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The Effect of Health Hazards Intervention on the Farmer's knowledge, Practice and Self-Reported Symptoms of Pesticides Exposure

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Abstract: **Background: Pesticides in Egypt are used for pest control in agriculture, their usage and unsafe handling practices may result in high farmer exposures and adverse health effects. The aim of the present study was to examine the effect of health hazards intervention on the farmers, knowledge, practice and self reported symptoms toward pesticides exposure. Design: A Quasi experimental research design (pre-post-test) was utilized. Setting and Sample: Simple random sample was used to select one village in Birket El-sab,ei district at Menoufia Governorate, Egypt. All vegetable growing farmers were selected to participate in the study.Tools:1- an interviewing questionnaire composed of two parts;first part was designed to assess demographic and occupational characteristics, and the second part was designed to assess workers' knowledge about health hazards of pesticides exposure.2- Checklist composed of two parts; the first part observational chicklist for inspection of use of safety measures, and the second part to assess the rate ofself reported symptoms after pesticide exposure.The main results: the current study showed that the percentage of satisfactory knowledge among studied workers improved from 17.4% before intervention to 80.2% after intervention. Regarding use of safety measures the data revealed that the percentage of satisfactory safety practice among studied workers before intervention was 12.8 % that improved to 89.5% % after intervention. There was significant reduction in the rate of self-reported symptoms after intervention program. There were statistical significant difference at all manifestations (p< 0.005%) except thirst (0.131). Conclusions: the level of satisfactory knowledge among farmers increased and the safety practices of the farmers during pesticides use also improved after receiving the health hazard intervention. The prevalence of self- reported symptoms of acute pesticide poisoning among the farmers decreased after receiving the health hazard intervention. Recommendation: further researches and more training for Egyptian farmers are needed for safe practice during of pesticide application.**

Keywords: **Health Hazards Intervention, pesticide exposure, farmers, self-reported symptoms.**

1. INTRODUCTION

Agriculture is one of the most hazardous of all economic sectors and many agricultural workers suffer occupational accidents and ill health each year. Agriculture employs some one billion workers worldwide, or more than a third of the world's labor force (ILO, 2011). Agriculture is different from most industries in that it can also present hazards to people not actively involved in the industry, such as family members living on the farm and visitors. Additionally, hazards may exist for emergency medical services personnel and other healthcare professionals as they provide assistance and care to victims of farm accidents (Rural Health Information, 2015).

Agricultural workers are at risk of exposure to occupational hazardous factors, including pesticides, dust, bacteria, moulds, endotoxins, and ammonia. Pesticides are chemical substances used to protect agricultural crops and they have helped limit and control the spread of certain human diseases, such as malaria. However, pesticides also endanger humans and the environment. Toxic, environmentally persistent, and inexpensive chemicals are used intensively in developing countries, which make up about 20% of the world pesticide usage. Yet they suffer 99% of deaths from pesticide poisoning (Kesavachandran et al., 2009).

The use of pesticides has increased due to widespread application in agricultural and environmental pest control. Many farming activities pose serious risks of pesticide exposure, such as land preparation for cultivation, storing, mixing, preparing and spraying of pesticides, and loading and cleaning of spraying equipment. Exposure to pesticides may result in acute and chronic health problems, including temporary acute effects like irritation of eyes and excessive salivation, as well as chronic diseases like cancer and reproductive and developmental disorders. Others have reported adverse health effects, such as dermatitis, asthma, peripheral nerve effects, chronic neurobehavioral, motor dysfunction, burning sensations in eyes/face, skin irritation, headache, dizziness, and respiratory effects (Issaa et al., 2010).

Nearly 80% of work force in Egypt are involved in agriculture and exposed to agriculture aerosols. Unlike other occupation they live in the same environment and thus exposure for them and their children continue over the weak. Agriculture workers and those living in rural environment are at increased risk of developing lung diseases (EL-Sobky, 2014).

The first use of petroleum-derived pesticides in Egyptian agriculture was initiated in 1950. Early applications consisted of distributing insecticidal dusts containing DDT/BHC/S onto cotton fields. This practice was followed by use of toxaphene until 1961. Carbamates, organophosphates, and synthetic pyrethroids were subsequently used, mainly for applications to cotton. About 1 million metric tons (t) of pesticides were used in the agricultural sector over a 50-yr period. Major problems related to pesticide exposure in Egypt include human poisoning, incidental toxicity to farm animals, insect pest resistance, destruction of beneficial parasites and predators, contamination of food by pesticide residues, and pollution of environmental ecosystems. Since 1990, there is a growing movement toward reduced consumption of traditional pesticides. On the other hand, DDT and lindane were used for indoor and hygienic purposes as early as 1952. Presently, indoor use of pesticides for pest control is widespread in Egypt (Mansour, 2008).

The health of workers is largely determined by the standard of occupational health services available to them at their place of work (Ahmed et al., 2012). Health at work is an important issue for most individual because they spent much time at work and the workplace has significant influence on health. The work place can be used by the occupational health nurse to be a primary site for the delivery of health promotion and disease prevention (Stanhope and Lancaster, 2008).

The role of the occupational health nurse is broad and includes health care provider, manager/coordinator, educator/advisor, and case manager and consultant, depending on the type of industry and the country in which the nurse practices. Regardless of the type of role, the occupational health nurse must participate in continuing nursing education (CNE) activities. The occupational health nurse participate in developing and implementing occupational and environmental health and safety programs and services to clients, workers, work populations, and community groups (Nies and McEwen, 2011).

Significant of the Study

Pesticides are increasingly used worldwide to enable increase production of higher quality crops and overcome of some diseases. The severity of pesticide hazards is much pronounced in third world countries as Egypt. A number of long persistent organochlorines, which have been severely restricted are still marketed and used in many developing countries. Acute poisoning with organophosphate (OP) in human is frequently seen in many countries and it is estimated to be the cause of more than 200,000 deaths around the world. Occupational exposures to these pesticides occur from skin absorption and inhalation, and the toxicity may be attributed to a number of reasons, including farmers' poor knowledge about pesticides and pesticide use, less protection against exposures, minimal understanding of the health risks and, most importantly, inadequate safety warnings on the packages provided by the manufacturers (Arafa, Afify, and Samy, 2013) .

The World Health Organization and United Nations Environmental Program have estimated one to five million cases of pesticide poisoning among agricultural workers each year with about 20,000 fatalities, mostly reported from developing

countries. Farmers of developing countries need educational programs to improve their awareness related harmful effects of pesticides and necessary precautions and help them to translate this awareness into practice (El-Wakeil et al., 2012).

Aim of the study

To examine the effect of health hazards intervention on the farmers, knowledge, practice and self- reported symptoms toward pesticides exposure.

Hypotheses

1. The knowledge of farmers about the health hazards of pesticides use and safety practices will increase after receiving the health hazard intervention.
2. The safety practices of the farmers during pesticides use will improve after receiving the health hazard intervention.
3. The prevalence of self- reported symptoms of acute pesticide poisoning among the farmers will decrease after receiving the health hazard intervention.

Methodology

Research Design

Quasi experimental research design pre-post-test was utilized to examine the effect of health hazards intervention on the farmers, knowledge, practice and self- reported symptoms toward pesticides exposure.

Research Setting

The study was conducted in Birket El-sab,ei district at Menoufia, Egypt.

Participants and Sample size Calculation:

Sample: the sample size was estimated to fulfill the aim of the study, with a 95% level of confidence (error=5 %) and a study power of 80% (error=20%). Using the Epi-info computer software program the required sample size was 86 subjects.

Simple random sample technique was used to select one village (Shentena Al-Hagar) in Birket El-sab,ei district, Menoufia, Egypt. All vegetable growing farmers in this village were included in the study.

Tools of Data Collection

To achieve the aim of the study, data collected by the following tools:

I Interviewing Questionnaire: it was developed by the researcher after reviewing the literature to collect the necessary data from workers and include the following:

A- The first part was designed to assess demographic and occupational characteristics of the farm workers such as (age, level of education, experience, working hours).

B- The second part was designed to assess workers' knowledge about pesticides that composed of three main items of knowledge:

1- Health hazards of pesticides exposure (pre/ post test), it consisted of 10 questions about accumulation of insecticide in the body, exposure to insecticide leads to: cancer, neurological troubles, depressed immunity, chronic respiratory diseases, poisoning, and abortion for pregnant, ……..etc.

2- Safety practices (pre/ posttest),it consisted of 11 questions about disposal of containers, spray in wind and rain, spray in hot weather, eating and drinking during spray, ……etc.

3-Frst aides of pesticide poisoning, it consisted of which included 23 questions related to five main items as follow (general principles, Skin contamination, Eye contamination, Inhalation, Swallowing).

Scoring system for workers' knowledge:

Each item was scored 1 for correct answer and 0 for incorrect answer. The total score of all questions will be represented in 100% and categorized into two levels, unsatisfactory (<60%) and satisfactory (≥ 60%).

The Validity: Instruments were reviewed and tested for validity by 5 experts community health nursing, modification were done accordingly to ascertain relevance and completeness.

Reliability: The internal consistency of the questionnaires was calculated using Cronbach's alpha coefficients. Test-retest was used. The Cronbach's alpha of the questionnaire was 0.82 indicate good reliability.

II. OBSERVATIONAL CHECKLIST FOR FARMERS'

A. Observational Checklist for Farmers' use of different personal protective devices such as safety glasses', apron, mask, goggles, etc.

It was developed by the researcher after reviewing the literature to collect the necessary data from workers.

Scoring system

Each item was scored 1 for use of personal protective devices and 0 for don't use of personal protective devices.

The total score of all questions will be represented in 100% and categorized into two levels, unsatisfactory (< 60%) and satisfactory (≥ 60%).

B. Checklist for self -reported symptoms of acute pesticides poisoning, was used to assess its prevalence; it included 20 questions related to five systems as follow (nervous system, GIT, respiratory system**,** dermatological, cardiovascular system).

Scoring System

Each item was scored 1 when worker reported that he had the manifestations and 0 for if no.

The **validity** was done through five experts from Faculty members of Community Health Nursing Department at Menoufia University and members of chest department at faculty of medicine Beni-Suef University. Necessary modifications were done. **Cronbach's alphatest** will be used to measure the internal consistency reliability of the questionnaire (0.78).

Method

- Data collection extended from November 2015 to the end of April 2016.

Approval

- An official letter from the faculty of nursing was delivered to the director (s) of the intended study setting (agricultural association in the selected village). A full explanation about the aim of the study was explored. Official permission to conduct the study was obtained from the responsible authorities.
- Workers consent obtained before starting collecting data. Approval from the ethics committee also was obtained to carry out this study.

Ethical consideration

The study was conducted with careful attention to ethical standards of research and rights of participants. Verbal consent was taken from each worker to participate in this study. During the initial interview, the purpose of the study and the procedures were explained to the workers. The subjects were assured that all information would be confidential and used for the research only to assure the confidentiality of the participants. The participation in the study was voluntary and that they can withdraw from the study at any time and can refuse to participate in the study. It would be explained that there were no costs to participate in the study.

Data Collection Procedure:

- At the beginning the researcher visited the agriculture sector at the selected village to get list of vegetable farmers and their addresses.
- The researcher visited the farmers at their homes and introduces himself; explain the aim of the study to each farmer to gain their cooperation to share in the study.
- **Tools developments:** tools were developed by the researcher after reviewing the literature to collect the necessary data from workers. Tool validity test was done through five experts. They were Faculty members of Community Health Nursing Department at Menoufia University and members of chest department at faculty of medicine Beni-Suef University) and necessary modifications were done. **Cronbach's alphatest** will be used to measure the internal consistency reliability of the questionnaire (0.78).
- **Pilot study:** A pilot study was carried out on 10% (10 workers) to test the content of the questionnaire as well as to estimate the time needed for data collection and the necessary modifications was done. Those who shared in the pilot study were excluded from the study sample.
- The researcher initiated data collection by interviewing each participant for assessing workers socio-demographic data, personal health habits and working characteristics by using a structured interviewing questionnaire. Also, each subject was asked to answer certain questions to evaluate his knowledge about pesticides. The interview conducted whenever possible in privacy and using simple language, the average number per day around 5-10 farmers and each farmer took an average 20-30 minutes.
- The researcher arranged another visit in their farms at a time in which the farmers would participate in pesticide application to observe the farmers use to safety measures and to fill the self-reported symptoms checklist
- After collection of the data in the field, the intervention program was developed and implemented for the studied farmers. The studied farmers divided into groups depending on closeness of their farms. Each group consisted of 5-10 workers and attended two sessions and duration of each session 25-40 minute.
- First session which include general information about pesticide, hazards of pesticides, safety measures and first aides in case of pesticide poisoning.
- Second session which included training on use of personal protective equipment and perform role play in applying first aides. The second session includes teaching videos about use of safety measure from pesticide preparation to the end of the process.
- Each session followed by a summary of essential points. The teaching methods include group discussion, lectures, role play and teaching videos. The teaching media included an illustrative structured colored booklet. It was prepared and written in simple Arabic language supported by illustrative pictures used to facilitate the process of education.
- At the end of intervention period post-test was performed by using the same pretest tools.

Statistical Analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS version 19 (Statistical Package for Social Studies) created by IBM, Illinois, Chicago, USA. For numerical values the range mean and standard deviations were calculated. The differences between two mean values before and after intervention were used using paired t test. For categorical variable the number and percentage were calculated and differences between observations before and after intervention were tested by Wilcoxon's singed ranks test. For testing factors affecting level of knowledge and safety practices, presented as satisfactory and unsatisfactory, chi square test was used. When chi square test was not suitable due to presence of observations with small number, Monte Carlo exact test was used The correlation between total score of knowledge and safety practices and age in years, educational level and experience in farming was calculated using Pearson's correlation coefficient. The level of significant was adopted at $p<0.05$.

3. RESULTS

Table (1) shows the distribution of demographic and occupational characteristics of studied workers. The table shows that 30.2% of the studied workers aged 20 to less than 30 years old and the same percentage was among workers who aged 50 year or more. In relation to education 27.9% of the workers were illiterate, and about one third (34.9%) of them had university education. Technical secondary and general secondary represented with percentages 23.3% and 14%

respectively. Related number of daily working hours in farming and years of experience, about one fifth of studied workers (20.9%) engaged in work more than 8 hours per day and 37.2% of them had years of experience exceeds 20 years, and 34.9% had years of experience range from 10 to 20 years.

Table (2): displays the comparison of mean value of total knowledge score and safety practices before and after intervention. The data reveals that there were significant differences between all items of total knowledge (p 0.001). Regarding use of safety measures there was statistical significant differences in the mean score in the post test (8.90±1.88) compared to pretest (3.35±1.63)

Figure (1) shows the distribution of studied workers by their level of total knowledge before and after intervention. The data revealed that the percentage of satisfactory knowledge among studied workers before intervention (17.4%) improved to 80.2% after intervention. There were significant differences with (p 0.001).

Table (3) reveals the relation between of satisfactory level of total knowledge and demographic factors among studied farmers before and after intervention. There was statistically significant relationship between the satisfactory level of total knowledge among studied workers before and after intervention. The satisfactory level of total knowledge after intervention was inversely proportional to the age and years of experience of studied workers. The percentages of satisfactory knowledge were higher among studied workers who were less than 30 years old and who had lowest years of experience (92.3% and 100% respectively). Regarding educational level, the highest percentage of satisfactory level of knowledge (96.7%) was among workers who had university education. Concerning daily working hours the percentages of satisfactory knowledge after intervention were significant higher among studied workers who reported working less than 6 hours.

Figure (2) shows the distribution of studied workers by their level of total safety practice score before and after intervention. The data revealed that the percentage of satisfactory safety practice among studied workers before intervention was 12.8 % that improved to 89.5 % % after intervention. There were significant differences (p 0.001).

Figure (3): illustrates the correlation between total knowledge and safety practice score after intervention. The data revealed that the percentage of using safety measures among studied workers increased with improved their knowledge after intervention. There were significant differences (p 0.001).

Table (4) reveals the relation between demographic factors and satisfactory level of total use of safety practices and among studied farmers before and after intervention. There was statistically significant relationship between age groups, educational level, years of experience, daily working hours and satisfactory level of total safety practices among studied workers before and after intervention.

Table (5) shows distribution of studied farmers by self reporting manifestations after exposure to insecticides. The data clarified that the rate of all manifestations that appeared after exposure to insecticides decreased after intervention program. There were statistically significant differences at all manifestations except thirst.

Table (1): Demographic and occupational characteristics of studied farmers

Socio-demographic characteristics	Number (n=86)	%
Age in years:		
20-	26	30.2
30-	12	14.0
40-	22	25.6
50+	26	30.2
Educational level:		
Illiterate	24	27.9
Technical secondary	20	23.3
General secondary	12	14.0
University	30	34.9
Number of daily working hours in farming:		
<6	32	37.2
6-8	36	41.9

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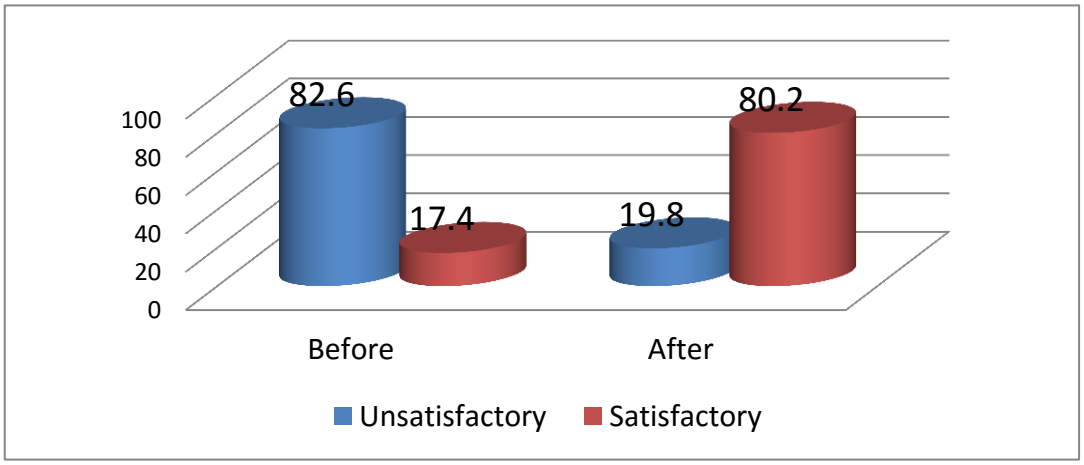
>8	18	20.9
Years of farming experience:		
<10	24	27.9
10-20	30	34.9
>20	32	37.2

Table (2): Comparison of mean value of total knowledge score and total score of using safety measures before and after intervention

Item of knowledge on insecticides	Total Score of using Safety Measures		T	P
	Before	After		
General knowledge	5.53±1.39	11.87±2.53	22.436	0.001*
Safety precautions	4.92±2.28	9.21±2.31	13.274	0.001*
Health hazards	4.63±1.98	8.36±2.27	13.722	0.001*
First aid management	10.60±4.57	17.67±4.89	11.510	0.001*
Use of safety measures	3.35±1.63	8.90±1.88	22.090	0.001*



Z=7.348 P=0.001*

Figure (1): Distribution of studied farmers by their level of total knowledge before and after intervention

Table (3): Relation between Demographic factors& satisfactory level of total knowledge among studied farmers before and after intervention

Demographic factors	Satisfactory level of total knowledge				X^2	P
	Before intervention		After intervention			
	N	%	n	%		
Age in years:						
20-	9	34.6	24	92.3	3.873	0.001*
30-	4	33.3	11	91.7	2.646	0.008*
40-	2	9.1	20	90.9	4.243	0.001*
50+	0	0.0	14	53.8	3.742	0.001*
Educational level:						
Illiterate	2	8.3	14	58.3	3.464	0.001*
Technical secondary	2	10.0	18	90.0	4.000	0.001*
General secondary	0	0.0	8	66.7	2.828	0.005*
University	11	36.7	29	96.7	4.243	0.001*
Experience in farming:						

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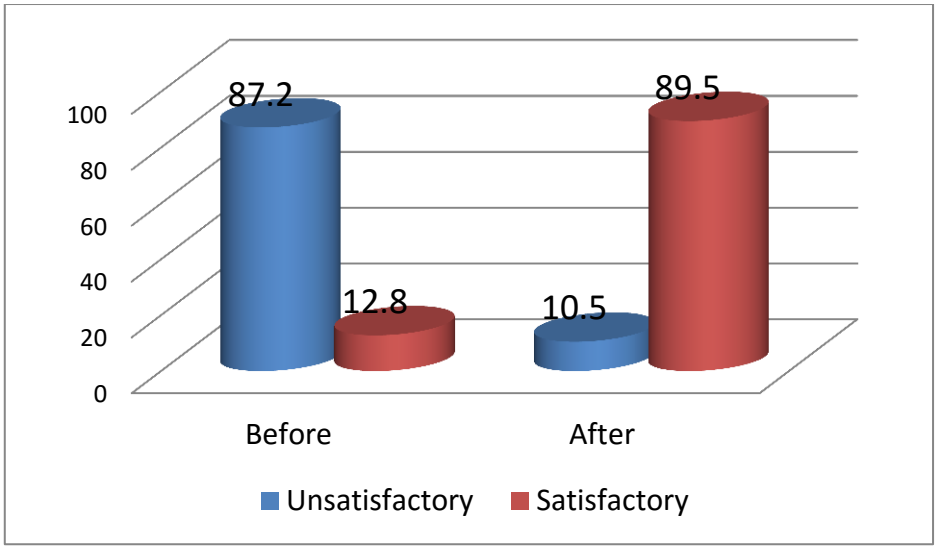
<10	9	37.5	24	100.0	3.873	0.001*
10-20	4	13.3	27	90.0	4.796	0.001*
>20	2	6.3	18	56.3	4.000	0.001*
Daily working hours						
<6	7	21.9	32	100.0	5.000	0.001*
6-8	8	22.2	27	75.0	4.359	0.001*
>8	0	0.00	10	55.6	3.162	0.002*

**Significant*



Z= 8.124 ***P= 0.001****

Figure (2): Distribution of studied farmers by their level of total safety practice score before and after intervention

Table (4): relation between Demographic factors & satisfactory level of total use of safety practices and demographic factors among studied farmers before and after intervention

Demographic factors	Satisfactory level				X	P
	Before intervention		After intervention			
	n	%	n	%		
Age in years:						
20-	5	19.2	26	100.0	4.583	0.001*
30-	0	0.0	11	91.7	3.317	0.001*
40-	4	18.2	22	100.0	4.243	0.001*
50+	2	7.7	18	69.2	4.000	0.001*
Educational level:						
Illiterate	4	16.7	20	83.3	4.000	0.001*
Technical secondary	2	10.0	20	100	4.243	0.001*
General secondary	0	0.0	8	66.7	2.825	0.005*
University	5	16.7	29	96.7	4.899	0.001*
Experience in farming:						
<10	5	20.8	24	100	4.359	0.001*
10-20	2	6.7	29	96.7	5.196	0.001*
>20	4	12.5	24	75.0	4.472	0.001*
Daily working hours						
<6	7	21.9	32	100	5.000	0.001*
6-8	4	11.1	31	86.1	5.196	0.001*
>8	0	0.0	14	77.8	3.742	0.001*

**Significant*

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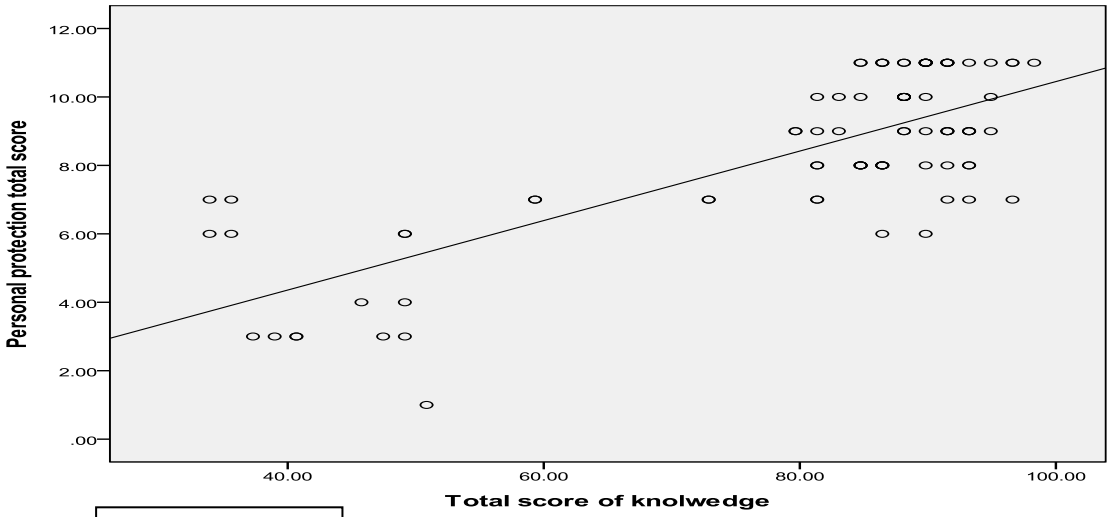

Figure (3): Correlation between total knowledge and safety practice score after intervention

Table (5): Distribution of studied farmers by self-reporting manifestations after exposure to pesticides

Self-Reported Manifestation	Self-reporting manifestations				Z	P
	Before intervention		After intervention			
	n	%	N	%		
Nervous system:						
Thirst	28	32.6	20	23.3	1.512	0.131
Frequent urination	46	53.5	20	23.3	4.459	0.001*
Excess saliva	20	23.3	12	14.0	2.828	0.005*
Headache	72	83.7	36	41.9	6.000	0.001*
Dizziness	75	87.2	36	41.9	5.689	0.001*
Excess sweating	20	23.3	8	9.3	3.000	0.003*
Blurred vision	82	95.3	40	46.5	6.481	0.001*
Excess secretion of tears	68	79.1	32	37.2	5.692	0.001*
Gastrointestinal system:						
Colic	48	55.8	14	16.3	5.246	0.001*
Nausea	82	95.3	36	41.9	6.782	0.001*
Vomiting	24	27.9	11	12.8	3.357	0.001*
Diarrhea	64	74.4	16	18.6	6.928	0.001*
Respiratory system:						
Cough	81	94.2	33	38.4	6.788	0.001*
Chest tightness	78	90.7	28	32.6	7.071	0.001*
Chest pain	57	66.3	14	16.3	6.557	0.001*
Skin:						
Dermatitis	48	55.8	16	18.6	5.657	0.001*
Itching	48	55.8	12	14.0	6.000	0.001*
Rash	70	81.4	20	23.3	6.682	0.001*
Cardiovascular system:						
Tachycardia	57	66.3	17	19.8	6.172	0.001*
Bradychardia	6	7.0	0	0.0	2.449	0.014*

**Significant*

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4. DISCUSSION

Studies of farm workers health status have provided data indicating that they are less likely to receive preventive care from any health source. Preventive need include dental care, specific screening programs and treatment and educational programs about safe work practices, occupational hazards and first aides(Nies and Mcewen, 2015).Therefore this study was aimed at examining the effect of health hazards intervention on the farmers' knowledge, practice and self -reported symptoms toward pesticides exposure.

Hypothesis1: The knowledge of farmers about the health hazards of pesticides use and safety practices will increase after receiving the health hazard intervention.

Regarding the knowledge of farmers about the health hazards of pesticides use and safety practices, the current study showed that after intervention program there was statistical significant improvement in all items of knowledge; pesticides, safety precautions, health hazards and first aid management. The current study also revealed that 17.4% of the studied workers had satisfactory level of knowledge before intervention, and improved to 80.2% after intervention. These results of current study in harmony with Sam etal., (2008)who studied "effectiveness of an educational program to promote pesticide safety among pesticide handlers of South India, they pointed out that the average baseline KAP score of 30.88 ± 10.33 improved after education significantly ($P < 0.001$) at first follow-up to 45.03 ± 9.16 and at second follow-up 42.9 ± 9.54".

The results of current study were in line with Zalat, Abo El-Seoud and Rabie, (2015) who aimed to "(1) assess knowledge of farmers and their families toward pesticide use and pesticide hazards in Wadi El Mullak village, Zagazig, (2) to assess safe pesticide use behavior, (3) to evaluate the effect of health education program on their knowledge, attitude toward pesticides exposure". They found that "there was a statistically highly significant effect of health education of the intervention program on farmers' knowledge of safety behaviors associated with pesticide use". The findings of the current study were in contrast with Kumari and Reddy, (2013) who studied "Knowledge and Practices of safety use of Pesticides among farm workers in India".They concluded that "the awareness programs not effective". The differences in current study might be related to the studied workers were motivated and initiated to increase their awareness about pesticides. Also might be due to about three fourths of studied farmers were educated.

Regarding the farmers knowledge, as regard age of studied workers and level of total knowledge, the results of current study revealed that there were statistically significant differences between age and level of total knowledge. The result of current study supported by Khan et al., (2013) who conducted study titled with "understanding pesticide use safety decisions". They reported that "there were significant differences between age of studied farmers and level of awareness about pesticides and added that the age affect negatively the level of knowledge". The result of the present study was in line with Hassen et al., (2011) who studied "the effect of educational health program on self-protective measures for farmers using pesticides at Kalyobia Governorate". They showed that "the age categories of workers influence the level of total knowledge score". While these results contradicted with Kumari and Reddy, (2013) who studied "Knowledge and Practices of safety use of Pesticides among farm workers in India". They founded that "the age not influence the knowledge or the practice of the studied farmers". This discrepancy may be attributed to the variation that related to the youngest workers had high level of education.

Regarding educational level of studied workers and level of total knowledge, in the current study the percentage of satisfactory knowledge is higher among those who had university education than illiterate by four times. The statistical analysis of the current study indicated that there were significant differences between educational level and level of total knowledge. These findings in agreement with Alzain and Mosalami, (2014) who studied "pesticides usage, perceptions, practices and health effects among farmers in North Gaza, Palestine". They found that "farmers who received school education had higher levels of knowledge than those who did not". The difference in total mean score was significant between the two groups.

In relation to the years of experience of studied workers, the current study revealed that the percentage of satisfactory knowledge were significant higher among workers who had least years of experience. The results of current study contradicted with results of Zyoud et al., (2010) that assessed "the knowledge and practices associated with pesticide use in an agricultural community in Palestine". They reported that "farm workers with less than 1 year experience had the

lowest mean knowledge score compared to farm workers with more than 10 years of experience". This difference may be due to, the majority studied workers in our study who had the least years of experience had technical education and that mean they have previous education about the pesticides.

Hypothesis (2): The safety practices of the farmers during pesticides use will improve after receiving the health hazard intervention.

Regarding use of safety measures there was statistical significant improvement in the rate of using safety measures among studied farmers. There were highly significant improvements at all items (p = 0.001). The results of current study were in congruent with Salvatore et al., (2009) who studied "the effect of community-based participatory worksite intervention to reduce pesticide exposures to farm workers and their families". They pointed that "effectiveness of an educational program in promoting the use of some form of personal protective equipment (e.g. gloves, breathing mask and boots, eye protection) and proper safety behaviors (e.g. frequent changes and washing of work clothes and other personal hygiene)".Additionally Orozco et al., (2011) who aimed to "assess changes in health promotion outcomes relevant to highly hazardous pesticide use associated with a multi-component community program". They found "significant improvement in using the safety practices, as a result of health promotion activities though people were still observed to engage in risky practices in the field". Also Zalat et al., (2015), they concluded that "health education and proper training are effective forms of intervention in improving the knowledge, attitude and practices of farmers on the use of pesticide".

The results of current study contradicted with the study of Osbina, April and Ariza (2009) who studied "Educational intervention concerning knowledge and practices regarding work-related risks in potato farmers in Boyacá, Colombia". They revealed that "there were less significant improvement recorded regarding attitude and practices". The variation of results of current study may be related to the approximately two thirds of the studied workers were literate, and about half of them younger than 40 years old, this age have less resistant to change their behaviors. Finally the presence of the researcher at the field during the process of pesticide use may act as a motivator to the studied farmers.

Regarding age & years of experience of studied workers in relation to level of total safety practices, the results of current study revealed that there were statistically significant differences between age & years of experience and level of total practices after intervention. The current study results showed that the highest rate of satisfactory use of pesticide was among youngest age of workers and least years of experience. The results of current study supported with the study ofHasanin et al., (2012) who studied "the effect of educational health program on self- protective measures for farmers using pesticides at Kalyobia governorate". They indicated that "the percentages of adequate performance of pesticide were higher among workers their ages less than 30 years old and years of experience less than 15 years". The results of current study may be related to the youngest workers had high level of education and more motivated to adopt safety practices.

In relation to educational level of studied workers and their level of total safety practice, there was statistically significant relationship between educational level and satisfactory level of total safety practices among studied workers before and after intervention. The results of current study showed that the higher rates of using safety practices was among studied workers who had university and technical education $p<0.05\%$. The results of the current were in agreement with Farahat, Farahat and Michael, (2009) who "evaluated the effect of an educational intervention for farming families to protect their children from pesticide exposure". They found that "the parents with high school or university degree showed significantly greater improvements in knowledge and practice than parents who were illiterate or only able to read and write". The result of current study contradicted with the study of Sam et al., (2008) who studied "Effectiveness of an educational program to promote pesticide safety among pesticide handlers of South India". They pointed out that "the average baseline KAP score not influenced by educational level of farmers". The differences of the results of current study might be related to two third of studied workers have satisfactory level of education and had satisfactory knowledge about pesticide hazards. The educated workers were more initiated and motivated to adopt safety practices.

Hypothesis (3): The prevalence of self -reported symptoms of acute pesticide poisoning among the farmers will decrease after receiving the health hazard intervention.

The data clarified that the rate of all manifestations that appeared after exposure to insecticides decreased after intervention program. There were statistically significant differences between the rate of self reported symptoms before

and after intervention program. The results of current study were supported by Zalat et al., (2015). They concluded that "there was significant relation between health education &proper training and decreased appearance of symptoms". The results of current study in agreement with Cole et al., (2007) who study "aimed to reduce pesticide exposure and associated neurotoxin burden in an Ecuadorian small farm population". They reported that community interventions reduced pesticide use, and neurotoxin burden among smallholder farm families.

Also it was in the same line with Hasanin et al., (2012) who studied "the effect of educational health program on self-protective measures for farmers using pesticides at Kalyobia governorate". They reported that "there was significant decrease in the rate of self -reported symptoms after conducting the intervention $p<0.05$". Additionally Ye et al., (2013) studied "the occupational pesticide exposures and respiratory health". They reported that "there was association between respiratory complaints and pesticide exposure and added that educational training programs focusing on basic safety precautions and proper uses of personal protection equipment (PPE) are possible interventions that able to control the respiratory diseases associated with pesticide exposure in occupational setting".

5. CONCLUSION

- There was statistical significant improvement in the total level of knowledge among studied workers after educational intervention than before.
- There was highly significant improvement at all items of Safety practices of workers about insecticides use after implementation of the educational intervention than before ($p = 0.001$).
- There was statistical significant reduction in the rate of all manifestations after intervention compared to pre intervention.

6. RECOMMENDATION

- More effective implementation of health education program and proper training are needed to improve awareness and practices of farmers about pesticide use
- Activate the role of occupational health nurse in agriculture sector by facilitating periodic visits to farmers to perform workplace assessment to ensure it doesn't affect farmers' health, develop & implement the most suitable educational program to farmers.
- Explore new strategies that motivate farmers to use safety measures.
- Further researches and more training programs for Egyptian farmers are needed for safe practice during of pesticide application.

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