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## Recommended Citation

Khan, N. U., Fayyaz, J., Khan, U., Feroze, A. (2013). Importance of clinical toxicology teaching and its impact in improving. *Journal of Pakistan Medical Association*, 63(11), 1379-1382.

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## Importance of clinical toxicology teaching and its impact in improving Knowledge: sharing experience from a workshop

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### Abstract

**Objective:** To assess the impact of a one-day clinical toxicology workshop in improving knowledge.

**Methods:** A one-day clinical toxicology workshop was conducted as a pre-conference workshop of the Annual Emergency Medicine Conference at the Aga Khan University Hospital, Karachi, in April 2012. The course was composed of poisoning-related common clinical scenarios. The pre-test and post-test understanding was used to assess the impact of the course in improving knowledge. The participants also evaluated the workshop as a whole thorough written evaluation forms. SPSS 19 was used for statistical analysis of the data.

**Result:** There were 22 participants in the course. The pre-test mean score was  $31.6 \pm 15.1\%$  (95% CI; 24-40; n=19) compared to the post-test the mean score of  $56.0 \pm 10.8\%$  (95% CI; 47- 61; n=17). The positive difference was also statistically significant ( $p < 0.001$ ). The overall workshop was evaluated as excellent by 08 (47.46%) and very good by 10 (52.63%) participants.

**Conclusion:** Short training in clinical toxicology improved knowledge of the participants.

**Keywords:** Clinical toxicology, Emergency medicine, Teaching, Pakistan. (JPMA 63: 1379; 2013)

### Introduction

Poisoning is an important cause of morbidity and mortality.<sup>1-3</sup> It has been identified as a significant global public health problem. According to the World Health Organisation (WHO) data, an estimated 346,000 people in 2004 died worldwide from unintentional poisoning. Of these deaths, 91% occurred in low- and middle-income countries.<sup>4</sup> Poisoning accounts for 0.86-5.9% of emergency department (ED) visits in developed countries.<sup>5</sup> Pakistan also suffers from poisoning-related mortality and a recent study from Rawalpindi reported such deaths to be as high as 7.1%.<sup>6</sup>

Clinical toxicology focuses on the clinical presentation and management of toxic substances and associated diseases.<sup>7,8</sup> Toxicology has now emerged as a subspecialty of emergency medicine.<sup>9</sup> Data has shown that toxicology-trained physicians provide a cost-effective management to patients with acute intoxication.<sup>10</sup> In Pakistan, the initial assessment and clinical management in the ED of acutely poisoned patients are undertaken by junior physicians who do not have any formal training in clinical toxicology.<sup>11</sup> Even patients are managed by internists with little training in toxicology. A study has shown an improvement in clinical care of acutely ill poisoned patients by targeted educational interventions.<sup>12</sup>

Formal training in toxicology like fellowship in clinical toxicology, is lacking in our undergraduate or postgraduate curricula. However, the importance of clinical toxicology has started to get recognition. The current study was aimed at assessing the impact of a short one-day course focussing on common scenarios of clinical toxicology at the ED in improving the knowledge of the participants.

### Subjects and Methods

The study comprised participants of a pre-conference workshop of the Annual Emergency Medicine Conference (AEMC) 2012 held in April at the Aga Khan University Hospital. It was a one-day workshop designed to address poisoning cases and related case presenting to the ED and other important lethal poisoning of clinical significance. The course participants were Emergency physicians, General/Family Medicine practitioners and medical students.

The workshop focus was on the importance of learning clinical toxicology. General principles of poisoning management were thoroughly reviewed. Poisoning scenarios common in the region were discussed. The clinical impact of environmental and occupational hazards were also touched upon. A separate session discussed poisoning issues in children such as "One pill that can kill" and "common household poison". Most sessions were scenario-based and the mode of teaching was problem-based learning. Active participation was sought from the participants and questions and

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reasoning were encouraged.

Pre-test and post-test quizzes were conducted to find out the impact of the course on knowledge increase among the participants. The pre-test quiz consisted of 20 multiple choice questions (MCQs), while the post-test quiz comprised 30 MCQs. Both the quizzes comprised questions from standard text book e.g. "Tintinalli's Emergency Medicine; A Comprehensive Study Guide" and "Gold Frank's Toxicologic Emergencies",<sup>13,14</sup> The questions were of, scenario-based "Choose the best answer", format and covered several topics (Table-1), and all were MCQs (Table-2). There was no negative marking.

At the end of the course, evaluation forms were circulated to get feedback related to the entire workshop experience. The participants were asked about objectives of the activity defined; content covered as per defined objective; overall presentation matching the participant's

Table-1: Course content of Clinical Toxicology workshop.

Introduction to Toxicological Emergencies
General principles of management of poisoning
Case discussion:
1. Aspirin Toxicity
2. Paracetamol poisoning
Case discussion
3. Gaseous poisoning
One Pill that can kill
Toxic Envenomation
Pesticide poisoning
Case discussion
4. Household toxins
Hydrocarbons
Alcohol poisoning
Case discussion
5. Heavy metal poisoning

Table-2: Sample of pre-test and post-test questions.

S.No	Multiple choice Question
1.	A young man is brought to ED by the custom agent with the suspicion of gastrointestinal drug smuggling. He has normal vital signs and normal examination. Which of the following is the appropriate management: a. Immediate surgical removal b. Keeping the patient in ICU for observation c. Oral bulk laxatives therapy in ICU d. Oral activated charcoal and whole bowel irrigation e. Single dose activated charcoal without a cathartic
2.	A 30 year old man is brought to ED comatosed. His pupils are small and breathing rate is very slow. There is secretions in the upper airway. The best immediate antidote recommended in this patient is: f. Atropine g. Flumazenil h. Nalaxone i. Glucose j. Thiamine
3.	Which of the following is true of acetaminophen toxicity in pregnancy? k. N- acetyl cysteine does not cross the human placenta l. The foetus is of incapable of producing NAPQI until late in the third trimester m. The Rumack Mathew normogram is not applicable to pregnant patients with acute ingestion n. Acetaminophen does not cross the human placenta o. In nearly all cases, both foetal and maternal outcome is good if N- acetyl cysteine is used in a timely manner
4.	A 3 year old child accidentally ingested unknown number of ferrous sulphate tab 300mg two hours ago. The child presented with vomiting and loose stool. On examination child is lethargic with a pulse 120/min BP 100/60 temp 37°C and RR 20/min. There is tenderness in epigastrium otherwise rest of the examination is unremarkable. His serum Iron level 4hr after presenting to ED is 500 microgram/dL. Normal serum iron level of a three year old child is 50-120 microgram /dL. The proven therapy in this case include a) Activated charcoal b) Gastric lavage c) Deferoxamine d) Haemodialysis e) Symptomatic treatment only

\*Reference

1. Gold Frank's Toxicological Emergencies 9th edition, 2011
2. Tintinalli's Emergency Medicine (A comprehensive study guide)7th edition, 2011

ED: Emergency Department. ICU: Intensive Care Unit. NAPQI: N-acetyl-p-benzoquinone imine.

level of understanding; level of interaction; acquired new knowledge; time management; queries responded; organisation of the activity; quality of course material, if provided; overall assessment of the activity.

The rating of the activity was assessed on a five-point scale; excellent scored as 5, very good as 4, good as 3, average as 2; and poor as 1.

To calculate mean differences for paired observations in pre- and post-assessment scores, paired t-test was used. Confidence interval for mean scores was also calculated using t-statistics. SPSS version 19 was used to analyse the data.

## Results

Of the total 22 participants pre-test and post-test quizzes

Table-3: Comparison of results.

	N	Mean Score (%)	Std.Deviation	Minimum	Maximum	P-Value *
Pre-test	16	31.6	15.1	5.0	60.0	<0.001
Post-test	16	56.0	10.8	23.3	76.7	

\*Used paired t test.

Table-4: Evaluation of overall course.

Rating	No of candidates	Percentage %
5 - Excellent	08	47.36
4- very good	10	52.63
3- good	01	5.26
2- Average	0	00
1- Poor	0	00
Total	19	100

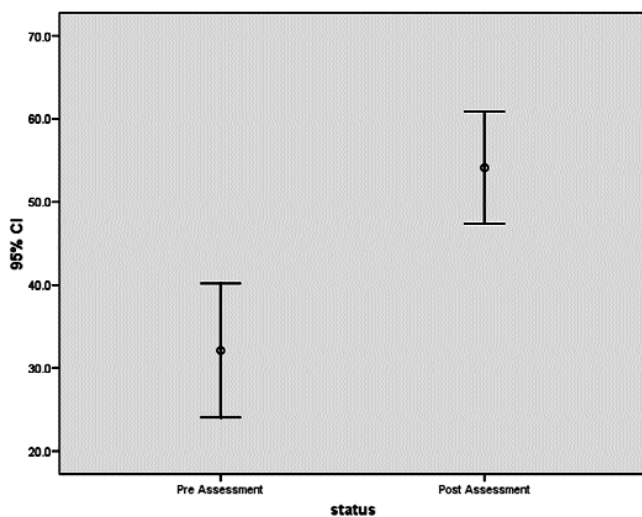


Figure: Mean scores and Confidence Interval for pre-test and post-test quiz.

were undertaken by 16 (73%), while the overall evaluation form was filled by 19 (86%). The mean score in the pre-test quiz was  $31.6 \pm 15.1\%$  (95% CI; 24-40; n=19), while in the post-test quiz the mean score was  $56.0 \pm 10.8\%$  (95% CI; 47- 61; n=17) (Table-3). The difference was positive and statistically significant ( $p < 0.001$ ) (Figure).

The evaluation of the overall course was rated as 'excellent' by 8(47.46%), 'very good' by 10 (52.63%) and 'good' by 1(5.26%) of the participants. No one rated the course as 'average' or 'bad' (Table-4).

## Discussion

To the best of our knowledge, it is the first study of its kind from the country. It highlights two important facts; first, a lack of knowledge among healthcare providers with

regards to clinical toxicology evident from suboptimal scores in the pre-test quiz and second, that training in clinical toxicology helps in acquiring knowledge.

Participants of the workshop included Family and Emergency physicians, who are likely to encounter cases of clinical toxicology, and the medical students, who were undergoing clinical training and should have general knowledge of the management of such cases. Poisoning kills people in the younger age group and the poisoning mortality is high in developing countries overall, including Pakistan.<sup>1,15-20</sup> While there are various factors for this high mortality, but we assume that lack of knowledge of poisoning management could also potentially contribute.<sup>21</sup> The reason for this lack of knowledge is limited exposure as well as opportunity during undergraduate and postgraduate training in Pakistan. A survey of academic leaders in medical college identified a perceived need of training in Emergency Medicine which will help develop the area of clinical toxicology.<sup>11</sup>

In the US, toxicology training is included in the curriculum of Emergency Medicine residency programme.<sup>22,23</sup> They also have well-established poison control centres which offer training to both undergraduates and postgraduates, in addition to providing awareness and education to community.<sup>22,24</sup> Some centres offer hazardous material (HazMat) life support course that are generally 2-3 days in

duration and over toxicological emergencies, including chemical disaster.<sup>25</sup> Toxicology training is also offered as a fellowship programme in the US and Master's programme in the UK.<sup>26,27</sup> In Pakistan, there are no programmes especially designed for clinical toxicology training. Forensic Medicine as a curriculum in medical college does cover the medico-legal aspect of toxicology during undergraduate training, but clinical exposure is limited. In Pakistan there are two poison control centres, but educational opportunities available at these centres are limited.<sup>28</sup>

The results highlight that even a short training course improves knowledge significantly in this subject.<sup>29</sup> This will potentially help in improving patient care. The course was rated highly and was appreciated by the participants. Some participants commented that this should be offered over a longer period of time.

Including clinical toxicology in the undergraduate curriculum as well as fellowship in clinical toxicology are needed and a pre-requisite for reducing the injury burden related to this preventable cause.

## Conclusion

Clinical toxicology knowledge is lacking among healthcare providers. Short training course helps in improving the knowledge significantly.

## Acknowledgement

We are grateful to Asher Bin Feroze for statistical assistance.

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