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RESEARCH ARTICLE

KNOWLEDGE, ATTITUDE AND PRACTICES TO REDUCE PREANALYTICAL ERRORS IN A TERTIARY CARE HOSPITAL BASED LABORATORY IN NORTH INDIA

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ABSTRACT: Introduction: Preanalytical variables account for maximum percentage of errors in lab reports. Analyzing knowledge, attitude and practices of technicians regarding preanalytical variables will give us insight to many future policies/decisions. **Materials and Methods:** This study was aimed to assess the level of knowledge, attitude and practices among medical laboratory personnel regarding pre-analytical variables in biochemistry laboratory before and after training sessions using questionnaire involving 32 technicians. Prevalidated knowledge attitude and practice questionnaire was given to all the participants before and after training session. **Results:** The study included a total of 32 laboratory technicians who were sub-grouped on the basis of experience; group A ≤5yrs experience and group B >5yrs. Pre-training knowledge showed significant positive correlation with the years of experience. Knowledge score was average in 34% technicians which became good (>75%) in all participants after training. Attitude was in good category (50-75% score) in all even before training. With training, it showed statistically significant further improvement in both groups especially in the more experienced group. However, practice score was average in all participants. But it improved very significantly (p=0.0001) after training. **Conclusion:** Knowledge and attitude regarding preanalytical variables is better in experienced technicians. However, the practices for preventing preanalytical errors are not up to the mark in both groups; but it improves significantly with training. Thus laboratories should be engaged in frequent training activities as it takes a lot of effort both at individual and management level to put knowledge and attitude into practice.

KEYWORD: Knowledge, Attitude, Practices, Preanalytical variables, prevalidated, questionnaire.

INTRODUCTION:

The biochemistry laboratory is the backbone of any hospital, as it contributes to both diagnosis and treatment, forming the basis of admission and discharge criteria for the patient. The lab reports have direct relationship with correct treatment protocol and patient care[1]. Recent studies have demonstrated that in vitro diagnostic tests are performed in up to 96% of patients and that up to

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80% of clinical decisions involve consideration of laboratory results[2]. An analysis indicated that pre-analytical errors accounted for 62% of all errors, with post-analytical 23% and analytical 15% of all laboratory errors[3]. So, it is evident that pre-analytical errors play a major role in the good quality of lab reports.

Analysing the base level of knowledge, attitude and practices (KAP) towards pre-analytical errors among technical staff working in the biochemistry laboratory will help to assess the ground situation and whether frequent retraining has any impact on already trained and experienced technicians.

So, a prospective questionnaire based study was done in the biochemistry lab of a premier tertiary care hospital in the capital of India with the objective to assess the knowledge, attitude and practices among medical laboratory personnel about the pre-analytical variables involved in the laboratory testing using questionnaire before and after training sessions.

MATERIAL AND METHODS:

A KAP questionnaire was used for the study which was validated as per content, construct, relevance (by expert opinion) and for time and simplicity (face validation by pilot study on 2 technicians-one senior and one junior)[4]. 5 likert type questions regarding questionnaire were included which helped in calculating the internal reliability using Cronbach's alpha for measuring internal consistency coefficient[5]. Clearance was obtained from institute ethical committee. Informed written consent was obtained from each subject before enrolling them in study.

Subjects included were technicians working regularly in the Biochemistry lab for a minimum period of 6 months. Freshly recruited technicians having less than 6 month experience and those on long leave on medical or other grounds were excluded from the study.

A total of 20 questions were asked in the form of knowledge, attitude and practices. The questions were of multiple choice type pertaining to the preanalytical variables like patient preparation, sample collection, vacutainers, additives, sample transportation, centrifugation and storage (annexure 1). After the participant filled the validated questionnaire as pre-test, a 2 hour long training class was taken on 'pre-analytical variables in biochemistry laboratory' in groups of 5 (max). Further, the same questionnaire was given to technicians as post-test within 7 days of training.

Knowledge assessment questions had three possible answers (yes, no, and I don't know). One point was given for each correct answer. For all other responses, zero points were assigned. The knowledge score thus ranged between zero (no correct answers) and twenty (all answers correct). Attitude assessment questions had five possible responses (very high, high, intermediate, low, and no importance), the answer 'very high' was given five points and 'no importance' got one point. So, the total score ranged from 20 to 100. Practice assessment questions had five answers (always, often, sometimes, seldom, and never). One point was allocated to correct and zero points for all other answers. The total score thus ranged from 0 to 20.

Statistical analyses was done using MS Excel 2010 and Graphpad quickcalcs online calculator[6]. Mean and SD was calculated for parameters and Student's t test was used for group comparison. Pearson's correlation coefficient was applied to compute association between years of experience and scores. A two sided p value of ≤ 0.05 was considered statistically significant. P value of <0.01 was considered very significant and <0.0001 was very significant.

Five likert type questions regarding questionnaire were included in the study which were analyzed using Cronbach's alpha for calculating internal consistency coefficient. The Cronbach's alpha value

was found to be 0.74 which represents a good reliability and consistency.

RESULTS:

A total of 32 participants were included in the study out of which 12 were male and 20 female. The mean age group of males was 31.08+/-12.18 (range 23 to 56) years and females 36.55+/-13.52 (range 23 to 59) years. The participants were divided into two groups (A and B) on the basis of years of experience (≤5yrs and >5yrs). There were 18 (56%) participants in group A (≤5yrs experience) with mean age 25.17+/-1.92 (range 23 to 30) years. Group B (>5yrs experience) had 14 (44%) participants with mean age 46.5+/-11.37 (range 26 to 59) years.

The average knowledge score regarding preanalytical variables in technical staff was16.47+/-2.30 (out of max score 20) before training which slightly improved to 17.25+/-1.24 after training. The attitude score was 89.97+/-7.26 (out of max score 100) pre training and 94.75+/-3.93 post training (p=0.002). Average practice score was 12.44+/-2.03 (out of max score 20) before training which significantly improved to 16.06+/-1.79 after the training (p=0.0001) (**Table 1**).

Table 1. Score comparison before and after training in all participants

	Before training	After training	p value
Knowledge (K)	16.47+/- 2.30	17.25+/- 1.24	0.10
Attitude (A)	89.97+/- 7.26	94.75+/- 3.93	0.002**
Practices (P)	12.44+/- 2.03	16.06+/- 1.79	0.0001***

* P value <0.05 = significant, P value<0.01 = very significant, P value<0.0001 = very very significant

The knowledge, attitude and practice scores were calculated in combination for individuals and the mean compared between both groups. The mean score for group A was 116.61+/-11.08 before training and 126.17+/-5.22 after training. For group B, the mean score was 121.79+/-5.51 before and 130.5+/-4.13 after training. Both groups were comparable in all aspects except the attitude after training, which was significantly higher in the more experienced group (p=0.02) (**Table 2**).

Table 2. Inter-group comparison

	GROUP A	GROUP B	p value
Count (=N)	18	14	
Age (yrs)	25.17+/- 1.92	46.5+/- 11.37	0.0001***
Lab Experience (yrs)	3.08+/- 1.19	21.36+/- 10.67	0.0001***
Pre training Knowledge score	16+/-2.33	17.07+/- 2.20	0.20
Post training Knowledge score	17.11+/- 1.13	17.42+/- 1.40	0.49
Pre trainingAttitude score	88.17+/- 8.70	92.29+/- 4.07	0.11
Post trainingAttitude score	93.33+/- 4.65	96.57+/- 1.45	0.02*
Pre trainingPractice score	12.44+/- 2.31	12.43+/- 1.70	0.99
Post trainingPractice score	15.72+/- 1.67	16.50+/- 1.91	0.23
Pre training total KAP	116.61+/- 11.08	121.77+/- 5.51	0.12
Post training total KAP	126.17+/- 5.22	130.50+/- 4.13	0.02*

* P value <0.05 = significant, P value<0.01 = very significant, P value<0.0001 = very very significant

On group wise comparison before and after training, it was found that there was no significant change in knowledge after training. The attitude significantly changed after training in both groups, more so in the experienced group. Interestingly, the practices showed very significant improvement in both groups after training (p=0.0001) (**Table 3**).

Table 3. Group-wise comparison before and after training

	Before training	After training	p value
Group A knowledge	16+/-2.33	17.11+/-1.13	0.08
Group B knowledge	17.07+/-2.20	17.42+/-1.40	0.62
Group A attitude	88.17+/-8.70	93.33+/-4.65	0.03*
Group B attitude	92.29+/-4.07	96.57+/-1.45	0.001**
Group A practices	12.44+/-2.31	15.72+/-1.67	0.0001***
Group B practices	12.43+/-1.70	16.50+/-1.91	0.0001***
Group A total KAP	116.61+/-11.08	126.17+/-5.22	0.002**
Group B total KAP	121.77+/-5.51	130.50+/-4.13	0.0001***

* P value <0.05 = significant, P value<0.01 = very significant, P value<0.0001 = very very significant

The scoring criteria was divided into poor (<50% score), average (50 to 75% score) and good (>75% score) for purpose of analysis. **Table 4** shows detailed analysis of scores before and after training. The results show that knowledge score improved after training (34% participants had average scores and 66% had good scores before training which improved to 100% after training), attitude was good in all participants even before training. However, practice score was average in all participants which could improve to good in only 53% participants after training.

Table 4. Scoring criteria before and after training

Scoring criteria	Pre training knowledge	Post training knowledge	Post training attitude	Post training attitude	Pre training practices	Post training practices
poor (<50%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
average (50-75%)	11 (34%)	0 (0%)	0 (0%)	0 (0%)	32 (100%)	15 (47%)
good (>75%)	21 (66%)	32 (100%)	32 (100%)	32 (100%)	0 (0%)	17 (53%)

Pearson correlation statistics was applied to find out any correlation between years of experience and pre-training scores. Only knowledge showed a significant positive correlation with years of experience. Attitude and practice had no correlation with experience (**Table 5**).

Table 5. Pearson's correlation coefficient values

Pearson's correlation	r value	p value
Years of experience vs Pre training Knowledge score	0.38	0.03*
Years of experience vs Pre training Attitude score	0.24	0.19
Years of experience vs Pre training Practice score	0.09	0.62

* P value <0.05 = significant, P value<0.01 = very significant, P value<0.0001 = very very significant

DISCUSSION:

Preanalytical variables are the most vulnerable aspect of lab reporting as there are maximum chances of variation associated with it. Proper and thorough knowledge regarding the preanalytical variables is essential for the technical staffs so that errors are minimized. The right attitude is more important than mere knowledge. It is even more essential to put the attitude into daily practice so as to achieve the quality goals[7].

Out of 32 participants in this study, 56% were new technicians having less than 5 years' experience while 44% were more experienced. This shows that the department is balanced in the form of having almost equal distribution of senior and junior technicians. Thirty eight % participants are male and 62% female, both genders having comparable mean age.

In this study it was observed that the total score was significantly higher in the more experienced group both before and after training (table 3). None of the participants had poor score in any category; knowledge, attitude or practices. Rather, 66% had good knowledge even before training. This is in .

contrary to previous studies by Milutinovic et al (2015), Dorotic et al (2015) and Jagannatha et al (2018)[8-10]. After training, all participants had knowledge scores >75%. Attitude was in the good

category (>75%) in all of the participants before training. With training, the attitude had improved from 89% to 95% score which is a significant rise, more so in experienced group. However, practices were in the average category for all participants before training. After training, 53% technicians were motivated to a good practice score. 47% still remained in average category but their scores had improved very significantly.

On analyzing data as per years of experience, the mean score was found to be same in both groups of technicians having experience more than or less than 5 years. This is contrary to study by Zinder (2002)[11]. This could be because this is a teaching institute where there is constant teaching learning activities. After training, the more experienced technicians had total score significantly better than the less experienced group. This is due to better improvement in attitude in the former group.

When the scores are compared for individual parameters, it is clear that the mean knowledge scores are similar in both groups both before and after training. The mean attitude scores are better in the more experienced group after training. This suggests that the attitude of more experienced technicians are motivated easily as compared to the younger group. The practices were equally poor in both groups before training and had very significant improvement after training.

This study thus shows that the laboratories should be engaged in frequent training activities even if the knowledge regarding preanalytical variables is good and the staff is experienced. Frequent and repeated training is important to improve the practices related to keeping preanalytical variables to a minimum, irrespective of the fact that the attitude is promising.

CONCLUSIONS:

This study concludes that the knowledge regarding preanalytical variables is better in experienced technicians, but the less experienced ones can be made at par with training. The attitude towards reducing preanalytical errors is overall good but lower in less experienced technicians. However, the practices for preventing preanalytical errors are not up to the mark in all groups of technicians, which improves with training. Thus laboratories should be engaged in frequent training activities as it takes a lot of effort both at individual and management level to put knowledge and attitude into practice.

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