

# Efficacy of Clinical Toxicology Curriculum on the 4<sup>th</sup> Year Egyptian Students - Faculty of Medicine- Tanta University in Improvement their Concept about Human Safety from Toxicity

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## Abstract

**Introduction:** Safety is considered the main mission in life. Decreasing death rate in homes, at work and among communities must be done through education and researches promotion. About 90% of poisoning happened due to lack of awareness. **The aim of this study:** is to illustrate the efficacy of Clinical Toxicology Curriculum on the 4<sup>th</sup> year Egyptian students-academic year 2018-2019 Faculty of Medicine- Tanta University in improvement their concept about human safety from toxicity. **Methodology:** Self designed questionnaire -based survey was conducted on the 4<sup>th</sup> year Egyptian students - Faculty of Medicine- Tanta University, administered in two parts; part I: pre course test was done in the second day of Clinical Toxicology curriculum and part II: post course test was done at the end of Clinical Toxicology curriculum which lasting for two months. **Results:** Number of 4<sup>th</sup> year Egyptian students participated in the study were 755. More than half of them were males, urban, and interesting in Clinical Toxicology study. The mean total knowledge score of participants was statistically significantly higher in post course test. Additionally, despite both genders showed significant increase in the mean total knowledge score, but the magnitude of knowledge gain was observed to be higher in females than males. **Conclusion:** it could be concluded that, many subjects in Clinical Toxicology Curriculum introduced satisfactory knowledge about safety like; how to maintain safety from household cleaning agents, but others need modifications like; safety from medications poisoning.

## Key words

Clinical Toxicology Curriculum; Improvement; Human Safety

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## Introduction

A global life mission is providing human safety; safe food and environment. Human behavior is the reaction to external or internal stimuli, which is responsible for improving environmental safety by increasing awareness and knowledge levels (Nishibuchi and Rinsho, 2012; Damalas and Koutroubas, 2018).

Elbur et al. (2016) established that knowledge about medication use and safety was moderate through public and internet-based surveys. There was variation in total knowledge on medication use and its safety between participants, with recommendation for more public education on safety through educational campaigns.

Clinical Toxicology curriculum edited by staff members of Forensic Medicine and Clinical Toxicology Department-faculty of Medicine- Tanta University is containing the following subjects; acute toxicity from many classes of medications, corrosives, heavy metals, volatiles, pesticides, food poisoning, animal envenomation,

poisonous plants as well as drug dependence and substance abuse.

This work was designed to study the efficacy of Clinical Toxicology Curriculum in improvement the 4<sup>th</sup> year Egyptian students - Faculty of Medicine- Tanta University concepts about human safety from toxicity.

## Subjects and Methods

### Study design and population:

Self-designed questionnaire -based survey was conducted on the 4<sup>th</sup> year Egyptian students - Faculty of Medicine- Tanta University. All literatures of Clinical Toxicology curriculum were reviewed. The questionnaire was designed to focus on the safety points which must be covered by the Clinical Toxicology curriculum for the 4<sup>th</sup> year -Faculty of Medicine- Tanta University. This questionnaire was administered as a hard copy in two parts; part I: pre course test (Appendix 1) was done in the

second day of Clinical Toxicology curriculum for two reasons: the first; this questionnaire depends on the background information not on that gained from the toxicology course items intended to gather minimal demographic data, the second; question number 3 (Do you visit Poison Control Center), as if student interested in Clinical Toxicology curriculum, he might go there in the first day after finishing lectures or before the beginning of the course. Part II: post course test was done at the end of all lecturers of Clinical Toxicology curriculum (Appendix II) which lasted for two months. Description of the study and explanations were done to each participant at the beginning of questioner in an effort to enhance return rate.

Data were collected anonymously using questions addressed a variety of topics related to students' knowledge about human safety from toxicity. These anonymous data were tabulated for each question. Incomplete surveys were included in data tabulations in all but four instances. In these instances, replies to questions were either insufficient for assignment or contradictory answers were given.

#### Inclusion and exclusion criteria:

**Inclusion criteria:** 4<sup>th</sup> year Egyptian students - Faculty of Medicine- Tanta University who agreed to participate in the study.

#### Exclusion criteria:

1. Egyptian 4<sup>th</sup> year medical students who refused to participate.

2. Other nationalities 4<sup>th</sup> medical students like Sudanese, Syrians, Jordanians and Malaysians were excluded from this questioner. Despite of English language is the main language of study, but because of the difference in native language, habits, culture and in life style.

#### Ethical consideration:

The study was carried out after approval of Research Ethical Committee - Faculty of Medicine - Tanta University (Approval code: 32898/02/19). All participants received full information about the scope of the study. Sharing in questionnaire is considered a written consent was obtained from each participant. Confidentiality and privacy were maintained.

#### Pre course test (Appendix I):

This questionnaire is a tool to study the efficacy of Clinical Toxicology curriculum for the 4<sup>th</sup> year Egyptian students - Faculty of Medicine- Tanta University in improvement their concept about human safety from toxicity. Just fill this questionnaire that you are voluntarily consent to participate in this study and have to withdraw at any time without giving any reasons.

#### Pre course test (Appendix I):

This questionnaire is a tool to study the efficacy of Clinical Toxicology curriculum for the 4<sup>th</sup> year Egyptian students - Faculty of Medicine- Tanta University in improvement their concept about human safety from toxicity. Just fill this questionnaire that you are voluntarily consent to participate in this study and have to withdraw at any time without giving any reasons.

Question number	Question	First choice	Second choice	Third choice
Q-1	What is your gender?	Male	Female	
Q-2	What is your residence?	City	Village	
Q-3	Are you interested in Clinical Toxicology curriculum?	Yes	No	
	If you are interested, did you visit Tanta poison control center?	Yes	No	
Q-4	From the followings, who are at high risk of poisoning at home?	All family members	Kids and old ages	Kids
Q-5	How do you be saved from medication poisoning?	Don't store it at home	Away from reach	Buy one by one daily
Q-6	How do you be saved from cleaning agents poisoning?	Disposal once finishes cleaning	Store in closed cabinet	Buy one by one daily
Q-7	Which of the following heavy metals is threatening our homes?	Mercury	Lead	Arsenic
Q-8	Which of the followings product threatens safety in home by the presence of alcohol in it?	Perfumes and makeup	Medications	Shampoo
Q-9	Who must be saved in rural area against pesticides poisoning?	Farmer in field	Who is in framer' home	Farmer in field and who are in his home
Q-10	Which drug resulted in abuse?	Paracetamol	Iron	Cannabis
Q-11	What is the time for high risk of scorpion sting?	Day time	Night	Any time
Q-12	What is the time for high risk of snake bite?	Day time	Night	Any time
Q-13	Which of the following is considered poisonous plant?	Roka	Parsley	Datura
Q-14	Which of the following is considered a probable source of food poisoning?	Salty fish	Smoked fish	Row fish
Q-15	Which place is considered high risk for chemical exposure?	Factory	Farm	All of above

**Appendix II:**

This questionnaire is a tool to study the efficacy of Clinical Toxicology curriculum for the 4th year Egyptian students - Faculty of Medicine- Tanta University in improvement their concept about human

safety from toxicity. Just fill this questionnaire that you are voluntarily consent to participate in this study and have to withdraw at any time without giving any reasons.  
Sex: Male: ... Female: ...

Question number	Question	First choice	Second choice	Third choice
Q-1	What is your gender?	Male	Female	
Q-2	What is your residence?	City	Village	
Q-3	After the end of Clinical Toxicological curriculum, do you visit Tanta poison control center?	Yes	No	
Q-4	From the followings, who are at high risk of poisoning at home?	All family members	Kids and old ages	Kids
Q-5	How do you be saved from medication poisoning?	Don't store it at home	Away from reach	Buy one by one daily
Q-6	How do you be saved from cleaning agents poisoning?	Disposal once finishes cleaning	Store in closed cabinet	Buy one by one daily
Q-7	Which of the following heavy metals is threatening our homes?	Mercury	Lead	Arsenic
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Q-13	Which of the following is considered poisonous plant?	Roka	Parsley	Datura
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This self-designed questioner was done according to guidelines of developing a new questionnaire (Sang et al., 2017). After reviewing literature, an initial form of the questionnaire was prepared. Content validity of the items of this questionnaire was evaluated by 3 experts in the field of Clinical Toxicology. The questionnaire was changed based on their comments. The reliability of the questionnaire was assessed using test-retest reliability. This was done two weeks before start teaching the Clinical Toxicology curriculum by first distributing the questioner on 30 participants (medical students) who filled the questioner. After one week, the same participants completed the questionnaire again. Statistical analysis of their responses revealed correlation coefficient  $r=0.90$ .

**Statistical analysis**

All analyses were done using SPSS version 22. For qualitative data, they were expressed as numbers and percentages and Mc Nemar and Marginal homogeneity tests were used for comparison between pre and post-test answers. Then, a score of 3 was given for each complete

correct answer, 2 for correct incomplete answer, and 1 for wrong answer and the total knowledge score was calculated and compared before and after studying the clinical toxicology course. Furthermore, the pre and post total knowledge scores were compared in relation to gender. Quantitative data were tested for normality and were expressed as median and interquartile range (expressed as 25<sup>th</sup>-75<sup>th</sup> percentiles) and Wilcoxon Signed rank test was used for their analysis. Significance was adopted at  $p < 0.05$  for interpretation of results of tests.

**Results**

In this study, number of 4<sup>th</sup> year Egyptian students were 801. Only 755 accepted participation in this study. (Table 1) shows the sociodemographic data of the study participants and their interest in Clinical Toxicology curriculum. It was noticed that, more than half (53.6%) were males, while females were 46.4%. Most of (87.45 %) the students were urban. Additionally, only 49% of the students showed interest in Clinical Toxicology curriculum.

Measuring the actual interest of students was done by asking about visit Tanta poison control center, in

order to saturate their attentiveness by curriculum. There was significant increase in the number of participants who visited Tanta poison control center at the end of the course compared to at the beginning of the course (74.9 % versus 47 % respectively,  $p < 0.001$ ) (Table 2).

Table (3) shows answers of the questioner. It should be noted that questions were classified into three types: firstly; questions with three answer possibilities (1 for wrong, 2 for correct incomplete and 3 for correct complete choice) as question 4. Secondly, questions with two answer possibilities (2 for correct incomplete and 3 for correct complete choice) like questions number 9 and 15. Lastly, questions with the two possibilities only (1 for wrong and 2 for correct choice) were questions number 5, 6, 7, 8, 10, 11, 12, 13 and 14.

Concerning question 4 (who are at high risk of poisoning at home?), there was statistical significance reduction of wrong answer from 75.8% in pre course test to 58.09% in post course test. Percentage of correct incomplete answer reduced from 5.4% in pre course test to 5.3% in post course test. Statistically significant elevation of correct complete answer, from 18.7% in pre course test to 35.8 % in post course test.

In question number 5 (What should we do to be saved from medication poisoning?); percentage of wrong answer was reduced from 5.45% in pre course test to 3.98% in post course test. Percentage of correct answer elevated from 94.5% in pre course test to 96.4% in post course test, with no statistically difference ( $p = 0.245$ ).

In question number 6 (What should we do to be saved from household cleaning agents poisoning?), there was statistical significance in both reduction of wrong answer from 23.14% in pre course test to 7.4% in post course test and elevation of correct answer from 76.85 in pre course test to 94.21% in post course test ( $p = 0.001^*$ ).

In question number 7 (Which of the following heavy metals is threatening our homes?); there was statistical significance in both reduction of wrong answer was reduced from 50.74 % in pre course test to 27.66 % in post course test and in elevation of correct answer was elevated from 49.25% in pre course test to 73.54 % in post course test ( $p = 0.001^*$ ).

In question number 8 (Which of the followings product threatens safety in home by the presence of alcohol in it?); it showed a statistically significant reduction of wrong answers from 39.07 % in pre course test to 25.16 % in post course test and increase in correct answers from 60.92 % in pre course test to 74.83 % in post course test ( $p < 0.001^*$ ).

In question number 9 (Who must be saved in rural area against pesticides poisoning?); percentage of correct complete answers were significantly increased in the post course test than in the pre course test (78.16% versus 71.83% respectively,  $p = 0.001^*$ ).

In question number 10 (Which drug resulted in abuse?); significant reduction of percentage of wrong

choice from 74.72 % in pre course test to 68.24% in post course test, and elevation of right choice from 25.27% in pre course test to 33.1% in post course test were noticed ( $P < 0.001^*$ ).

In question number 11 (What is the time for high risk of scorpion sting?); a statistically significant reduction of wrong answer from 56.7 % in pre course test to 34.52 % in post course test and elevation of correct answer from 43.29 % in pre course test to 65.73 % in post course test ( $p = 0.008^*$ ).

In question number 12 (What is the time for high risk of snake bite?); it was shown that, wrong answer was decreased from 87.9 % in pre course test to 84.99 % in post course test, while correct answer was increased from 12.08 % in pre course test to 15.27 % in post course test ( $P = < 0.001^*$ ).

In question number 13 (Which of the following is considered poisonous plant?); there was significant reduction of wrong answer from 15.7 % in pre course test to be 2.69 % in post course test and elevation of correct answer from 48.9 % in pre course test to 98.92 % in post course test ( $P = < 0.001^*$ ).

In question number 14 (Which of the following is considered a probable source of food poisoning?); choosing correct answers among students was increased from 60.0% in pre course test to be 77.38 % in post course test, while choosing wrong answer decreased from 39.97 % in pre course test to 24.22 % in post course test ( $P = < 0.001^*$ ).

In question number 15 (Which place is considered high risk for chemical exposure?); it showed a statistically significant reduction of correct incomplete from 11.76 % in pre course test to 5.3% in post course test, and elevation of correct complete answer from 88.23% in pre course test to 95.58% in post course test ( $P = < 0.001^*$ ).

The mean total knowledge score for the study participants was illustrated in (Table 4). The mean total knowledge score of the study participants was significantly higher in the post course test than in the pre course test ( $22.69 \pm 2.01$  and  $20.79 \pm 2.22$  respectively,  $p < 0.001^*$ ). The practical importance (magnitude) of this difference was measured by large effect size calculation (effect size = 0.85).

Table (5) shows that mean total knowledge of males was significantly higher in the post course test than in pre course test (20.40 versus 22.11 respectively,  $p < 0.001^*$ ). The magnitude of this effect was measured by effect size which was 0.67. Equally, females showed significant increase in the mean total knowledge score in the post course test than in the pre course test (23.36 versus 21.24). Additionally, despite both genders showed significant increase the mean total knowledge score, the magnitude of gain of knowledge as measure by the effect size was observed to be higher in females than males (1.24 versus 0.67 respectively).

**Table (1): Sociodemographic data and interest in clinical toxicology curriculum (Number =755)**

		N=755	%
Gender	Male	405	53.6%
	Female	350	46.4%
Residence	Urban	660	87.4%
	Rural	95	12.6%
Are you interested in Clinical Toxicology curriculum?	Yes	370	49.0%
	No	385	51.0%

N: number

**Table 2: Frequency of Visiting Tanta poison control center (PCC) at the beginning and at the end of Clinical Toxicology curriculum (Number=755)**

		Groups				P
		Pre course test		Post course test		
		N= 755	%	N=755	%	
Visit Poison Control Center	No	400	53.0 %	190	25.2%	17.28
	Yes	355	47 %	565	74.9 %	

N: number

**Table (3): Comparison between pre course test and post course test answers of the questionnaire (N=755)**

		Groups				Mc Nemar and Marginal homogeneity tests	
		Pre course test		Post course test		Test statistic	P value
		N	%	N	%		
Q4 N=753 <sup>a</sup>	1	571	75.8	445	58.09	9.14	<.001*
	2	41	5.4	40	5.3		
	3	141	18.7	270	35.8		
Q5 N=752 <sup>b</sup>	1	41	5.45	30	3.98	1.35	0.245
	2	711	94.5	725	96.4		
Q6 N=743 <sup>c</sup>	1	172	23.14	55	7.4	83.84	<.001*
	2	571	76.85	700	94.21		
Q7 N=741 <sup>d</sup>	1	376	50.74	205	27.66	102.00	<.001*
	2	365	49.25	545	73.54		
Q8 N=755	1	295	39.07	190	25.16	61.80	<.001*
	2	460	60.92	565	74.83		
Q9 N=742 <sup>e</sup>	2	209	28.16	175	23.58	11.20	.001*
	3	533	71.83	580	78.16		
Q10 N=740 <sup>f</sup>	1	553	74.72	505	68.24	24.86	<.001*
	2	187	25.27	245	33.1		
Q11 N=753 <sup>g</sup>	1	427	56.7	260	34.52	136.00	.008*
	2	326	43.29	495	65.73		
Q12 N=753 <sup>h</sup>	1	662	87.9	640	84.99	7.68	<.001*
	2	91	12.08	115	15.27		
Q13 N=743 <sup>i</sup>	1	112	15.07	20	2.69	93.01	<.001*
	2	631	84.9	735	98.92		
Q14 N=743 <sup>j</sup>	1	297	39.97	180	24.22	74.53	<.001*
	2	446	60.0	575	77.38		
Q15 N=748 <sup>k</sup>	2	88	11.76	40	5.3	4.73	<.001*
	3	660	88.23	715	95.58		

Q=question

Choices1, 2 and 3; 1=wrong, 2= correct-incomplete and 3= correct-complete

Choices1 and 2 only; 1=wrong and 2=correct

a; missing2, b; missing3, c; missing12, d; missing14, e; missing13, f; missing15, g; missing2, h; missing2, i; missing12, j; missing12 and k; missing7

**Table (4): Effect size to measure total knowledge score**

		Groups				Paired T test
		Pre course test	Post course test	Mean difference	Effect size	P value
Total knowledge score	Minimum	9.00	17.00	1.896	0.85	<0.001*
	Maximum	25.00	27.00			
	Mean± SD	20.79±2.22	22.69± 2.01			

SD; Standard Deviation

**Table 5: Effect size of total knowledge score according to gender**

		Gender	
		Males	Females
Pre course score	Minimum	9.00	18.00
	Maximum	25.00	25.00
	Mean	20.40	21.24
	Standard Deviation	2.52	1.71
Post score	Minimum	19.00	17.00
	Maximum	27.00	26.00
	Mean	22.11	23.36
	Standard Deviation	1.68	2.14
Paired T test	Mean difference	1.70	2.12
	Effect size	0.67	1.24
	P value	<0.001*	<0.001*

small effect= 0.2-0.5      medium effect = 0.5-0.8      higher, large effect =0.8

## Discussion

Poisoning is a major health problem in developing countries with high morbidity and mortality rate. About 200,000 from 500,000 deaths occur yearly from poisoning in South East Asia. Educational awareness is considered one from the most effective preventive strategies to control this problem (Anthony and Kulkarni, 2012).

From this fact, safety is considered a golden goal in our life, hence designing this work. Only 755 accepted participation of this questioner from 801 Egyptian students, 405 were males and the remaining was females. Majority of them was from urban areas (87.45 %), while who from rural areas were 12.6%.

By asking about the interest in Clinical Toxicology curriculum, it was found that students who interest in Clinical Toxicology curriculum were 370 (49 %), 355 (47 %) from them visited Poison Control Center in the pre course test and elevated to be 565 (74.9 %) in post course test. The same result reported by Khan et al. (2013) who organized workshop in Pakistan, Aga Khan University Hospital, to improve and advance knowledge of participants about practice and importance of Clinical Toxicology as they found that patients are managed by internists only with insufficient training and curricula either in undergraduates or postgraduates. It could be explained by Brenton, (2016) when she said that "Making your students interested in a subject can be a real challenge". Decreasing student's interest may contribute to family and emotional problems, difficulty in learning or in concentration from hormonal fluctuations. She advised ten ways to increase our students' interest; put the subject in their regular day, make it pleasurable,

explain its application, encourage their sharing, use numerous resources, personalize it, forget evaluation now, change the atmosphere, make it achievable and respect their comforts.

Regarding the targeted members of family more susceptible to poisoning, correct compete answer was chosen by 35.8 % in post course test. The safety from both medications and household were elevated to be 96.4% and 94.21% in post course test respectively. The same result reported in a review done by Ferguson et al. (2017), when they found some good insight about children exposure to poisoning, but more effort and good communication are still needed to increase population's awareness about child safety. Also a questionnaire conducted by Hakami et al. (2017) in Riyadh region, KSA on random sample of medical students, they recorded an adequate knowledge about early management of acute poisoning, with high recommendation for educational and training programs from the first year of the college to increase the knowledge and practice to save more patients.

So, more effort will need to increase students' knowledge to focus on children susceptible for poisoning as discussed by Better Health Channel of Victorian State Governorate, (2018), who reported that accidental poisoning is very common among toddlers aged from 1 to 3 years. As children explore their environment by opening containers, imitating what they see adults do. They can reach to any poisonous substance and take wrong medicine or wrong dose of medicine. As they do not know the difference between what is safe and what is

dangerous, so it is adults' responsibilities to make home safe for them. The best protection from poisoning is to be sure that home is poison-proofing by various protective strategies, like to store all medicines in a locked cabinet and in child-resistant cap, avoid taking medicines in front of your children, never transfer chemicals or cleaning products to another container, especially food or drink containers and never underestimate child's ability to reach anything.

In Tanta poison control center, Sobeeh et al. (2018) found that household agents were the most causative agents of morbidity and mortality in pediatrics. Peden et al. (2008) discussed studies done in Bangladesh, Egypt, and Pakistan reported that medications were responsible for one third of poisonings in children below 12 years, followed by cleaning agents, which accounted for 20%. The most effective way to prevent children coming into contact with a poison whatever medications or household cleaning agents is to remove the poison itself. For these previous facts, more focus must be positioned on safety measures to learn a trace percentage of students who ignored this knowledge. According to Guidotti and Ragain, (2007) there are three main strategies to protect children: individual intervention, preventive medical strategy, and public health strategy.

Regarding old age poisoning; Haoka et al. (2019) reported that the majority of unintentional poisoning was in older than 75 years. This is because elderly are multiple drug user as well as the distribution, excretion and sensitivity to drugs change with age.

Regarding safety from lead exposure, only 73.54 % from participants were oriented by it in post course test. The same result reported by Mehta and Binns, (1998) after a new self-administered test (The Chicago Lead Knowledge Test) in Children's Memorial Hospital, Chicago; to evaluate knowledge about parents' lead education. They found low knowledge about how to protect family member from lead poisoning and what is the nutrition needed to prevent it. To improve students' orientation about safety from lead poisoning, curricula must learn lead sources and preventive strategies as discussed by Vig and Hu, (2000). They enumerated sources of lead exposure; inhalation of home paint in older house air, ingestion of food cooked in glazed food containers, and drinking tap water running through lead plumbing. Eradicating lead poisoning in children is reachable goal through primary prevention strategies that eliminate sources of lead before exposure and provide intensive care to children have elevated blood lead level. These prevention strategies like rising the awareness among parents about sources of lead poisoning and good nutrition to prevent it, phasing out lead-based paints and controlling lead content in children's toys must be done by law enforcement (Ettinger et al., 2019; Njati and Maguta, 2019).

Percent of participants oriented by the threatening of alcohol in many products in post course test was 74.83 % only. Because of that, improving knowledge about

alcoholic free cosmetics must be considered. Dumitrascu et al. (2018) & Kelley et al. (2019) listed common household items which containing alcohol and people abuse them to get the effect of drinking like mouthwash, cough syrup, flavored extracts and perfumes. An American Addiction Centers are being available twenty four hours for any one need or explanation. Miastkowska et al. (2018) advised water-based alcohol free perfumes for its safety, as the ethanol base perfumes obtainable on market may lead to skin irritation and inflammation besides poisoning.

Regarding the orientation by saving farmers in the field and surroundings at homes, 76.8% only from students chose the correct complete answer in the post course test. The same result reported by Damalas et al. (2007) after a survey done to discover knowledge, attitudes, and practices towards safety issues of pesticide usage among farmers of northern Greece. About 46% of farmers didn't use any protective equipment during spraying pesticides because of there were uncomfortable to wear, expensive to buy, time-consuming to use and not available when needed. Wong et al. (2017) discussed that volatilization is possible way for spreading of pesticides through air. Weather conditions at time of application could affect pesticides spread. After incoming into atmosphere, pesticides spray transported by wind to far distances before its deposition locally. Spreading of sprayed pesticides may extent to 1000 meters away from treated field. Anthony and Kulkarni, (2012) suggested some strategies must be applied to reduce danger from pesticides: guidelines, safe use and changes in farming practice. So, farmers must be educated and changed their wrong habits which can be dangerous for their health.

Regarding the drug leads to abuse, correct answer was chosen by 33.1 % in post course test. The same result was recorded by Piontek et al. (2008) after an online screening survey to evaluate the orientation by cannabis dependence. Despite of satisfactory results, extra research is necessary to judge broader cannabis-related problems other than dependence.

Correct answer in post course test was unsatisfactory in both regarding the expected time of scorpion sting and snake bite (65.73 % and 15.27 % respectively), so more focus must be done on both points. The same result was reported by Chen et al. (2017) following a Snakebite knowledge survey on Chinese farmers. They recorded inadequate information with recommendation for intensive educational campaigns especially for high risk population.

Additionally, Khatony et al. (2015) discussed that about 47.5 % of patients were wounded by scorpion sting between midnight and 6 am, so it is necessary to know that scorpion attacks at night. On other hand, snake bites are expected at day time as Slagboom et al. (2017) discussed that snake attacks population in tropical and sub-tropical areas especially rural ones. So, there is an association between working in rural tropics and day activity of snakes. Widespread educational campaigns

must be organized teaching the target population the safety measures from both scorpion stings and snake bites. This safety measures were discussed by National Institute for Occupational Safety and Health, (2018) that to be protected from scorpion's sting, wear long covers, shake shoes before putting on and who with history of allergic reactions to stings, must wear wristlet stating his allergy. According to University of California, Davis Health, (2018) there are recommendations to avoid snake bites; wear long boots, avoid tall weeds, do not disturb any snake, consider camouflaged snakes and teach children to leave snakes alone.

Students oriented by the poisonous effect of datura plant were 98.92%. In contrast of the current study, Khan et al. (2018) reported in department of Botany UST, Bannu Khyber Pakhtunkwa Pakistan low knowledge of Bannu population about the poisonous effects of 87 poisonous plants and datura was one of them. As Geeta and Gharaibeh, (2007) said that Ibn al-Baytar, Ibn Sina, Abu'l-Farag ibn al-'Ibri and many others Gregarious wrote that Egyptians cultivated Datura in fields in Port of Damietta, so Datura is considered a historical plant cultivated in Egypt from centuries. Chung et al. (2018) discussed that, it is one of the most unsafe fruits in the world. It is belonging to the family Solanaceae. Consumers of Datura plants may present with a range of anticholinergic symptoms, like agitation, hallucination, tachycardia, delirium, dilated pupils, and hyperthermia. Orientation by its toxidrome can be life-saving, so awareness must be built among public, either by medical or religious awareness.

Regarding botulism, students chose the correct answer was 77.38% in post course test. The same result was obtained by Ulusoy and Çolakoğlu, (2018) who designed questionnaire on kitchen employees in Istanbul about food hygiene, correct food storage and food borne diseases and their agents. Unsatisfactory knowledge was obtained and training must be organized regularly. As botulism is considered a lethal disease caused by released *Clostridium botulinum* toxins. Outbreaks of botulism from food sources lead to a mass fatality involving hundreds of individuals (Krebs et al., 2018). Outbreaks in Egypt with the salted gray mullet named Faseikh were reported (Horowitz, 2010). So, authorities must promote companies to educate population about the lethality of salty raw fish and suggest a safe fish meal like smoked one.

Regarding the orientation about chemical hazards, 95.58% from students chose the correct complete answer in post course test. Such finding was seen in Han and Park, (2018) survey done in South Korea to study the awareness of populations about dangerous chemicals, 73% from participants oriented that they were surrounded by chemical hazards in many fields. As exposure to chemical substances resulted in wide range of poisonings every year, poison control centers all over the world must guide societies by what recorded of new chemical poisoned cases in their databases and published

them in annual reports (Begemann et al., 2019). As Bhadade et al. (2019) reported in an observational study conducted at a tertiary care, teaching, public, urban hospitals that about 41% of poisoning was from chemicals. A satisfactory choice of right answer is reported in current study with recommendation for more focusing on safety from chemicals to save trace participants don't know this knowledge.

In current study, the mean total knowledge score of participants was significantly higher after Clinical Toxicology curriculum completed including case studies than before, which is the main goal of this study. The same results obtained by Preeti et al. (2013) who conducted a study done on medical students from Dayanand Medical College and Hospital, Ludhiana in the form of pretest and posttest. They proved that problem based learning PBL confirms better practical learning, creates more interest and completes subjects' understanding. So, PBL is considered a modern-day educational strategy and an effective tool to improve the knowledge achievement in Medical Teaching.

Additionally, despite both genders showed significant increase in the mean total knowledge score, the magnitude of knowledge gain as measured by effect size was observed to be higher in females than males. It could be explained by Wehrwein et al. (2007) who suggest that males tend to be more externally focused, while females tend to be more introspective. They proved by their questioner that each student has unique learning style favorites it. This learning style concises by word VARK; visual (V; learning from graphs, diagrams and charts), auditory (A; learning from speech), read-write (R; learning from reading and writing), and kinesthetic (K; learning from touch, hearing, smell, taste, and sight). Instructor must concern this point and be aware of what student prefers in learning style to improve his / her learning. They found that females preferred unimodal learning, whereas males preferred multimodal learning. Du and Kolmos (2009) reported that when they increased the variety of engineering education to be more applicable, beneficial and attractive to females, this new teaching method is more relevant and gainful for all students, not only females.

Finally, gender mixing in classrooms will allow both genders to learn from each other. So, students need more help both inside and outside lecture's theater in order to find the suitable method of teaching for the majority of them.

## Conclusion

There is significant difference in improving the students' concept about human safety from toxicity with significant difference males and females regarding many subjects. One from instructor's responsibility is to improve students' awareness by choosing suitable learning style. Students must be helped more, in and out of lecture. Such questioner must be done yearly for contentious assessment of curriculum efficacy.

## Recommendations:

1. Consider males in teaching process.
2. Apply questioner yearly to detect any defect in all medical curricula not only Clinical Toxicology.

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الملخص العربي**فعاليه منهج علم السموم الإكلينيكي علي الطلاب المصريين بالفرقه الرابعه - كلية الطب - جامعة طنطا في تحسين مفهومهم عن مفهوم السلامة البشرية من السمية**علياء عبد الحكم هديب<sup>١</sup>

**المقدمة:** تعتبر السلامة هي الهدف الرئيسي في الحياه. فيجب خفض معدل الوفيات في المنازل، وكذلك في العمل وبين المجتمعات، وهذا من خلال التعليم وتشجيع البحث العلمي. وتشكل قلة الوعي ما يقارب من ٠ % من حالات التسمم.

**الهدف من هذا العمل:** هو توضيح تأثير مقرر علم السموم الإكلينيكيه على الطلاب المصريين بالفرقه الرابعه للعام الجامعي ٢٠١٨-٢٠١٩ - كلية الطب - جامعة طنطا في تحسين مفهومهم عن سلامة الإنسان من السمية.

**طريقة البحث:** تم إجراء المسح المستند إلى الاستبيان الذاتي التصميم على طلاب الفرقة الرابعه - كلية الطب - جامعة طنطا، علي جزئين؛ الجزء الأول: تم إجراء اختبار ما قبل دراسته المقرر في اليوم الثاني من دراسته علم السموم الإكلينيكيه والجزء الثاني: تم إجراء اختبار ما بعد المقرر في نهاية دراسته علم السموم الإكلينيكيه والذي دام لمدة شهرين.

**النتائج:** شارك في هذه الدراسة نحو ٧٥٥ من الطلاب المصريين بالفرقه الرابعه. وكان أكثر من نصفهم من الذكور، قادمون من المناطق الحضرية وأبدوا اهتماماً في دراسة علم السموم الإكلينيكيه. متوسط درجة المعرفة الإجمالية للمشاركين في الدراسة قد ارتفعت بدلاله احصائه بعد دراسته علم السموم الإكلينيكيه. وعلى الرغم من أن كلا الجنسين أظهر زيادة كبيرة في متوسط درجة المعرفة الكلية، فقد لوحظ أن حجم اكتساب المعرفة مقياساً بحجم التأثير كان أعلى عند الإناث من الذكور.

**الخلاصة:** وفي النهايه، خلصت الدراسة إلى أن العديد من الموضوعات في مقرر علم السموم الإكلينيكيه قد قدمت معرفة مرضية حول السلامة مثل كفيه الحمايه من المنظفات المنزليه، ولكن البعض الآخر يحتاج إلى تعديل مثل السلامه من الادويه.

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