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A TRAINING PROGRAM FOR NURSING STAFF ON HEALTH HAZARDS OF CHEMICAL INSECTICIDES EXPOSURE IN A PRACTICAL FIELD

By

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Abstract

An insecticide is an agent used against insects, ticks, mites and other animals affecting human welfare. Exposure to Insecticides is one of the most important occupational risks among staff worker in Military camp, veterinary medicine, industry and household as well as schools and hospitals. This study Aimed to improve nursing staff knowledge regarding adverse health effects of chemical insecticides exposure in a military field. Setting: The study was conducted in one of the Main Military Hospital. Research design: was used a quasi-experimental research design to conduct this study. Subject: all nursing staff who work in a Military Hospital (n=55) who accept to participate in the research study. Results: A significant improvement in the Nurses' Total knowledge score was found in post-test as compared to that in pre-test. All nurses obtained a satisfactory level of knowledge after the 1st & 2nd post-tests; all of them evaluate the program in relation to trainees' expectations as "excellent".

Key Words: Chemical insecticides, Hazards, Nurses, Training Program

Introduction

Insecticides are tremendously effective weapons in the fight against insect vector of diseases and Agriculture insects. At the same time, insecticides create problems of their own. Also, biologists have found that the careless or excessive use of insecticides destroys many beneficial insects, birds, and small mammals (Eisler, 2004).

An insecticide or a pesticide is an agent used against insects, ticks, mites and other animals affecting human welfare. They include ovicides and larvicides used against the eggs and larvae of insects respectively. Insecticides are used in agriculture, veterinary medicine, industry and household as well as schools and hospitals. The use of insecticides is believed to be one of the major factors behind the increase in agricultural productivity in the 20th century (Vale and Kulig, 2004). Nearly all insecticides have the potential to significantly alter ecosystems; the majorities are toxic to humans; edible animals and others are concentrated in the food chain (Ahsan *et al*, 2006).

The earliest insecticides were of natural origin; they included borax, sulfur, and extracts of the camphor, tobacco, and pyrethrum plants. In the late 19th century the widespread use of arsenic compounds such as Paris green proved the value of insecticides to agriculture.

Since the 1940's chemists have invented hundreds of insecticides by synthesizing compounds such as chlorinated hydrocarbons and organic phosphates (Marshall *et al*, 2007). Examples are DDT, chlordane, parathion, and toxaphene. Sterilants and pheromones were developed in the 1960's, because of the possible wide-ranging ill effects of such insecticides as DDT and chlordane (Lasky *et al,* 2004).

Insecticides are classified according to the method of application and the way they enter the insect's body. Many insecticides take effect in more than one way. Stomach .Insecticides is applied on the surface of plants, fabrics, and wood, or is added to bait. The insecticide is eaten, along with the food material, by insects that chew, such as ants, caterpillars, and grasshoppers. Contact Insecticides are

sprayed or dusted on the insect's body. The poison is absorbed through the body wall. Most soft-bodied insects are vulnerable to contact insecticides (Sanad *et al*, 2003).

Fumigants are insecticidal gases. Insects that lurk out of reach of sprays are killed when they breathe the gas. Fumigants are used by professional exterminators to rid houses of cockroaches and bedbugs and to kill beetles in grain bins. The soil may be fumigated to destroy grubs that attack roots (Liu, 2008).

Residual Insecticides are applied to foliage, the bodies of livestock, pets, and to screens and walls. Insects absorb deadly doses by touching the poisoned surface. Systemic Insecticides are absorbed by plant tissues, so that when insects feed on the sap they are poisoned (Peters *et al*, 1984).

Many insecticides are carcinogenic particularly the halogenated hydrocarbons containing benzene ring (Ovchinnikova *et al*, 2013). The epidemiological studies proved that indicates that DDT causes cancers of the liver, pancreas and breast. There is mixed evidence that it contributes to the leukemia, lymphoma and testicular cancer. Other epidemiological studies suggested that DDT/DDE does not cause multiple myeloma or cancers of the prostate, endometrial, rectum and lung (Chiou *et al,* 2001).

Prevention, health maintenance, and illness and injury management are included in the management of pesticide exposure. Essential skills include a basic understanding of the health hazards of pesticides, prevention and abatement methods recognition, diagnosis, and treatment of pesticide exposure and utilization of resources for referral and assistance at both a patient and community based level (Waggoner *et al*, 2013). In addition to direct patient interventions, health care providers may assume the role of educator, advocate, and policy planner on behalf of an individual patient or population of patients **(**Khan *et al*, 2012).

A comprehensive approach to nursing and medical practice requires awareness, recognition, and treatment of critical factors that affect individual and community health, even if these factors are not obvious at first to patients or providers. This initiative recognizes the unique role and functions served by registered nurses and advanced practice nurses (McCarthy *et al*, 2013**)**.

Rational: Deploying military personnel in unfamiliar environments is a risky. Many deployment activities are not routine. Tasks must be accomplished with limited means, despite the potential dangers of the setting. Military deployments involve a spectrum of activities that range from peacekeeping to combat. The uncertainties about exposure of the troops to pesticides led the U.S. Department of Defense to investigate the use and management of pesticides during the Gulf War (DeFraites and Richards, 2011) and to raise concerns about the potential adverse health effects of pesticide exposures to service members in general.

As part of mission planning, it is necessary for operational decision makers to have information on health hazards to individual soldiers and their potential impact on the options being considered for achieving the mission. Also, the health care workers are usually exposed to insecticides, but they do not know the precautions, anti-dot and the first aid to safe life in emergencies. Furthermore, none has been addressed such a study in the field of nursing in Egypt.

The aim of the present study is to improve nursing staff knowledge regarding adverse health effects of chemical insecticides exposure in a military field

Objectives: 1- To assess nursing staff knowledge regarding adverse health effects of chemical insecticides exposure in a military field before, after program im-

plementation and 3-months later as well as the educational program evaluation, 2- To assess nursing staff satisfaction toward the educational program after program implementation, and 3- To design a self-instruction booklet on adverse health effects of chemical insecticides exposure management in a military field.

Setting: All Staff nurses who work in one of the Main Military Hospital and accepted to participate in the research study and met the inclusion criteria were included. Inclusion Criteria: The participants should meet the following inclusive criteria: a- Complete attendance pre-test at the beginning of the study and b- Successfully complete the educational program. Exclusion Criteria: a- Participation in the pilot study, and b-Unable to continue the educational program.

The instruments of data collection were established according to local conditions. These were: **1-** Educational needs assessment questionnaire**:** including two parts: **Part 1**: Socio-demographic data: such as age, sex, qualifications, experience years, and training courses.

Part 2: The Educational needs assessment questionnaire will be developed by the researcher based on review of the related literature to determine the unmet educational needs of nursing staff regarding adverse health effects of chemical insecticides exposure in a Military Field

2- Knowledge Questionnaire (Pre-Post Test): They were developed to be used to assess knowledge of nursing staff Adverse Health Effects of Chemical Insecticides Exposure in a Military Field

3-Participants' Satisfaction Questionnaire

Participants' satisfaction Questionnaire was developed to evaluate the program outcome of nursing staff point of views. It included questions related the objectives, time period, content, time schedule of the program and the methods of teaching used participants' reactions questionnaire

Program Design: The training programs regarding adverse health effects of chemical insecticides exposure in a Military Field included illustrative lectures, group discussions with handouts. Training program covered ten sessions of 45 minutes each, from the first of 2/2012 to the end of 6/2012. Data were collected two days per week starting from 10:00 am to 1:00 pm.

Validity Test: The developed questionnaires and the program content was submitted to a panel of five experts in the field of nursing education and epidemiology and infection control for content language clarity, relevancy, and readability, ease of understanding, question sequence, and completion time. After that, questionnaires and the program content will be edited according to experts, suggestions.

Once the permission granted the pilot study was carried out on 10 % of the sample to ensure the clarity and validity of content of tools used in the study sample, to estimate the time, needed to answer the test. This pilot sample was excluded from the total number of the study if there is a major change.

Data collection procedure: Before implementation of educational program, assessment of nursing staff educational needs, knowledge regarding, the adverse health effects of chemical insecticides exposure in a Military field will be done. An educational program will be developed and implemented by the researcher based on review of the literature and the information yielded from initial assessments of nursing staff.

After implementation of educational program, assessment of nursing staff knowledge regarding adverse health effects of chemical insecticides exposure in a Military Field done and 3 months later. At the end of the educational program the Participants' program evaluation Questionnaire were used to evaluate the outcome of the nurses' point of views.

Administrative and Ethical Considerations: Permission and official approvals were obtained from the responsible authorities for data collection. All principles of ethics in research will be followed. Informed written consents were obtained from all participants. Total confidentiality of any obtained data was secured.

Statistical design: Data were computerized and statistically analyzed. Data entry and statistical analysis will be done using SPSS 16.0 statistical software package. Categorical variables will be compared using chi-square or Fisher exact tests as suitable. Statistical significance was considered when p-value<0.05 (Roebuck and Liberman, 2009).

Results

The results presented in the following tables (1 to 30) and figures (1 to 5).

Table 1: Frequency distribution of different ages:

Age in years	No.	%	Total	χ^2 test	P value
20-25	27	49.1	55	39.76	< 0.001
26-30	11	20			
More than 30	17	30.9			
Descriptive Statistics	Mean ±SD		Range		
	27.24±5.08		(20-43)		

***Highly statistically significant at p<0.001.

Table 2: Frequency Distribution regarding marital status

Marital Status	No.	%	Total	χ^2 test	P value
Single	24	43.6	55	23.17	0.000***
Married	31	56.4			

***Highly statistically significant at p<0.001

Table 3: Frequency Distribution regarding education

Education	No.	%	Total	χ^2 test	P value
Bachelor of Nursing	3	5.5	55	31.3	0.000***
Technical Institute of Nursing	19	34.5			
Diploma	33	60			

***Highly statistically significant at p<0.001

Table 4: Frequency distribution regarding years of experience

Years of Experience	No.	%	Total	χ^2 test	P value
Less than 5Y	24	43.6	55	11.67	0.00***
5-10Y	11	20			
>10Y	20	36.4			
Descriptive Statistics	7.8 ± 4.95		(3.00 – 17.00)		

***Highly statistically significant at p<0.001

Table 5: Frequency Distribution regarding attending any training courses.

Attending any training courses	No.	%	Total	χ^2 test	P value
Yes	12	21.8	55	29.47	0.00***
No	43	78.2			
Descriptive Statistics	Mean ± SD		Range		
	2.5 ± 1.17		(2 – 3)		

***Highly statistically significant at p<0.001

Table 6: Frequency distribution regarding abroad within Peacekeeping Forces.

Abroad peacekeeping forces	No.	%	Total	χ^2 test	P value
Yes	10	18.2	55	34.6	0.00***
No	45	81.8			
Descriptive Statistics	Mean ± SD		Range		
	1.8 ± 0.39		(1.7 –1.9)		

***Highly statistically significant at p<0.001

Table 7: Degree of knowledge level of pre sample study group (None got more than limited)

Knowledge level Items	No idea		Limited	
	No	%	No	%
1. General information on beneficial & harmful insects	52	94.5	3	5.5
2. Types of pesticides	51	92.7	4	7.3
3- Toxic damages of pesticides on man	51	92.7	4	7.3
4- Preventive measures in dealing with pesticides	52	94.5	3	5.5
5- Personal protection equipment's	51	92.7	4	7.3
6- Transport, storage, removal & cleaning spilled matters/substances	54	98.2	1	1.8

Table 8: Pre, post and follow up intervention results regarding knowledge level:

Knowledge level	Pre (n=55)		Post (n=55)		Follow up		Chi square Fisher	p-value
	No	%	No	%	No	%		
Fail	55	100	0	0	0	0	39.6	< 0.001
Pass	0	0	2	3.6	6	10.9		
Good	0	0	3	5.5	8	14.5		
V. good	0	0	14	25.5	19	34.5		
Excellent	0	0	36	65.5	22	40		

*Highly statistically significant at p<0.001

Table 9: Pre, post & follow up regarding information on beneficial and harmful insects.

About beneficial and harmful insects	Pre (n=55)		Post(n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
knowledge about insect	21	38.2	27	49.2	28	50.9	2.1	> 0.05
insects harmful to humans	29	52.7	50	90.9	48	87.3	17.6	< 0.001
Methods of insects killing	11	20	54	98.2	54	92.7	35.38	<0.001
Interaction between pesticide & fatty layers	13	23.6	53	96.4	50	90.9	36.45	< 0.001
Contact between insect & insecticide	7	12.7	37	67.3	33	60	23.19	< 0.001
Gastrointestinal toxicity of pesticide	14	25.5	52	94.5	48	87.3	34.15	< 0.001
Transmission of pesticides to insect	13	23.6	53	96.4	52	94.5	32.8	<0.001
Reasons for the spread of pesticides:	3	5.5	43	78.2	38	69.1	33.45	< 0.001
Damages caused by pesticides:	6	10.9	51	92.7	42	76.4	35.13	< 0.001
Insects biological control:	5	9.1	31	56.4	30	54.5	21.8	< 0.001
Beneficial insects to humans:	50	90.9	52	94.5	51	92.7	9.04	>0.05
Harmful insects cause:	11	20	42	76.4	34	61.8	23.7	< 0.001
Insects types	10	18.2	50	90.9	41	74.5	28.96	< 0.001
insects harmful to humans	50	90.9	50	90.9	50	90.9	0	> 0.05
insect sex	18	23.7	54	98.2	43	78.2	25.4	< 0.001
a pest definition	2	3.6	2	3.6	1	1.8	24.6	< 0.001
successful pest control	6	10.9	38	69.1	35	63.6	29.5	< 0.001
pest control goal	5	9.1	47	85.5	37	67.3	25.6	< 0.001
pest control action taken	4	7.3	46	83.6	40	72.7	29.3	< 0.001

*non-significant at p>0.05, ** significant at p<0.05, ***Highly significant at p<0.001

Table 10: Comparison between pre, post and follow-up results regarding types of pesticides.

Pesticides Types	Pre (n=55)		Post (n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
Knowledge about pesticides and uses	5	9.1	44	80	39	70.9	29.6	< 0.001
Pesticides components	17	30.9	53	96.4	45	81.8	30.8	< 0.001
Hydrocarbon pesticides	41	74.5	50	90.9	49	89.1	15.2	> 0.05
chemical components of Most pesticides	11	20	46	83.6	43	78.2	45.7	< 0.001
Classification of pesticides	9	16.4	54	98.2	47	85.5	48.48	< 0.001
Chlorophyllic Pesticides:	5	9.1	49	89.1	39	70.9	30.6	< 0.001
Organophosphorus pesticides:	1	1.8	42	76.4	32	58.2	71.2	< 0.001
Types of unauthorized pesticides permitted	4	7.3	51	92.7	45	81.8	40.7	< 0.001
Malathion - parathion – Dipterex	7	12.7	43	78.2	41	74.5	71.1	< 0.001
kinds of organochlorine pesticides	2	3.6	51	92.7	46	83.6	90.6	< 0.001
Organophosphorus pesticides	5	9.1	54	98.2	48	87.3	84.6	< 0.001
carbamates	6	10.9	53	96.4	51	92.7	46.9	< 0.001

DDT and Gamaxan are:	7	12.7	46	83.6	45	81.8	51.08	< 0.001
Sevin, Beramat and Carbaryl	6	10.9	46	83.6	39	70.9	65.6	< 0.001
Organochlorine pesticides characteristics	10	18.2	42	76.4	34	61.8	46.8	< 0.001
Chloride/Chloric pesticides	3	5.5	39	70.9	34	61.8	58.4	< 0.001
As for organophosphorus pesticides:	4	7.3	49	89.1	40	72.7	53.1	< 0.001
rodenticides:	3	5.5	45	81.8	35	63.6	48.4	< 0.001

*non-significant at p>0.05, ** significant at p<0.05, ***Highly significant at p<0.001

Table 11: Pre, post and follow-up correct regarding toxicity of pesticides on man.

Toxic Damages of Pesticides to man	Pre (n=55)		Post (n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
Acute poisoning:	3	5.5	47	85.5	37	67.3	42.6	< 0.001
Chronic poisoning:	2	3.6	50	90.9	39	70.9	57.5	< 0.001
Causes of pesticides damage:	4	7.3	52	94.5	35	63.6	48.2	< 0.001
Pesticides following damage except:	28	50.9	54	98.2	49	89.1	22.6	< 0.001
Exposure to pesticides:	4	7.3	48	87.3	38	69.1	32.3	< 0.001
Pesticides can enter the body through:	16	29.1	53	96.4	44	80	38.4	< 0.001
Pesticides & environmental pollution:	5	9.1	49	89.1	43	78.2	36.5	<0.001
Prevention of pesticide poisoning:	4	7.3	47	85.5	42	76.4	39.6	< 0.001
Treatment of pesticide poisoning:	7	12.7	30	45.5	20	36.3	46.6	< 0.001
Diazepam or phenytoin with emergencies	16	29.1	53	96.4	50	90.9	41.03	< 0.001
Pesticides from organic phosphorus	46	83.6	55	100	54	98.2	16.4	< 0.05
Pesticides from nicotine cigarette industry	49	89.1	55	100	55	100	12.45	0.05
Pesticides from cyanide gas	49	89.1	54	98.2	55	100	4.6	> 0.05
uses of pesticides in chemical welfare	30	54.5	54	98.2	45	81.8	31.33	< 0.001
Is it allowed to use Pesticides in war?	12	21.8	54	98.2	43	78.2	41.5	< 0.001

*non-significant at p>0.05, ** significant at p<0.05, ***Highly significant at p<0.001

Table 12: Pre, post and follow up intervention regarding Preventive measures used when dealing with pesticides.

Harmful effects and emergency response	Pre (n=55)		Post (n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
Major categories of pesticide exposure are:	2	3.6	51	92.7	47	85.5	59.68	< 0.001
Exposure of people working with pesticides?	4	7.3	52	94.5	45	81.8	46.9	< 0.001
Major categories of harmful pesticide effects:	5	9.1	45	81.8	42	76.4	47.4	< 0.001
A measure of pesticides acute toxicity based on	4	7.3	53	96.4	45	81.8	59.06	< 0.001
Types of pesticide delayed effects exposure:	4	7.3	51	92.7	45	81.8	43.4	< 0.001
Hazards from harmful pesticide depends on	6	10.9	53	96.4	42	76.4	57.3	<0.001
No manifestation from acute pesticide poisoning	29	52.7	47	85.5	50	90.9	28.7	< 0.001
In a man pesticide poisoning, what be done?	30	65	52	92.7	40	90.9	54.88	< 0.001
Pesticide swallowed; what first aid to be done?	6	10.9	42	76.4	44	80	43.44	< 0.001
LD50, more acutely toxic by pesticide	16	29.1	55	100	47	85.5	45.75	< 0.001

*non-significant at p>0.05, ** significant at p<0.05, ***Highly significant at p<0.001

Table 13: Pre, post and follow up intervention regarding Pesticide labeling:

beneficial and harmful insects	Pre (n=55)		Post (n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
Pesticide labeling	2	3.6	1	1.8	3	5.5	56.4	< 0.001
A pesticide label	2	3.6	21	38.2	21	38.2	53.9	< 0.001
Parts of pesticide labeling	3	5.5	43	78.2	38	69.1	78.4	< 0.001
Signal words for pesticide action on eye & skin?	5	9.1	52	94.5	41	74.5	42.18	< 0.001
Statements appear on all pesticide labels	4	7.3	50	90.9	43	78.2	42.9	< 0.001
Directions on a pesticide label	5	9.1	50	90.9	37	67.3	48.37	< 0.001

*non-significant at p>0.05, ** significant at p<0.05, ***Highly significant at p<0.001

Table 14: Pre, post and follow up intervention results regarding Personal protection equipment's.

Personal Protective Equipment	Pre (n=55)		Post (n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
Personal protective equipment's (PPE):	22	40	54	98.2	46	83.6	57.23	< 0.001
methods of protection from pesticides	33	60	55	100	51	92.7	39.52	< 0.001

Human protective equipment (PPE) from pesticide	12	21.8	50	90.9	47	85.5	75.6	< 0.001
Law for PPE instructions on label	27	49.1	54	98.2	51	92.7	49.77	< 0.001
Pesticide influence PPE type restriction on label	17	30.9	53	96.4	46	83.6	63.46	< 0.001
PPE that resistant to dry pesticides:	6	10.9	53	96.4	45	81.8	41.16	< 0.001
Handlers of pesticide hazardous required to wear:	14	25.5	53	96.4	47	85.5	34.32	< 0.001

Table 15: Pre, post & follow up regarding transportation, storage disposal, & Spill Clean-up:

Transportation, storage disposal, & Spill Clean-up:	Pre (n=55)		Post (n=55)		Follow up		Chi square	p-value
	No	%	No	%	No	%		
pesticides not in use stored in a manner to allow:	5	9.1	47	85.5	40	72.7	49.25	< 0.001
An important rule in storage of pesticides is to:	10	18.2	43	78.2	44	80	45.35	< 0.001
In the event of pesticide spills, you have to:	3	5.5	47	85.5	37	67.3	47.46	< 0.001
In spill a pesticide on yourself during busy spring planting season, best procedure:	11	20	48	87.3	40	72.7	49.58	< 0.001
When transporting pesticides in bulk containers, pesticide in manufacturer's approved container	14	25.5	54	98.2	51	92.7	45.8	< 0.001
Exposure to pesticides during pregnancy lead to:	9	16.4	51	92.7	44	80	46.98	< 0.001
Fetus stage most vulnerable pesticides to effects?	9	16.4	49	89.1	48	87.3	43.5	< 0.001
Pesticides consist of (contain):	14	25.5	44	80	38	69.1	51.6	< 0.001
Insecticides are used inside:	16	29.1	52	94.5	42	76.4	58.28	< 0.001
Using pesticides in the form of:	16	29.1	52	94.5	49	89.1	37.1	< 0.001
All pesticides are:	28	50.9	43	78.2	41	74.5	6.74	< 0.05
Suspend pesticides dissolve in	22	40	44	80	39	70.9	13.6	< 0.001
Pesticides are sprayed:	23	41.8	44	80	72	76.4	14.2	<0.001
Respiratory tract influenced with exposure to pesticides	12	21.8	41	74.5	37	67.3	31	< 0.001
Insecticides reach blood and cause:	9	16.4	50	90.9	45	81.8	52.3	< 0.001
Among cancers caused by exposure to pesticides:	8	14.5	53	96.4	47	85.5	57.6	< 0.001
Cancer occurs as a result of exposure to pesticides:	12	21.8	47	85.5	42	76.4	39.3	< 0.001
Symptoms of exposure to pesticides cause:	30	54.5	52	94.5	38	69.1	24.5	< 0.01
Mild poisoning.	13	26.6	44	80	43	78.2	41.2	< 0.001
Average poisoning.	15	27.3	53	96.4	48	87.3	45.3	< 0.001
Severe poisoning.	15	27.3	54	98.2	52	94.5	46.8	< 0.001
Optimal uses to reduce pesticides risk during use are:	14	25.5	52	94.5	48	87.3	44.3	< 0.001
Key factors to control damage extent of pesticides use:	13	23.6	52	94.5	49	89.1	40.8	< 0.001

*non-significant at p>0.05, ** significant at p<0.05, ***Highly significant at p<0.001

Table 1: Nurses' general knowledge about beneficial & harmful insects regards interventions

General information	Pre- (n=55)		Post- (n=55)		Follow up		χ^2 test Fisher	P value
	No	%	No	%	No	%		
Fail	46	83.6	0	0	1	1.8	47.9	0.00
Pass	6	10.9	2	3.6	0	0		
Good	3	5.5	3	5.5	14	25.5		
Very good	0	0	14	25.5	19	34.5		
Excellent	0	0	36	65.5	21	38.2		
Mean ±SD	33.77±15.98		83.65±13.79		77.86±14.1		F 29.4	0.00

**Highly statistically significant at p<0.01

Table 17: Nurses' knowledge about types of pesticides regarding interventions

Types of pesticide	Pre- (n=55)		Post-(n=55)		Follow up		χ^2 test Fisher	P value
	No	%	No	%	No	%		
Fail	54	98.2	0	0	1	1.8	57.4	0.00
Pass	1	1.8	2	3.6	0	0		
Good	0	0	7	12.7	11	20		
Very good	0	0	21	38.2	26	47		
Excellent	0	0	25	45.5	17	30.9		
Mean ±SD	8.82±12.25		85.3±18.56		74.67±19.5		F 32.8	0.00

**Highly statistically significant at p<0.01

Table 2: Knowledge about toxic damages of pesticides on man regarding interventions

Toxic effect on man	Pre- (n=55)		Post- (n=55)		Follow up		χ^2 test	P value
	No	%	No	%	No	%		
Fail	51	92.7	3	5.5	1	1.8	57.3	0.00
Pass	4	7.3	6	10.9	6	10.9		
Good	0	0	3	5.5	10	18.2		
Very good	0	0	10	18.2	8	14.5		
Excellent	0	0	33	60	30	54.5		
Mean ±SD	25.7±12.8		90.9±11.86		79.35±14.14		F 25.9	0.00

**Highly statistically significant at p<0.01

Table 3: Knowledge about preventive measures when dealing with pesticides regarding interventions

preventive measures	Pre- (n=55)		Post- (n=55)		Follow up		χ^2 test Fisher	P value
	No	%	No	%	No	%		
Fail	52	94.5	1	1.8	0	0	89.3	0.00
Pass	3	5.5	1	1.8	2	3.6		
Good	0	0	4	7.3	9	16.4		
Very good	0	0	4	7.3	22	40		
Excellent	0	0	45	81.8	22	40		
Mean ±SD	13.9±23.73		91.5±27.38		81.8±30.64		F 78.5	0.00

**Highly statistically significant at p<0.01

Table 20: Knowledge about personal protection equipment's regarding interventions

Personal protection	Pre- (n=55)		Post- (n=55)		Follow up		χ^2 test Fisher	P value
	No	%	No	%	No	%		
Fail	44	80	3	5.5	0	0	67.5	0.00
Pass	4	7.3	0	0	1	1.8		
Good	6	10.9	8	14.5	11	20		
Very good	1	1.8	0	0	18	32.7		
Excellent	0	0	44	80	25	45.5		
Mean ±SD	26.76±24.74		97.14±6.96		88.8±11.9		F 54.2	0.00

**Highly statistically significant at p<0.01

Table 21: Transport, storage, removal and cleaning spilled matters / substances regarding interventions

Results	Pre- (n=55)		Post- (n=55)		Follow up		χ^2 test Fisher	P value
	No	%	No	%	No	%		
Fail	51	92.7	0	0	0	0	68.2	0.00
Pass	3	5.5	0	0	0	0		
Good	1	1.8	2	3.6	16	29.1		
Very good	0	0	6	10.9	8	14.5		
Excellent	0	0	47	85.5	31	56.4		
Mean ±SD	27.09±19.6		98.9±16.77		91±16.6		F 91.3	0.00

Table 22: Total Knowledge Percent Score & Nurses' Age groups

Intervention	Nurses' Age Groups year			Mean % Score	ANOVA	P-Value
	20-25 (n=27)	26-30 (n=11)	More than 30 (n=17)			
Pre-Test	27.37 ± 7.47	28.45 ± 7.67	28.06 ± 10.67	27.8 ± 8.47	0.073	0.93
Post-Test	86.6 ± 10.96	91.5 ± 6.6	89.6 ± 7.6	88.53 ± 9.3	1.3	0.28
Follow up	78.44±10.05	81.8±9.76	80.17±8.46	79.64±9.45	0.52	0.59

Table 26: Total Knowledge Percent Score & abroad with Peacekeeping Forces.

Type of Intervention	Abroad with Peacekeeping Forces		Total Mean % Score	ANOVA	P-Value
	Yes (n=10)	No (n=45)			
Pre-Test	29.4±9.86	27.44±8.21	27.8±8.47	0.43	0.51
Post-Test	86.6±10.76	88.96±9.08	88.53±9.34	0.515	0.48
Follow up	75.5±10.8	80.48±9.04	79.64±9.5	2.05	0.16

Table 27: Total knowledge percent score & attending any training courses.

Type of Inter-vention	Attending any training courses		Total Mean % Score	ANOVA	P-Value
	Yes (n=12)	No (n=43)			
Pre-Test	24.33±9.9	28.77±7.88	27.8±8.47	2.65	0.1
Post-Test	88.75±8.07	88.46±9.75	88.53±9.34	0.009	0.93
Follow up	79.5±10.07	79.7±9.4	79.6±9.5	0.003	0.95

Table 28: Pre, post and follow up intervention results total mean % score.

	Pre (n=55)	Post (n=55)	Follow up	F	p-value
General data on beneficial and harmful insects	8.8±12.25	85.3±18.56	74.67±19.5	79.6	0.00
Types of pesticides	25.7±12.8	90.9±11.86	79.35±14.13	59.3	0.00
Toxic damages of pesticides on human beings	13.9±23.7	91.5±27.38	81.82±30.6	58.6	0.00
Preventive measures to deal with pesticides.	26.7±24.74	97.1±6.9	88.8±11.89	62.3	0.00
Pesticide labeling	27.09±19.6	98.98±14.56	91±16.59	74.2	0.00
Personal protection equipment's	11.6±21.66	91.5±27.38	81.8±30.6	62.3	0.00
Transport, storage disposal, & spill clean-up	22.6±24.6	97.14±6.96	87.82±10.98	58.3	0.00

**Highly statistically significant at p<0.01

Table 29: Assess nursing staff satisfaction toward educational program post-implementation

Program Evaluation Dimensions	Excellent		V Good		Good		Fair		Bad	
	No	%	No	%	No	%	No	%	No	%
A- Evaluation of tutor										
1- Tutor competence with scientific CV	55	100	0	0	0	0	0	0	0	0
2- Teaching and communication capabilities	45	81.8	10	18.2	0	0	0	0	0	0
3- Ability to respond to trainees question	47	85.5	8	14.5	0	0	0	0	0	0
4- Provide adequate and through explanation	48	87.3	7	12.7	0	0	0	0	0	0
5- Repeating & stressing on important topics	39	70.9	16	29.1	0	0	0	0	0	0
6- Professional and well organized	39	70.9	16	29.1	0	0	0	0	0	0
7- Learning by friendly and patient with trainees	35	63.6	20	36.4	0	0	0	0	0	0
8- Give good examples	43	78.2	12	21.8	0	0	0	0	0	0
9- Generally, give a grade to tutor!	45	81.8	10	18.2	0	0	0	0	0	0
B- Training materials/teaching aids										
1- Visual/Hearing	51	92.7	4	7.3	0	0	0	0	0	0
2- Distributing notes with scientific materials	50	90.9	5	9.1	0	0	0	0	0	0
3- Generally, how find scientific material?	45	81.8	10	18.2	0	0	0	0	0	0
C- Lecture duration					0	0	0	0	0	0
1- Specified Lecture duration group discussion	50	90.9	5	9.1	0	0	0	0	0	0
2- Time replying to questions is adequate	41	74.5	14	25.5	0	0	0	0	0	0
3- Generally, how you find lecture duration?	49	89.1	6	10.9	0	0	0	0	0	0
D- Training place										
1- Training room well equipped and clean	47	85.5	8	14.5	0	0	0	0	0	0
2- Training room equipped with computer devices used in training	44	80	11	20	0	0	0	0	0	0
3- Generally, how you find training rooms?	50	90.9	5	9.1	0	0	0	0	0	0
E- Meeting trainees expectations										
1- Generally, program meets my expectations	43	78.2	12	21.8	0	0	0	0	0	0
2- Able to apply what I learned here	53	96.4	2	3.6	0	0	0	0	0	0
3- All informed with intended learning outcomes and evaluated after fulfillment	46	83.6	9	16.4	0	0	0	0	0	0
4- Program content organized and easy	54	98.2	1	1.8	0	0	0	0	0	0
5- Lectures useful & related to program title	55	100	0	0	0	0	0	0	0	0
6- Tutor broad minded with scientific background	55	100	0	0	0	0	0	0	0	0

*non-significant at p>0.05, ** significant at p<0.05, ***highly significant at p<0.001

Table 30: Continued assess nursing staff satisfaction toward educational program post-implementation

Questions	Insecticides	No	%
What were most useful topics?	Types and damage and risks	51	92.7
	Protection and prevention	2	3.6
	1+2	2	3.6
Topics that should be deleted from course content?	Non	55	100
Topics you would like to add to content?	Non	55	100
Suggestions to improve of educational program	Training sessions	55	100

Discussion

Generally, the great majority of insecticides have marked significant in altering ecosystems; and toxic to humans; edible animals and others (Ahsan *et al*, 2006).

In the present study, nursing staff were in the age category 20-25y (49.1%), with a highly significant difference between them regarding age categories (P<0.001). Total ages ranged from (20-43) with a mean of 27.24±5.08. More than half were married

(56.4%); with a highly significant difference (P<0.001), and (60.0%) have nursing school diploma, with a significant difference regarding education (P<0.001). 43.6% had less than five year experience, 20.0% had 5-10y; and 36.4% had more than 10 years' work experience, with significant difference regarding work experience (P<0.001). Work experience ranged from 1.0-7.0year with a mean of 2.4±1.6.

This study showed that (78.2%) didn't attend training courses. The time ranged from (2-3 months) and the mean attendants were 2.5±1.7, 81.8% didn't share in Peacekeeping Forces. The attended course ranged from (1.7-1.9) and the mean sharing of 1.8±0.039.

In this study, 98.5% didn't have any idea about the topics, 7.3% have limited knowledge about adverse health effects of chemical insecticides exposure in a military field in pretest that was mainly because of few number of course about insecticides and its hazards. Konradsen *et al.* (2003) reported that most of studied HCWs had inadequate knowledge regarding insecticides health hazard and their management and the study relayed that on the deficiency of training courses and absence of that topic in the curriculum of the education sessions done at studied hospitals. There was significant improvement in nurses' knowledge level about educational program after its implementation in both post-test (65.5% & 25.5%) excellent and very good respectively and in follow up (40% & 34.5%) excellent & very good respectively. Vianio and Tuominen (2001) reported significant improvement of knowledge level among the nursing staff after implementation of specific tailored educational program about insecticides toxicity and prevention methods. Colwell *et al.* (2009) showed adequate and significant improvement in knowledge regarding eradication of insects and vectors also in eliminate their breeding areas. They examined the potential consequences of eradicating a group of livestock parasites, and ask what possibilities for improvement of the health of humans and animals might also be lost. Galal *et al*. (2014) reported improvement in knowledge and attitude post-educational program offered to the nursing staff. They added that the educational training programs should be multidisciplinary interventions in the era of quality control to help healthcare workers realize the importance of basic infection-control measures in reducing pediatric morbidity and mortality and improving the quality of care.

There was significant improvement in nurses' knowledge and knowledge level about beneficial and harmful insects in both post-test and follow up when compared with pre-test (P<0.001). The highest improvement was in the insects killing the lowest was in insects harmful to humans. Galloway (2006) mentioned that marine pollution is a major threat to human and environmental health and by placing a greater emphasis on the health status of impacted biota, it was more likely that risk assessment will develop the efficiency, reliability and predictive power to adapt to the unforeseen environmental threats that were an inevitable consequence of human development and global change, which provided new and persuasive evidence of the effectiveness of this intervention. Lu *et al*. (2006) concluded that children were most likely exposed to the organophosphorus pesticides exclusively through

their diet. They added that to employ a longitudinal design with a dietary intervention to assess children's exposure to pesticides was a must. Tilson (2013) reported no significant difference between pre and post knowledge assessment regarding Organophosphorus exposure and prevention among studied group due to high pre-program (base-line) knowledge

There was significant improvement in nurses' knowledge and knowledge level about types of pesticides in both post-test and follow up when compared with pre-test ($P<0.001$). The highest improvement was in Organophosphorus pesticidesidentification and lowest was in Hydrocarbon pesticides; prevalent of Organophosphorus toxicity cases among farmers in Egypt so studied nurses were interested to increase their knowledge about it. Mikhail *et al*. (2007) reported that in Egypt and Qatar Chlorophyrifos and Cyfluthrin were the most effective mosquito larvicides, Cyphenothrin was moderate and Propetamphos and Etofanprox were the least ones. Juraske *et al.* (2009) in Europe and United States indicated that pesticide intake due to the ingestion of fruits and vegetables consumed in Switzerland and the United States does not lead to significant human health damages.

In this study, there was significant improvement in nurses' knowledge and knowledge level about toxic damages of pesticides on man in both post-test and follow up when compared with pre-test ($P<0.001$). the highest improvement was in Diazepam or phenytoin are used with crises (emergencies) of pesticides poisoning and the lowest was in the principles of the treatment of pesticide poisoning that's indicate defect in education and training regarding principles of the treatment of pesticide poisoning**.** On the other hand, Strong *et al*. (2004) focused on the principle of management of pesticides poisoning as that study reported significant improvement in knowledge and skills of management of pesticides poisoning after in hospital tailored educational program.

Barakat *et al*. (2012) in Lake Maryut, Egypt examined Organochlorine compounds (OCs) in surface and core sediments to elucidate their distribution, ecological risk and historical trend. They found the highest concentrations of OCs were found at stations near the discharge point of sewage and close to industrial areas. The distribution of DDT and its metabolites suggest no recent inputs into the lake environment. Contamination levels of sedimentary PCBs and DDTs can be categorized moderate to high compared to other urbanized regions worldwide. Temporal trends in OCs levels were influenced by input pathways at two sites

This study showed a significant improvement in the nurses' knowledge and knowledge level about the preventive measures used when dealing with pesticides in both post-test and follow up when compared with pre-test ($P<0.001$). The highest improvement was in Major categories of pesticide exposure the lowest was in course of action should be followed after human pesticide poisoning, This agreed with Konradsen *et al,* (2003) who reported good knowledge regarding pesticides exposure preventive measures.

Regarding knowledge about pesticide labeling, there was significant improvement in both post-test and follow up when compared with pre-test ($P<0.001$). The highest improvement was in statements that would appear on all pesticide labels the lowest was in pesticide labeling. WHO (2008) published a document to improve medical management and mental health care of people with pesticide poisoning in health care facilities at different levels. More particularly, to describe best practices in the clinical management of acute intoxication with pesticides, accidental and intentional, for different levels of staff in the health care system, i.e. primary health care, district hospitals, and specialized units. The

mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the WHO in preference to others of a similar nature that are not mentioned. Errors and omissions accepted, the names of proprietary products are distinguished by initial capital letter. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use. Chen *et al.* (2011) reported confusion among health care workers regarding pesticide labeling and that the associations between covariates listed in the warfarin prescribing information and increased bleeding risk are not well supported by the medical literature. Lekei *et al*. (2014) stated that pesticides in Tanzania are extensively used for pest control in agriculture and found a high potential for pesticide exposure in the selected rural community, a high frequency of self-reported Acute Pesticide Poisoning (APP) and poor recording in hospital records. Farmers' knowledge levels appeared to be unrelated to their risk. Rather than simply focusing on the knowledge-based strategies, comprehensive interventions are needed to reduce both exposure and health risks, including training, improvements in labeling, measures to reduce cost barriers to the adoption of safe behaviors, promotion of control measures other than PPE and support for Integrated Pest Management (IPM).

The present study result showed significant improvement in nurses' knowledge about personal protection equipment's in both post-test and follow up when compared with pre-test ($P<0.001$). The highest was in PPE that resistant to dry pesticides the lowest was in methods of protection from pesticides. Ahad *et al*. (2006) in United Kingdom reported that in the post program assessment of knowledge highly significant improvement knowledge about the equipment used for protection from insecticides.

The present results showed significant improvement in nurses' knowledge about transportation, storage disposal, and spill clean-up in both post-test and follow up when compared with pre-test ($P<0.001$). Fenske *et al*. (2013) stated that pesticides used in agriculture can be taken into worker homes and pose a potential risk for children and other family members, and focused on identification of potential intervention points at the workplace to reduce take home pesticide exposure closer to the source of contamination; specifically, the workplace and vehicles used to travel to the workplace.

The present study showed that nurses lying in the age group 26-30y had got the highest total mean % knowledge score than others. However, there was a statistically insignificant difference between the total mean knowledge % score according to age ($p>0.05$) in the three interventions. Regarding work experience nurses worked more than 10 years had got the highest total mean % knowledge score, with statistically insignificant difference between the total mean knowledge % score according to work experience ($p>0.05$) in the three interventions. Also, married nurses have got the highest total mean % knowledge score, with statistically insignificant difference between the total mean knowledge % score according to marital status ($p>0.05$) in the three interventions. Nurses hadn't been sent abroad within Peacekeeping Forces have got the highest total mean % knowledge score, with statistically insignificant difference between the total mean knowledge % score according to sending abroad ($p>0.05$) in the three interventions. Besides, nurses had attended a training courses had got the highest total mean % knowledge score, but there was statistically insignificant difference

between total mean knowledge % score according to attendance training courses ($p>0.05$) in the three interventions.

On the other hand, nurses with technical institute degree of nursing had got the highest total mean % knowledge score, and there was statistically significant difference between the total mean knowledge % score according to education ($p<0.05$) in the three interventions. There were some differences regarding these items. Bagchi *et al*. (2008) found no significant difference among age groups, occupation, marital status and experience regarding knowledge improvement after educational program. Gatrad *et al*. (2004) in Turkey reported that effect of continuous educational sessions during work on knowledge, attitude and practice among health care workers (regarding prevention) was poor in nurses. Saja *et al*. (2010) found that more the age and experience the better knowledge, but agreed with the present result on positive effect of educational degree on the level of knowledge and percent of knowledge improvement after educational session held in hospitals. Abd el Hamed *et al*. (2010) showed that the HCWs had previous training and pre-employment and pre-traveling training was important factor to improve their knowledge and compliance to prevention guidelines. Ryan *et al*. (2014) reported that providing education to staff before implementing new practice changes enhances their knowledge. The quality improvement monitoring is recommended to ensure nursing adherence to any practice change

The present study reported significant improvement in nurses' knowledge about educational program after its implementation in both post-test and follow up was excellent and very good grade. Besides, types and pesticide damage and risks were the most topics meet their satisfaction. Rella et *al*. (2004) stated that sources of cyanide exposure are many, including combustion of plastic and vinyl, such as in a house fire, laboratory or industrial exposures including exposure in the electroplating industry both of printed circuit boards and in jewellery work. Rapid and definitive diagnosis of cyanide poisoning is unavailable in the emergency department setting. It is desirable to make a definitive diagnosis in order to prevent potential complications of empiric treatment of presumptive cyanide poisoning from the cyanide antidote kit currently approved by the US Food and Drug Administration (FDA). Their evaluation of their educational program showed that most of the trainee 91% gave a positive feedback regarding educational program and the most positive feedback was trainer and training material. Davis and Bene (2007) stated that home environmental health risks and the pollution of indoor residential air are becoming increasingly recognized as sources of injury and exacerbation of illness, particularly in vulnerable populations such as pregnant women, infants, children, the elderly, and those living with a chronic medical condition or disability. Nurses play a key role in prevention, education, and screening activities for patients. The core environmental health knowledge is essential for all nurses regardless of setting or population of practice. They added that it is essential that nurses be aware of these and other common environmental health hazards so that they can incorporate this teaching into nursing care for their patient populations, particularly those with baseline vulnerabilities, such as infants and children, pregnant mothers, the elderly, and people with disabilities. It is also imperative for nurses to have access to evidence-based information, tools, and resources so that they can incorporate environmental health knowledge into daily practice and plan interventions for their patients and communities that protect health.

On the other hand, Amer *et al*. (2002) examined 150 Egyptian workers exposed to pesticides and 50 healthy control subjects clinical and dermatological, patch tests, liver and renal function tests, CBC, blood sugar and urinalysis as well as antioxidant enzymes superoxide dismutase, glutathione peroxidase and glutathione reductase. They found that dermatological results were positive in 78%, 76% & 54% of those exposed to organophosphates, pyrethroids and carbamate pesticides respectively. The patch test was positive in 70% of workers exposed to pyrethroids and 64% exposed to carbamate pesticides. Liver enzyme levels were generally increased in workers while antioxidant enzyme activity was significantly decreased in all workers compared with the controls. Adongo *et al*. (2005) reported that the large-scale trials of insecticide-treated nets (ITNs) throughout Sub-Saharan Africa reduced child mortality in malaria endemic communities. These encouraging results have generated interest in ITNs as a viable malaria control strategy in many malaria endemic countries. However, regular use of ITNs under routine or non-project conditions has been beset with several problems. They employed structured formal observation and a range of interviewing techniques which included informal interviews, focus group discussions, semi-structured in-depth interviews, and structured survey interviewing. People recognize the term 'malaria' but have limited biomedical knowledge of the disease, including its aetiology, the role of the vector, and host response. Convulsions and anaemia are rarely linked to malaria. They concluded that people acknowledged a role for ITNs in nuisance reduction, but not for malaria prevention. Gilden (2010) focused on the health risks associated with pesticide and antimicrobial use in the health care setting and the roles that nurses could play in assessing and addressing the human health risks associated with exposure to these chemicals. Specifically, common biocides, sterilants, insecticides, herbicides, and fungicides are reviewed, including products that might be found in and the health effects associated with their use. Then followed a discussion of actions nurses and nurse administrators could implement to reduce exposure to these chemicals. He stated that the interventions improved assessment of patient exposure, education of staff and patients on health effects of hazardous chemicals and safer alternatives, and implementation of integrated pest management policies and programs within facilities and in the community. Arredondo *et al*. (2011) presented a nurse who suffered from poisoning by gas phosphine confirmed through an environmental monitoring of gases in an emergency department carried out by the government service of civil protection of the State of Jalisco. Forns *et al*. (2012) stated that a number of life socio-environmental factors during prenatal life and the early childhood, such as the socio-demographic characteristics, breastfeeding, maternal nutritional supplementation with the folic acid and vitamins and exposure to some organochlorine compounds influenced inattentive and hyperactive/impulsive symptoms in youth.

El-Bahnasawy *et al*. (2012) in Egypt mentioned that human lice treated with DDT, malathion, and lindane, but resistance to one or more of them were reported. Pyrethroid permethrin when applied as a dust or spray to clothing or bedding proved highly effective against lice as a delousing agent of choice. Fabric treated with permethrin retains toxicity to lice even after 20 washings, thereby offering significant long-term passive protection against epidemic typhus. Itching may continue even after all lice are destroyed. This happens because of a lingering allergic reaction to their bites. Over-the-counter cortisone (corticosteroid) creams or calamine lotion may help.

Singleton *et al*. (2015) reported that Chlorpyrifos (CPF) and profenofos (PFF) are organophosphorus (OP) insecticides that are applied seasonally in Egypt to cotton fields. Urinary trichloro-2-pyridinol (TCPy), a specific CPF metabolite, and 4-bromo-2-chlorophenol (BCP), a specific PFF metabolite, are biomarkers of exposure, while inhibition of blood butyrylcholinesterase (BChE) and acetylcholinesterase (AChE) activities are effect bio-markers that may be associated with neurotoxicity. Urinary TCPy and BCP and blood BChE and AChE activities were measured in 37 adult Egyptian Ministry of Agriculture workers during and after 9-17 consecutive days of CPF application followed by an application of PFF (9-11 days), and a second CPF application (5 days) in 2008. They suggested that thevariable exposures between job classification and work site suggest that job title and work location should not be used as the sole basis for categorizing OP exposures when assessing neurobehavioral and other health outcomes in Egyptian cotton field workers. They added that these data would be important in educating the Egyptian insecticide application workers in order to encourage the development and implementation of work practices and personal protective equipment to reduce their exposure to CPF and PFF. Del Prado-Lu (2015) reported that 20% of the eggplant samples tested positive for insecticide residues at any one stage of sampling done. He added that farmers and farm workers also reported of pesticide-related illnesses but none of them sought any medical attention. Intervention to reduce the farmers' pesticide exposure can focus on the risk factors identified, primarily the toxicity of pesticides used, the unsafe application practices, and the adverse health effects of pesticide exposure.

Conclusion

Most of the participants about (98.5%) did not have any idea about hazardous effect of pesticides exposure before the program. There was significant improvement regarding adequate knowledge about pesticides hazard, prevention and management among nursing Staff after implementation of our program. Also, there was highly significant improvement in the Nurses' knowledge level after the program application. Besides, the educational degree and qualification was determinant for level of knowledge and capacity of education also for improvement of level of education regarding pesticides exposure hazards and prevention.

Recommendations

Design training programs for adverse health effects of chemical insecticides exposure must be developed and provided on regular basis are recommended.

1. Make continuous training need assessment about adverse health effects of chemical insecticides exposure in a military field for the new comers to the military field.
2- Establishment of a fixed training course for chemical insecticides exposure and its prevention and management in a military field.
3- Support and provide fund for more research and promote other types of studies to find more about HCWs knowledge and attitude regarding adverse health effects of chemical insecticides exposure in a military field, specially tailored intervention studies, and to find the relation between knowledge and practice and invent new way of prevention and eliminate of related health hazards.

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Explanation of figures

Figure 1: Distribution of nurses regarding mission abroad within Peacekeeping Forces

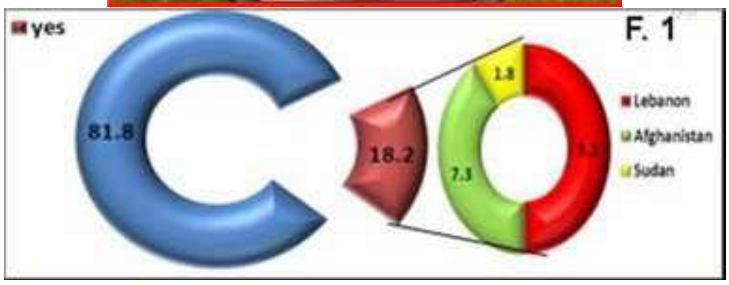
Figure 2: Total knowledge percent score & nurses' work experience

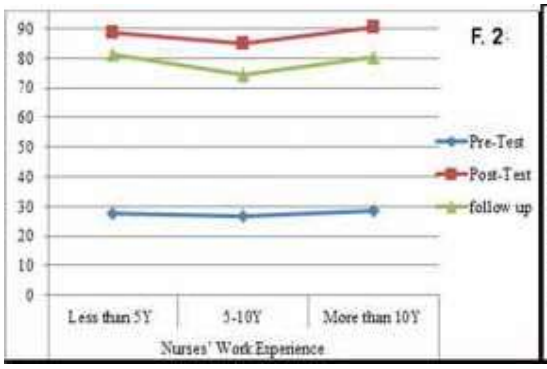
Figure 3: Total knowledge percent score & nurses' education.

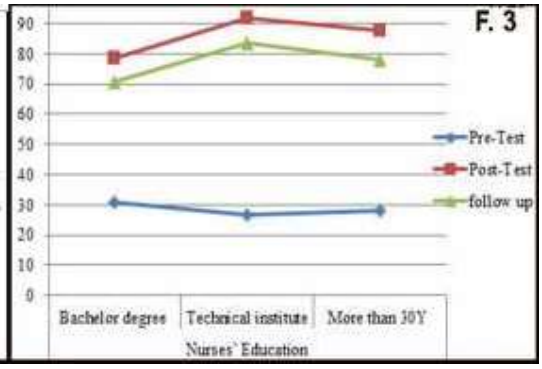
Figure 4: Total Knowledge Percent Score & Nurses' Marital Status

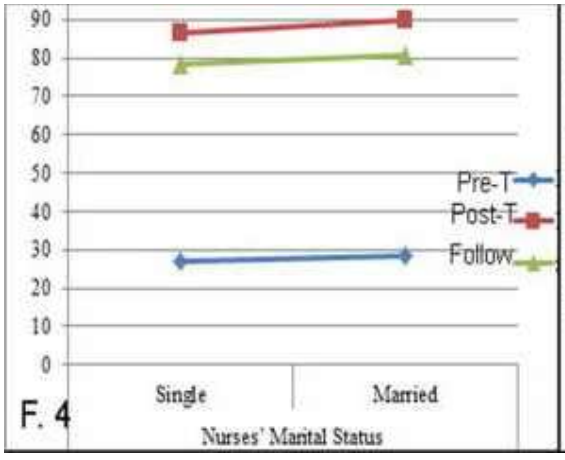
Figure 5: Total knowledge percent score & abroad within peacekeeping forces

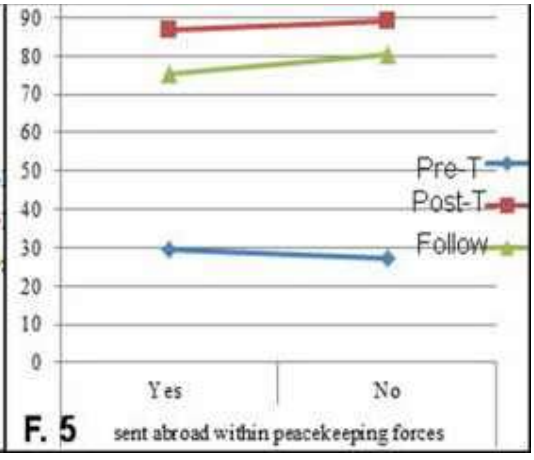

FOOD
WATER
WARNING
PESTICIDES
FIRE WILL CAUSE
TOXIC FUMES
AIR
SOIL


yes
F. 1
81.8
18.2
7.3
1.8
Lebanon
Afghanistan
Sudan


F. 2
Pre-Test
Post-Test
follow up
Less than 5Y
5-10Y
More than 10Y
Nurses' Work Experience


F. 3
Pre-Test
Post-Test
follow up
Bachelor degree
Technical institute
More than 30Y
Nurses' Education


Pre-T
Post-T
Follow
Single
Married
F. 4
Nurses' Marital Status


Pre-T
Post-T
Follow
Yes
No
F. 5
sent abroad within peacekeeping forces