



## Occupational Health Safety Precautions Instructions regarding Pesticides' Use Practices among Egyptian Farmers

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### ABSTRACT

**Background:** The risks associated with pesticides are becoming more widely recognized as a community health issue that can be avoided with sufficient understanding and safety health training. **Aim of the study:** This study aimed to evaluate the effect of occupational health safety precautions instructions regarding pesticides' use practices among Egyptian farmers. **Design:** A quasi-experimental research design using pre/ post-test. **Setting:** This study was conducted inside the Egyptian agricultural association at El Hamrawy principal village, Kafrelsheikh Governorate. **Subject:** A simple random sample of (134) Egyptian farmers. **Tool:** A structured interviewing sheet includes 4 parts. Part (1): Demographic & socioeconomic information of farmers, Part (2): Health complaints related to farmers' pesticides use, Part (3): Farmers' knowledge toward health effects of pesticide use pre- and post-test, part (4): Farmers reported practices regarding pesticides use pre and posttest. **Results:** Reveals that the total knowledge score of farmers toward the health effects of pesticide use improved from 11.9 % in the pretest to 56.7% after implementation of the occupational health safety precautions instructions ( $P < 0.001$ ). Moreover, there was a highly statistically significant improvement towards total health safety practices level pre- and post-instructions (23.1%, 81.3%) respectively at ( $P \leq 0.001$ ). **Conclusion and Recommendation:** The results of this study concluded that farmers' knowledge and safety practices of pesticides use had been improved after the implementation of occupational health safety precautions instructions with statically significant differences between pre & post instructions. Regular teaching programs are recommended for farmers to emphasize the significance of safety precaution instructions for pesticides use. Additional researches are required to increase awareness of pesticides hazards related to storage and usage, as well as protective strategies.

**Keywords:** Safety precautions instructions, Pesticides use & Egyptian farmers

### Introduction

Worldwide, agriculture employs around one billion people, or more than a third of the workforce. Unlike most other sectors, agriculture has the potential to harm not only farmers but also,

including visitors and family members who reside on the same boundaries. Approximately 20% of all pesticides are utilized worldwide, and toxic, environmentally harmful, and cheap chemicals are widely employed in underdeveloped nations. However, 99% of their deaths are caused by pesticide toxicity. Because pesticides are widely used in environmental and agricultural pest control, their use has expanded (**Jakob,etal, 2021**). Among all economic sectors, agriculture is one of the riskiest, with a high number of occupational accidents and illnesses affecting agricultural workers annually. Emergency medical services workers and other medical professionals may also face risks while helping and tending to farm accident victims (**Ahmadipour & Nakhei, 2024**).

Pesticides are chemical substances used to protect crops in agriculture and have also been instrumental in containing and preventing the spread of some diseases among humans, like malaria. Pesticides, however, can pose a threat to the environment and people. Pesticide exposure is a significant risk associated with many farming operations, including clearing land for agriculture, storing, mixing, preparing, and spraying pesticides (**Mathiyazhagan, et al,2024**).

The widespread and uncontrolled use of pesticides is one of the biggest issues facing the environment and public health. When applied incorrectly, pesticides can cause residues in primary and derived agricultural products, soil, water, and air contamination, secondary pest outbreaks, and extinction of non-target species. All

of these effects can pose a threat to human health and, the environment. Pesticide use is critical, but poisoning issues are one of the most important occupational hazards for farmers as they may come into contact with endotoxins, dust, bacteria, mold, pesticides, and ammonia, among other harmful occupational conditions. Therefore, Training can help protect farmers' health from pesticide hazards (**Tudi et al., 2021**).

Furthermore, the main causes of using pesticides in a hazardous manner by farmers are a lack of awareness about safe pesticide application practices, a lack of use of personal protective equipment, unsafe pesticide maintenance and storage practices at home and on the farm, unsafe pesticide waste management practices, including the use of empty containers and pesticide residues, indiscriminate use, and a lack of awareness about safety labels on pesticide containers). Therefore, it can be useful to reduce risks and ensure safety by emphasizing enhancing farmers' knowledge and training on the safe use of pesticides and encouraging optimal management techniques (**Sookhtanlou & Allahyari, 2021**).

The adverse health effects of Pesticide exposure are both acute and long-term health issues, such as cancer and problems with reproduction and development, as well as transient acute effects like eye irritation and excessive salivation. Other negative health consequences that have been observed include dermatitis, asthma, peripheral nerve effects, chronic neurobehavioral disorders, motor dysfunction, headaches, dizziness, and respiratory effects (**Shah, 2021**). Moreover,

Pesticide exposure among farm laborers may lead to harmful health outcomes such as cancer and birth deformities, which have claimed hundreds of lives, most of them in developing nations. Farmers, particularly those who handle pesticides directly, are particularly vulnerable to pesticide exposure due to contact with pesticide residues on treated crops, improper handling, storage, and disposal procedures, poor spraying equipment maintenance, and the absence or improper use of protective gear **(Suphim & Songthap, 2024)**.

Occupational health and safety instructions regarding pesticide use have a significant impact on farmers' health. Since most farmers spend a large amount of time at farms which has a big impact on their health, planning to educate farmers about the proper use of pesticides, offering technical assistance, and supplying personal protective equipment are essential. By taking action in this area, poisoning rates can be effectively lowered and the working conditions for farmers in underdeveloped nations can be improved **(Gabriel, etal, 2021)**.

Occupational health nurses have an essential role in providing health services to farmers. When creating thoughtfully planned occupational health and safety guidelines, they can be very helpful. Additionally, they can have a significant impact on promoting preventive measures and safe work practices in relation pesticide use risks that farmers encounter on a daily basis when engaging in unsafe practices. The occupational health nurse may use agricultural land as the main location for providing health promotion and illness-preventive services for farmers **(Megahed, 2024)**.

### Significance of the study

The World Health Organization reports that 220,000 deaths and over 3,000,000 cases of pesticide poisoning occur in developing nations annually. Approximately 2.2 million people, primarily from underdeveloped nations, are more likely to be exposed to pesticides. Additionally, some individuals—such as newborns, young children, agricultural farm laborers, and pesticide applicators—are more vulnerable to the harmful effects of pesticides than others **(Boedeker, et al.2020)**. In Egypt, approximately 80% of the workforce works in agriculture, putting them in contact with agricultural products. People who live in rural areas and work in agriculture are more likely to suffer from lung problems. Developing country farmers require training initiatives to increase their knowledge of the negative effects of pesticides and the essential safety measures, as well as assistance in putting this knowledge into reality **(Qasim, 2024)**.

Additionally, according to a study done by Sallam, El Hefny, Okasha, and Hassanein,2022 in Sohag governorate, Egypt on 550 workers aiming at assessing the understanding level of pesticide labels, their field application practices, and observance of safety procedures among farmers and pesticide applicators at Sohag Governorate, Egypt. The results of the study showed that 49.8% of the respondents claimed immediate health hazards after pesticide application. Also, about two-thirds of participants said they did not wear personal protective equipment (PPE) because of its high cost, while 32 % of them reported that it was uncomfortable.

### Aim of the study

The present study aimed to evaluate the effect of occupational health safety precautions instructions regarding pesticides' use practices among Egyptian farmers.

### **Research hypotheses**

Implementing occupational Health safety precautions instructions will positively change Egyptian farmers' practices regarding pesticides use.

### **Subjects and Method**

#### **Study design:**

A Quazi experimental research design was conducted to accomplish the study's aim. The dependent variable, which is the Egyptian farmers' health safety practices toward pesticides' use was measured once before and after program implementation. Furthermore, the independent variable is Occupational Health safety precautions instructions.

#### **Setting of the study:**

The current study was conducted inside the Egyptian agricultural association at El Hamrawy principal village, of Kafrelsheikh Governorate. Kafrelsheikh Governorate consists of 37 villages. By using a simple random sample El Hamrawy principal village was selected. El Hamrawy principal village was chosen as it is considered to be one of the biggest villages in Kafrelsheikh Governorate and has 204 farmers, and the safety precautions instructions regarding pesticides were applied in the specific room present within the agricultural association.

#### **Study Sample and Sampling Method**

Sample calculation was done using the sample size calculator website available at: (<http://www.calculator.net/sample-size-calculator.html>, 2019). With confidence level (95%), confidence interval (5%), and population size (204). The sample size will be (134) farmers out of (204). Then the calculated sample number was chosen by a simple random method in which the researcher assigned farmers a number and then randomly picked a subset of them.

#### **Inclusion criteria:**

- Farmers above the age of 18 years old
- Farmers who are working in the agriculture sector for at least 6 months

#### **Tools of data collection:**

**A structured interviewing sheet** was utilized to collect data from the farmers after reviewing the related literature by the researchers. The sheet consisted of four parts:

**1st part: Demographic & socioeconomic information of farmers** as (age, sex, educational level, source of income, pesticide training, farming experience, total land area, and living close to agricultural land).

**2<sup>nd</sup> part: Health complaints related to farmers' pesticides use** as (nausea/vomiting, eye irritation, vertigo, chest pain, discomfort, headache, and skin irritation).

**3<sup>rd</sup> part: Farmers' knowledge of the health effects of pesticide use.** It was used Pre/post-safety precautions instructions after revising the relevant literature ((Momen, 2024), (Mishra & Satapathy, 2022) & (Jakob, et al., 2021)). It included 10 multiple choice questions which

**covered the knowledge part as follows:** (definition of pesticides, the reason for pesticides' use, the existence of pesticide residues, getting rid of pesticide residue, methods to store pesticides, mode of pesticide entrance into the body, pesticides affect farmers' health, effects for pesticide use on farmers' health, pesticides affect the environmental health and protection from harmful health effect of

#### **Scoring system:**

It was computed as 1 score for correct answer and 0 score for incorrect answer or don't know. The total knowledge score was categorized into the following three levels: (Less than 59%) poor, (60->80%) fair, and (80-100%) good).

**4<sup>th</sup> part: Farmers' health safety practices when applying pesticides in pre and post-instructions** ( Shafi, et al ., 2023) & (Muhammad, et al ., 2019) included Self -reported practices regarding pesticides use ( 12 items) & First aid measures for pesticides use ( 4 items).

#### **Scoring system:**

It was given 1 score for done and 0 score for not done. A total self-reported practices toward pesticides use had been categorized as satisfactory ( $\geq 80\%$ ) and unsatisfactory self-reported practices ( $< 80\%$ ).

#### **Tools validity and reliability:**

The sheet to test for face and content validity was distributed to five academic nursing specialists in the field of community nursing. Sheet contents were verified in terms of their suitability, thoroughness, and clarity. The experts' suggestions were followed when making modifications. The reliance on the recommended sheet had been

assessed using Cronbach's alpha. The structured interviewing sheet had a highly significant positive correlation between its items. a Cronbach's alpha value (internal consistency) was made by an expert in statistical analysis for the farmers' knowledge of the health effects of pesticide use and it is 0.902, and the farmers' health safety practices levels regarding pesticides is 0.896.

#### **Pilot study:**

Fourteen farmers representing 10% of the total, participated in a pilot study. The current study incorporated data obtained from those farmers. The aim of the pilot study was to appraise the clarity of the instruments, estimate the duration required for data collection, and examine the viability of the research protocol. There were no changes made.

#### **Ethical consideration of the study:**

Official permission to conduct the proposed study was obtained from the Research Ethics Committee at Kafrelsheikh University (KFSIRB200-165). Then permission from the manager of the Egyptian Agricultural Association at El Hamrawy principal village, Kafrelsheikh Governorate was obtained. The researcher clarified the aim and the nature of the research to the farmers. The researcher also explained farmers' rights to accept or refuse participation in the research. Oral informed consent was obtained from every farmer who accepted to participate in the study. Participation in the study was voluntary; the ethical issues considerations include, stating the possibility to withdraw at any time, and confidentiality of the information where it was not be accessed by any other party without taking permission of the participants.

**Fieldwork:**

After obtaining the ethical approval to perform the study, the aim of the study was explained to the participants. The study was performed for three months, from April until June 2024. The collection of data took an average of 30 minutes, with the help and permission of the manager of the Egyptian Agricultural Association at El Hamrawy principal village, the researchers met the participants in a specific room two days every week (Sunday and Wednesday) from 8.30 am to 12.00 pm.

**Safety instructions construction included the following phases:**

**Assessment phase**, at this phase, individual interviews were conducted with every farmer within the Egyptian Agricultural Association. The researchers began the interview by introducing themselves, wishing each participant a good day, and going over the nature, objectives, timeline, and activities of the study. Next, verbal approval was requested from the farmer. After that, the researchers used parts I and II to assess demographic characteristics and general health complaints. Furthermore, part III evaluates farmers' knowledge of pesticide use pre-instructions. As well as Part (IV) was also employed to assess farmers' reported practices regarding pesticides use pre-instructions. The researchers remained in the Egyptian agricultural association at El Hamrawy principal village, of Kafrelsheikh Governorate, during the completion of the questionnaires. The average duration of each farmer's interview was about thirty minutes. About 10 to 11 farmers were questioned each day. The information gathered during this stage served as

the standard against which later comparisons to evaluate the impact of occupational health safety precautions instructions.

**In the implementation phase**, based on the results obtained, the researchers designed the safety and health precaution instructions. The aim of these instructions was to provide the participants with knowledge and measures of safe pesticides practices for the prevention of adverse health effects. The instructions were carried out in five sessions (one session for the pre-test, three sessions for educational instructions, and one for the post-test); each session in a separate week which lasted for 1 hour weekly. Participants were divided into small groups of 25 farmers for each session. The instructions included knowledge and safe practices about pesticides use. Instruction sessions included educational sessions for pesticide information and the researcher gave information about the health hazards of pesticide and the importance of wearing personnel protective equipment. During the instruction sessions, educational methods such as health education, role-playing, question-and-answer, demonstration, re-demonstration, and discussion were used. The farmers were shown how to apply first aid techniques resulting from pesticide' usage such as burning, eye irritation, poisoning, and fainting. The summary of the instructed guidelines was delivered to farmers by researchers at the end of each session and the end of the whole period of education. Posters, pamphlets, and role-play on preventive measures, and safe pesticide practices were used during the instruction.

**During the evaluation phase**, the effectiveness of occupational health safety

precautions' instructions was evaluated by appraising their knowledge and reported practices through the utilization of the previously listed instruments. The tools will be fulfilled pre and immediately post post-occupational health safety precautions' instructions

### Statistical analysis:

Data of valid sheet revised, coded, tabulated, and introduced to a PC using Statistical Package for Social Science (SPSS 22 for Windows). Data cleaning and checking for quality of data and data entry were performed. Data was presented and suitable analysis was done (frequency, percentage, and chi-square). A value of  $p \leq 0.05$  was considered significant.

### Results

Table (1) reveals that 43.3% of the farmers aged from 31 -45 years old while 11.2% of them are more than 61 years old with Mean $\pm$ SD 43.6  $\pm$ 8.9. In relation to sex, 81.3% of the farmers were male, while 39.6% of them had basic education. In addition, 71.6% of the farmers had insufficient income, as well as 93.3% hadn't received pesticide training previously, Also, 30.6% of farmers had work experience of more than 30 years and only 20.1% had less than 10 years of work experience. While 59.0% of them had less than 5 acres. Moreover, 83.6% of farmers were living close to agricultural land.

Table (2) shows that, 88.8%, 87.3%,47.0%, 42.5%, 39.6%,29.1% &25.4% of the farmers suffered from skin irritation, eye irritation, vertigo, chest pain, nausea/vomiting, discomfort & headache respectively.

Figure (1) illustrates that only 11.9% of farmers had a good level of knowledge in the

pretest compared to 56.7% of them had a good level of knowledge in the posttest after implementation of the occupational health safety precautions instructions ( $P<0.001$ ).

Table (3) reveals that 21.6% of farmers wore personal protective equipment pre instructions which increased to 75.4% post instructions. In addition, 23.1% and 72.4% of them ate and drank after washing their hand with soap pre/post instructions respectively. Furthermore, 6.7% and 96.3% of farmers wash contaminated clothes in a separate load pre/post instruction respectively. According to first aid measures such as (eye irritation, burn, poisoning, and fainting), there was an improvement in farmers' performance from 23,9%, 5,2%,2,2%&13,4% respectively pre instructions to 87.3%, 67.9%,66.4%&79.1% respectively post instructions with ( $p <0.001$ )

Figure (2) clarifies a highly statistically significant improvement toward total health safety practices level pre- and post-instructions (23.1%, 81.3%) respectively at ( $P \leq 0.001$ )

Table (4) reveals a highly statistically significant association between farmers' knowledge and safety practices regarding pesticide use post instructions ( $P<0.001$ ).

Table (5) illustrates a positive statistically significant relation between farmers' knowledge regarding pesticide use and level of education, farming experience & living close to agricultural land in post instructions ( $P< 0.001$ ).

Table (6) illuminates statistically significant relation between farmers' safety practices regarding pesticide use and level of education post instructions ( $P<0.001$ ).

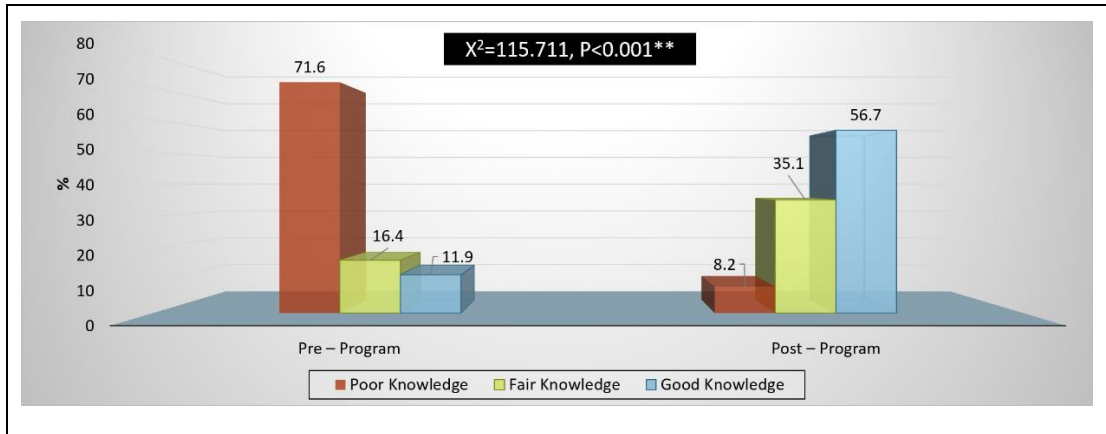
<b>1st part: Demographic &amp; socioeconomic information of farmers: (N=134)</b>		
	N	%
<b>Age (Years)</b>		
18< 30	34	25.4
31 – 45	58	43.3
46 – 60	27	20.1
> 61	15	11.2
<b>Sex</b>		
Male	109	81.3
Female	25	18.7
<b>Educational Level</b>		
Illiterate	13	9.7
Basic	53	39.6
Preparatory	42	31.3
Secondary /Higher	26	19.4
<b>Income</b>		
Sufficient	38	28.4
insufficient	96	71.6
<b>Pesticide Training Previously</b>		
Yes	9	6.7
No	125	93.3
<b>Farming experience Years</b>		
<10	27	20.1
10 – 20	36	26.9
20 – 30	30	22.4
>30	41	30.6
<b>Total Land Area (Acres)</b>		
< 5	79	59.0
5 – 10	36	26.9
> 10	19	14.2
<b>Living close To Agricultural Land</b>		
Yes	112	83.6
No	22	16.4

**Part II: Distribution of Health complaints related to farmers' pesticides use: (n=134)**

<b>Part II: Distribution of Health complaints related to farmers' pesticides use: (n=134)</b>		
	n	%
<b>Health complains</b>		
Nausea/vomiting	53	39.6
Eye irritation	117	87.3
Vertigo	63	47.0
Chest pain	57	42.5
Discomfort	39	29.1
Headache	34	25.4
Skin irritation	119	88.8

#More than one answer was allowed

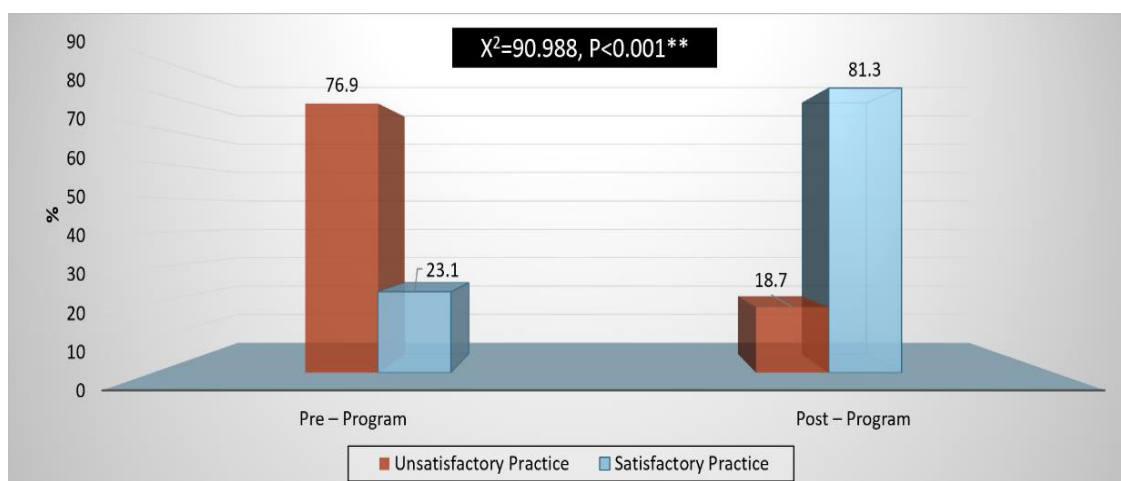




**Figure 1. Comparison of Farmers total knowledge toward health effects for pesticide use in pre and post program: (n=134)**

Figure (1) illustrates that only 11.9 % of farmers had good level of knowledge in pretest compared to 56.7% of them had good level of knowledge in posttest after implementation of the occupational health safety precautions instructions ( $P<0.001$ ).

Part IV: Comparison of Farmers' health safety practices when applying pesticides in pre and post-program (n=134)										
	Pre – Program				Post – Program				Chi-Square	
	Done		Not done		Done		Not done			
	n	%	n	%	n	%	n	%	X <sup>2</sup>	P
<b>Self-reported practices regarding pesticides use</b>										
Apply the recommended dose of pesticides	58	43.3	76	56.7	98	73.1	36	26.9	24.542	<0.001**
Wearing personal protective equipment during pesticides applications	29	21.6	105	78.4	101	75.4	33	24.6	77.442	<0.001**
Discard of empty pesticide containers	11	8.2	123	91.8	113	84.3	21	15.7	156.153	<0.001**
Mixing pesticides without naked hands	7	5.2	127	94.8	99	73.9	35	26.1	132.095	<0.001**
Storing Pesticides in a separate room	19	14.2	115	85.8	121	90.3	13	9.7	155.595	<0.001**
Taking a bath after pesticides' application	53	39.6	81	60.4	131	97.8	3	2.2	105.493	<0.001**
Eat and drink after washing hand with soap	31	23.1	103	76.9	97	72.4	37	27.6	65.145	<0.001**
Use a small wire to remove the blockage	41	30.6	93	69.4	92	68.7	42	31.3	38.823	<0.001**
Wash contaminated clothes in a separate load	9	6.7	125	93.3	129	96.3	5	3.7	215.117	<0.001**
Never use mouth to blow blocked nozzle	37	27.6	97	72.4	132	98.5	2	1.5	144.563	<0.001**
Apply instructions written on the container	27	20.1	107	79.9	101	75.4	33	24.6	81.895	<0.001**
No smoking during pesticides' use	17	12.7	117	87.3	124	92.5	10	7.5	171.348	<0.001**
<b>First aid measures for pesticides use</b>										
Eye irritation	32	23.9	102	76.1	117	87.3	17	12.7	109.204	<0.001**
Burn	7	5.2	127	94.8	91	67.9	43	32.1	113.505	<0.001**
Poisoning	3	2.2	131	97.8	89	66.4	45	33.6	122.414	<0.001**
Fainting	18	13.4	116	86.6	106	79.1	28	20.9	116.229	<0.001**



**Figure 2. Comparison of Farmers health safety practices levels when applying pesticides in pre and post program (n=134)**

Part VI: Association between practice and knowledge levels						
	Farmers health safety practices					
	Unsatisfactory Practice		Satisfactory Practice		Fisher’s exact test	
	n	%	n	%	X <sup>2</sup>	P
Knowledge level						
Poor Knowledge	11	44.0	0	0.0		
Fair Knowledge	14	56.0	33	30.3		
Good Knowledge	0	0.0	76	69.7	69.228	<0.001**

Part VII: Association between socio-demographic and knowledge level								
	Poor Knowledge (n=11)		Fair Knowledge (n=47)		Good Knowledge (n=76)		Chi-Square / Fisher's exact test	
	n	%	n	%	n	%	X <sup>2</sup>	P
<b>Age (Years)</b>								
18< 30	4	36.4	11	23.4	19	25.0		
31 – 45	5	45.5	23	48.9	30	39.5		
46 – 60	2	18.2	9	19.1	16	21.1		
> 61	0	0.0	4	8.5	11	14.5	3.553	0.737
<b>Sex</b>								
Male	10	90.9	39	83.0	60	78.9		
Female	1	9.1	8	17.0	16	21.1	1.034	0.596
<b>Educational Level</b>								
Illiterate	9	81.8	4	8.5	0	0.0		
Basic	2	18.2	21	44.7	30	39.5		
Preparatory	0	0.0	13	27.7	29	38.1		
Secondary /Higher	0	0.0	9	19.1	17	22.4	75.252	<0.001**
<b>Income</b>								
Sufficient	4	36.4	14	29.8	20	26.3		
insufficient	7	63.6	33	70.2	56	73.7	0.550	0.759
<b>Pesticide Training Previously</b>								
Yes	0	0.0	0	0.0	9	11.8		
No	11	100.0	47	100.0	67	88.2	7.363	0.025*
<b>Farming experience Years</b>								
<10	8	72.7	8	17.0	11	14.5		
10 – 20	3	27.3	16	34.0	17	22.4		
20 – 30	0	0.0	10	21.3	20	26.3		
>30	0	0.0	13	27.7	28	36.8	25.488	<0.001**
<b>Total Land Area (Acres)</b>								
< 5	8	72.7	28	59.6	43	56.6		
5 – 10	2	18.2	12	25.5	22	28.9		
> 10	1	9.1	7	14.9	11	14.5	1.115	0.892
<b>Living close To Agricultural Land</b>								
Yes	0	0.0	41	87.2	71	93.4		
No	11	100.0	6	12.8	5	6.6	61.818	<0.001**

<b>Part VIII: Association between socio-demographic and practice level</b>						
	Unsatisfactory Practice (n=25)		Satisfactory Practice (n=109)		Chi – Square / Fisher's exact test	
	n	%	n	%	X <sup>2</sup>	P
<b>Age (Years)</b>						
18< 30	7	28.0	27	24.8		
31 – 45	12	48.0	46	42.2		
46 – 60	5	20.0	22	20.2		
> 61	1	4.0	14	12.8	1.663	0.645
<b>Sex</b>						
Male	21	84.0	88	80.7		
Female	4	16.0	21	19.3	0.143	0.705
<b>Educational Level</b>						
Illiterate	13	52.0	0	0.0		
Basic	7	28.0	46	42.2		
Preparatory	5	20.0	37	33.9		
Secondary /Higher	0	0.0	26	23.9	64.942	<0.001**
<b>Income</b>						
Sufficient	7	28.0	31	28.4		
insufficient	18	72.0	78	71.6	0.002	0.965
<b>Pesticide Training Previously</b>						
Yes	1	4.0	8	7.3		
No	24	96.0	101	92.7	0.362	0.547
<b>Farming experience Years</b>						
<10	7	28.0	20	18.3		
10 – 20	9	36.0	27	24.8		
20 – 30	3	12.0	27	24.8		
>30	6	24.0	35	32.1	3.813	0.282
<b>Total Land Area (Acres)</b>						
< 5	17	68.0	62	56.9		
5 – 10	5	20.0	31	28.4		
> 10	3	12.0	16	14.7	1.069	0.586
<b>Living close To Agricultural Land</b>						
Yes	4	16.0	18	16.5		
No	21	84.0	91	83.5	0.004	0.950

## Discussion

Pesticides are highly hazardous chemicals and may pose a risk to public health and the environment (Abdollahdokht, et al., 2021). Exposure to pesticides can compromise the immune system, trigger hypersensitivity, asthma, and allergies, and negatively impact the nervous system, leading to compromised cognitive function, reduced vision, and issues with memory and coordination (Poudela et al., 2022).

The current study was carried out in a particular village in Kafer El Shik, Egypt, an area beset by several environmental problems, including concerns over the effects of farming methods linked to pesticide use. The current study investigates farmers' self-reported pesticide usage practices and knowledge.

The present study encompassed a sample of one hundred thirty-four farmers, with about thirty of them falling within the age range of 31 to 45. The majority of the farmers were male, and around one-third of them possessed over thirty years of work experience. These findings are consistent with research conducted on 250 farmers in the Lahore division of Punjab, Pakistan, by Shafi, et al., (2023) to assess farmers' knowledge of pesticide usage, hazards, and storage. 97% of the participants were male, and 28% of them were in the 26–45 age range. **From the researchers' point of view, most of the farmers were men because agricultural work was heavy for women.**

Furthermore, according to the results of the current study, the majority of farmers did not have

enough money, and nearly half of them only had a basic education. The current study's findings are consistent with those of a 2019 study on 335 farmers in Egypt by Gaber and Abdel-Latif, which examined farmers' awareness of and practices around the use of pesticides and how they connect to educational attainment and health locus of control. According to the study's findings, 75% of the farmers were deemed impoverished and only 51% of them had completed elementary school. **These results may be due to most of the farmers being busy with farming work and not keen on education.**

Besides, the majority of farmers had not previously received pesticide training. While the majority of them lived close to agricultural land, two-thirds of them had less than five acres. The current study's findings are consistent with a study conducted in Egypt in 2023 by Tolba, which involved 48 gardeners and assessed their attitudes and safety practices regarding pesticides as well as their knowledge and awareness of the risks associated with their use. The study's findings stated that 15.6% of the gardeners had received prior pesticide training, and 43.8% of the gardeners lived close to agricultural land. **From the researchers' point of view, Living near agricultural areas without training for safe pesticide use practices exposes farmers to a high level of pesticide risks and puts them in need of training.**

In terms of health complaints brought on by pesticides, the results of the current study indicated that most farmers experienced skin and eye

irritation, about half experienced vertigo and chest pain, roughly one-quarter experienced nausea and vomiting, and the remaining farmers experienced discomfort and headaches. According to a study conducted in Cameron in 2022 by Achancho, et al on 296 cocoa farmers. This study's findings are in agreement with the findings of the current study that asserts that 76% of the farmers reported experiencing skin rash and eye pain after spraying, which accounts for the highest frequency of signs and symptoms of the various chemicals. The least side effects by farmers were (13%) headache. These symptoms as reported by farmers range from mild to severe cases that may take days for them to stabilize. **This result is due to not using the appropriate necessary precautions when exposed to or using pesticides.**

Additionally, regarding farmers' total knowledge of the health effects of pesticide use and first aid total knowledge, a minority of farmers had a good level of knowledge in the pretest while the majority had a good level of knowledge in the posttest after implementation of the occupational health safety precautions guidelines. The current study's findings are supported by those of Xu (2016), who studied 201 Chinese farmers in the southern province of Anhui to discover farmers' attitudes, behaviors, and level of knowledge on pesticides. The findings showed that the majority of farmers had poor knowledge about pesticides

It is in the same line with the study done by Mohammed, et al., (2018) in Egypt on 322 pesticides users to assess the impact of health education program on the safe use of pesticides for

farmers in a village of El-Minia city. The study's findings demonstrated that the investigated sample's general and first aid knowledge had increased, going from 7.8% and 23.6%, respectively, prior to program implementation to 69.3% and 90.4%, having high levels, following program implementation. **This result shows that the efficacy of the guidelines sessions contributes to farmers' post-program knowledge level development on the health effects of pesticides, which is in tune with the research hypothesis.**

Also, the vast majority of farmers lacked personal protective equipment, mixed pesticides with their bare hands, and stored pesticides in separate rooms. According to the current study, which is in the same field as a study by Shafi, et al., (2023) on 250 farmers, the majority of respondents (96%) did not wear personal protective equipment (PPE) when mixing pesticide solutions, and 94% did not wear PPE when applying pesticides. Additionally, 59% of respondents disposed of any leftover pesticide solution on the ground, and 67% used it for other purposes until it was finished.

Another study done by Sa'ed, et al 2021, in Palestine on 381 farmer workers to assess the knowledge and practices associated with pesticide use in an agricultural community in Palestine, and to determine the prevalence of self-reported health symptoms related to pesticide exposure which confirmed that unsafe behaviors were identified as the storage of pesticide products at home, the preparation of pesticides in the kitchen, inadequate

disposal of empty pesticide containers, eating and drinking during pesticide application, and using inadequate protective clothing. **These results confirm that guidelines have the potential to enhance farmers' understanding of critical precautions related to pesticide use.**

It is evident from the current study results that, following guidelines implementation, the majority of farmers had satisfactory pesticide health and safety practices, up from a minority of them in the pretest. The current results also demonstrated statistical significance ( $P=0.001$ ). It is corroborated by a study conducted in 2016 by Mohsen, Mohamed, and Hafez on 86 vegetable farmers in the Shentena-El-hagar area of Birket El-sab,ei district in the Menoufia governorate of Egypt. The study aimed to evaluate the farmers' self-reported symptoms, knowledge, and practices about the risks associated with pesticide exposure. The study's conclusion showed that only 12.8% of people used safety precautions satisfactorily. Leikei, Ngowi, and London (2014) carried out a study aimed at evaluating the knowledge, behaviors, and injuries of farmers related to pesticide exposure in Tanzanian rural agricultural areas. The study finding reported, "only one-third of farmers reported use of safety measures. **This demonstrated that the guidelines in the current study encourage safe pesticide use practices among farmers. Also supports the research hypothesis.**

Likewise, a positive statistically significant association between farmers' knowledge and practice of using pesticides can be seen by the

current study's findings. It is in keeping with research by Endalew, Gebrehiwot, and Dessie (2020) on 300 Ethiopian floriculturists to identify the knowledge, attitudes, behaviors, and variables related to the precautions taken by floriculturists in Bahirdar City against pesticide exposure. The findings demonstrated a relationship between knowledge, attitudes, and practices.

Also study by Sa'ed, et al 2021, in Palestine on 381 farmer workers to assess the knowledge and practices associated with pesticide use in an agricultural community in Palestine, and to determine the prevalence of self-reported health symptoms related to pesticide exposure. It found a significant positive correlation ( $r = 0.323$ ;  $P<0.001$ ) between the knowledge and safety procedure scores. Contrary to the results of the current study, Yuantar et al.'s (2015) investigation of the knowledge, attitudes, and practices of Indonesian farmers regarding the use of personal protective equipment in order to protect themselves from pesticide exposure revealed no significant correlation between knowledge and actual use of PPE. **From the researchers' point of view, this result highlights the importance of conducting guidelines precautions for raising farmers' knowledge toward pesticides use that will improve their pesticides practices, proper control, and safety precautions for pesticides to create a healthy life and safe environment**

Additionally, the results of the current study suggested that in both the pre-and post-test following guidelines implementation, there was a positive statistically significant relationship

between farmers' knowledge about pesticide use and their level of education, training, experience, and closeness to agricultural land. It is in the same stream as a study by Kumari and Reddy (2013), who evaluated farm workers' knowledge and practices regarding the safe use of pesticides in India, farm workers' educational level has a significant impact on their level of knowledge regarding pesticide safety, and the knowledge of farmworkers in closed farms is more than that of open fields.

Appositive statistically significant relation between farmers' practice regarding pesticide use and level of education ( $P=.001$ ) was the result of the current study. This goes with a study by Kumari and Reddy, (2013) who “assessed knowledge and Practices of safety use of Pesticides among Farm workers in India. They reported that “the practice of farmers influenced by their educational level. **This suggested that educational level is a significant predictor of good knowledge and satisfactory practices.**

#### **Conclusion of the study :**

The results of this study concluded that the total knowledge score of farmers toward the health effects of pesticide use improved after the implementation of the occupational health safety precautions instructions ( $P<0.001$ ). In addition, there was a highly statistically significant improvement in total health safety practices level pre- and post-instructions.

#### **Recommendations of the study:**

Based on the findings of this study, the following recommendations are derived:

- Regular teaching programs are recommended to identify farmers and emphasize the significance of safety precaution guidelines for pesticides use.
- Additional researches are required to increase awareness of pesticides hazards related to storage and usage, as well as protective strategies.
- Occupational Health safety precautions instruction regarding pesticides' use practices must be provided through the Ministry of Agriculture which most of the farmers seem to trust regarding receiving pesticide information and delivering information to all farmers in Egypt.

#### **Limitation of the study:**

-It was hard for the researcher to collect the participants every session to deliver the information about pesticide precaution instructions without the help of the manager of the Egyptian Agricultural Association at El Hamrawy principal village.

- In order to increase accuracy and generalizability, it is recommended that future research replicate this study with a larger sample size. Also, this research should take into account methods for recruiting a larger number of participants.

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