, as well as specialized courses should be included in their training programs to upgrade knowledge and skills used in the Medical Laboratory Technology.

CONCLUSION AND RECOMMENDATIONS

Pathology is the back-bone of medical science and MLTs are the front-line in laboratory medicine. We found a deficiency in curriculum and training of B.Sc MLT about implementation of Quality Assurance and Quality Control. We therefore recommend that the curriculum of B.Sc MLT should be revised and updated to cope with the training needs of MLTs. The changes should include hands-on training in practical work during B.Sc studies.

The University of Health Sciences (UHS) should re-design the curriculum that must include the basics about QA, QC and implementation procedures of QC in laboratory.
Institutes should provide effective training program to maximize retention of knowledge of MLTs about use of QA and QC in laboratory with more emphasis on implementation of QC procedures. Short courses, training lectures, scenario based study, journal clubs, laboratory research and updated sessions about importance and use in error detection during laboratory procedures should be offered to MLTs during B.Sc training period. MLTs should maintain an up to date working knowledge of recent automated system and modern techniques. In order to achieve advanced knowledge they should read journals, articles and research papers and attend refresher courses to develop dedication and commitment in their attitudes.

REFERENCES

Settings
This research was conducted in the Allied Health Sciences Department, University Of Health Sciences, Lahore, Pakistan.

Conflict of interest: None

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