Effect of Educational Program on Prevention of Pesticides Hazards among Children Working in Agriculture

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Abstract

Background: A child's exposure to pesticides is widely acknowledged as a threat to the physical well-being of children and the environment. The research aimed to evaluate the effect of educational programs on the prevention of pesticide hazards among children working in agriculture. Design: Quasi-experimental design (study group only, pre/post/ follow up- test) was used in this study. Setting: This study was conducted at Al Qassasin Al Kadima preparatory school. The study sample: convenient sample (97 Children) selected from preparatory school students working in agriculture. Tools: Tool (1): Children working in agriculture assessment structured interview questionnaire. Tool (2): An observational checklist for children working in agriculture. Results: there was a statistically significant relationship between socio-demographic data of children working in agriculture as gender, hours working per day and their mean scores of knowledge, and practice in post-test and follow-up phases at p<0.001. Also, there was a statistically significant correlation (P=0.041*) between their total mean scores of knowledge and practice throughout the post and follow-up phases. Also, there was a statistically significant correlation between their total mean scores of knowledge and attitude throughout the post phases. Conclusion: Knowledge, attitude, and practice of children working in agriculture about pesticides had shown high improvement as compared to the pre-program test. Recommendation: Organizing workshops and school activities such as drama plays, painting, and games about pesticides and their dangers with each agricultural cycle in schools located in rural areas to raise health awareness among children working in agriculture and their parents.

Keywords: attitude, children working in agriculture, knowledge, pesticides, practice

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1. Introduction

Globally, Pesticides have become an integral part of present-day farming, and play a major role in increasing agricultural productivity. Pesticides are chemical compounds that are used to kill pests, including insects, rodents, fungi, and unwanted plants, which are widely used in agriculture. While pesticides help in increasing crop production, their indiscriminate use adversely affects the environment and human health making it an important concern in public health [1].

Although such health hazards on humans range from short-term (e.g., skin and eye irritation, headaches, dizziness, and nausea) to chronic impacts (e.g., cancer, asthma, and diabetes), their risks are difficult to elucidate due to the involvement of varied factors (e.g., period and level of exposure, type of pesticide (regarding toxicity and persistence), and the environmental characteristics of the affected areas). Hence, the development of eco-friendly pesticide alternatives and Integrated Pest Management (IPM) techniques are desirable to reduce the impacts of pesticides [2].

Interventions based on the health belief model may aim to increase perceived susceptibility to and perceived the seriousness of a health condition by providing education about the prevalence and incidence of disease, personal estimates of risk, and data concerning the results of sickness (e.g., medical, financial, and social consequences). Interventions may also aim to alter the cost-benefit analysis of engaging in a health-promoting behavior (i.e., increasing perceived benefits and decreasing perceived barriers) by providing information about the efficacy of various behaviors to reduce the risk of disease, identifying commonly perceived barriers, and engaging social support or other resources to encourage health-promoting behaviors [3].

Nurses play a crucial role in the quality of care improvement, which provides children with education and
support. At the same time, the nurse can provide health promotion & psychosocial services include assessment, health education, counseling & appropriate referral. At community level prevention, community nurse can apply community activities that include community campaigns, school activities, support organic farming Integrated pest management (IPM) at homes, schools, public buildings, health centers and public parks [4].

The role of community nurses is educating children to adopt safe behaviors when working in agricultural settings can be effective. Children are moldable and still capable of changing behaviors, which becomes more difficult with age. Community nurse teaches children working in agriculture pesticide safety precaution to follow it when transporting, storage, mixing and applying pesticides. Community nurse learns them safety guidelines to deal with pesticide spill, pesticide drift, pesticide fire, and pesticide restricted interval [5].

2. Significance

The agricultural sector represents the highest percentage (77.7 percent) of child laborers in Egypt. Poor rural families consider creating their youngsters add farms, which may increase a household’s income. Agricultural child laborers are exposed to rather dangerous conditions from unsafe transportation to exposure to pests, pesticides and bad weather conditions. The severity of pesticide hazards is much pronounced in third world countries as Egypt. Occupational exposures to these pesticides occur from skin absorption and inhalation, and the toxicity may be attributed to some reasons, including farmers’ poor knowledge about pesticides and their use, less protection against exposures, minimal understanding of the health risks [6].

International Labor Organization (ILO) estimated that 14% of all occupational injuries are due to exposure to pesticides and other agrochemical constituents and 10% of these are fatal. While the World Health Organization (WHO) and the United Nations Environmental (UNE) Program estimated that one to five million cases of pesticide poisoning occur among agricultural workers each year with about 20000 fatalities. The primary reasons for accidental poisoning among agricultural workers include inappropriate use, inadequate knowledge, and awareness about pesticide storage, protective measures [7,8].

3. Aim of the Study

This study aimed to evaluate the effect of educational program on prevention of pesticides hazards among children working in agriculture through:

1. Assess knowledge, attitude, and practice among children working in agriculture regarding pesticide use.
2. Design an educational program to prevent pesticides hazards among children working in agriculture.
3. Implement an educational program to prevent pesticides hazards among children working in agriculture.
4. Evaluate the effect of an educational program to prevent pesticides hazards among children working in agriculture.

3.1. Research Hypotheses

An educational program will cause an improvement in knowledge, attitude and practice among children working in agriculture regarding pesticide use through

- Increasing total scores of knowledge after conducting an educational program than before it.
- Increasing total scores of attitude after conducting an educational program than before it.
- Increasing total scores of practice after conducting an educational program than before it.

4. Subject and Methods

4.1. Research Design

The quasi-experimental design (study group only, pre/posttest) was used in this study.

4.2. Research Setting

This study was conducted at Al Qassasin Al Kadima preparatory school in rural areas in the district and city of Al Qassassin El Jadida. Al Qassassin El Jadida is a city lie in the west of Ismailia on the Suez Canal in Egypt. This school is selected randomly from 5 high capacity schools that were selected randomly from 25 preparatory schools affiliated to Al- Qassassin Educational Administration.

4.3. Subjects

A convenient sample consists of preparatory school students working in agriculture from different educational grade. The study sample was selected based on the following inclusion criteria: parent's consent to the child's participation in the study, the child must be enrolled at the school during the collection of the sample; the child should work in agriculture besides the school. The exclusion criteria: The child misses a lot and is not regular at school.

Sample size: it was 97 students, it determined according to the following equation [9]

Sample size (n) = \( \frac{(Z\alpha)2 \times (S)2}{d2} \)

\( Z = 1.96 \)

\( S = 1.6 \)

\( d = 0.1 \)

\( n = 97 \) students.

4.4. Tools for Data Collection

The First Tool: Children Working in Agriculture Assessment Structured Interview Questionnaire:

An interviewing questionnaire was used to assess the socio-demographic data, knowledge, attitude, and practice of children working in agriculture. This tool was divided into six parts and entitled the following items:

a) Part 1: Socio-demographic and occupational characteristics of children working in agriculture: this part is composed of ten closed-ended questions such as; age, sex, educational grade, family numbers working in agriculture, type of agricultural land, type of plants grown,
duration of using a pesticide, working days per week and working hours per day and paying mechanism.

b) Part II: Knowledge of children working in agriculture regarding pesticide: It is formed of thirteen multiple-choice questions about types of pesticides used, source of pesticide knowledge, route of pesticide entry into the human body, visiting the agricultural association, prohibited pesticides and other alternatives to the pesticide. It was used three times before, immediately after completion of the program and after three months.

Scoring system: this part is categorized as the scores ranged between zero (0) for incorrect answers and one (1) for correct answers. The total scores of all questions categorized into two levels: < 50% inadequate knowledge and ≥ 50% adequate knowledge [10].

c) Part III: Attitude of children working in agriculture regarding pesticide based on the health belief model

This scale was developed by the researcher based on the health belief model (HBM) by reviewing related literature and experts’ opinions to predict behavior.

It is composed of 27 close-ended questions answered with "Agree", "Neutral" "Disagree". These 27 questions about perceptions divided into perceived susceptibility (four questions), perceived severity (seven questions), perceived benefits (three questions), perceived barriers (five questions), cues to action (four questions), and self-efficacy (four questions) [11].

Scoring system: The total scores of all questions categorized into two levels for the Health Belief Model as follow: each positive-direction questions were scored as "Agree" = 3, "Neutral" = 2, "Disagree" = 1 and Negative-direction questions were scored as "Agree" = 1, "Neutral" = 2, "Disagree" = 3.

Positive statement queries contained a press release which can lead children working in agriculture to follow healthy behavior in reducing pesticide exposure (e.g., Q36 “The use of PPE protects against chemical hazards at work”). On the other hand, negative statement questions were aimed at a belief, which may inhibit children working in agriculture to practice healthy behavior in reducing pesticides exposure (e.g., Q39 “Wearing protective personal equipment is uncomfortable”).

The total numbers of positive statements were 13 statements and the total scores of positive statements were 39 degrees, and the total numbers of negative statements were 14 statements and the total scores of negative statements were 42.

d) Part (IV): Assessment of reported-pesticide practice for children working in agriculture: It was composed of twenty four multiple-choice closed-ended questions. It included questions about mixing pesticides, spraying pesticides, storing pesticides, personal hygiene after mixing or spraying and cleaning the tools after mixing or spraying, disposal of pesticides container and pre-harvest period

Scoring system: Measuring the score of children workers’ practice toward agricultural pesticides hazards and safety measures were scored as follows, "Done correctly" = 1 "Done incorrectly" = 0

The total reported-practices scores of all questions categorized into three levels as good practice scores were ≥ 75%, average practice scores were ≤ 50% to less than 75%, and poor practice scores were less than 50% [10].

e) Part (V): Self-reported toxicity symptoms of pesticides among children working in agriculture: it included questions related to five systems as following the nervous system, eyes, respiratory system, dermatological and muscles, gastrointestinal system.

Scoring System: Each item was scored as follows: when children worker reported symptoms of pesticide poisoning = "1" and if no reported symptoms of pesticide poisoning = "0".

f) Part (VI): Reported first aid practice for pesticide poisoning in children working in agriculture: it included questions related to first aid in cases of pesticide enters eyes, spill on clothes or skin, swallowing of pesticides, inhalation of pesticides.

Scoring system: Each item was scored as follows: "Done correctly" =1 when performing first aid and "Done incorrectly" = 0 when not perform first aid.

The second tool: An observational checklist for children working in agriculture: this tool is used to assess children who are working in agriculture for wearing personal protective equipment. It included 5 items such as overall uniform, head cover, eye goggles, gloves, protective apron, safety boots, and a respiratory mask.

Scoring system: Each item was scored "Done" =1 for use of personal protective devices and "Not done" = 0 for don't use of personal protective devices.

Administrative phase

An official letter from the Faculty of Nursing, Suez Canal University was directed to the Directorate of education in the city and station of Al Qassassin El Jadida at Ismailia governorate to seek their Permission for conducting the study. The Directorate of the schools was informed about the aim of the study and the date and time of data collection.

Pilot Study

A pilot study was carried out on 10 children working in agriculture (10%). To test the clarity and applicability of the tools, the pilot study was also used to estimate the time required to complete the questionnaire by each subject. Modifications were done based on the results of the pilot study. Those children’s workers were excluded from the actual study.

The validity of the tools

Tools of data collection were tested for content validity by a panel of five experts from different specialties as Community Nursing, Pediatric Nursing and Administration Nursing form Faculties of Nursing at Cairo University and Suez Canal University. Modifications were done according to the experts’ opinions.

Tools Reliability:

The reliability of the tools was done by using (test and retest) measurement and applied time to be sure the consistency of answers. The reliability was assured utilizing Cronbach's alpha; it indicated that the tool has a reliability of 0.925.

Ethical considerations:

Informed consent was obtained from a participant after explaining the purposes of the study, no harmful methodology used with the participant; they had the right to withdrawal from the study at any time.
4.5. Fieldwork

These phases were carried out in the period from October 2017 to August 2018 through the following phases:

Phase (1): Preparatory Phase:
An extensive review of the current national and international literature related to the research title was done. The tool questionnaire was designed to assess children working in agriculture knowledge, attitude and practice before and after implementation of nursing intervention sessions.

Phase (2): Assessment Phase (Pretest):
In this stage, the researcher assessed the actual educational needs by using pre-constructed tools; the researcher interviewed each children working in agriculture throughout using (Tool I, Tool II), at schools that were visited twice days/week at Monday from 8 am to 1 pm and Tuesday from 8 am to 11 am every week. Also, the suitable days to make farm observations were Friday, Sunday every week, and public holidays. This phase was conducted by the researcher during the period from the beginning of October 2017 to the end of November 2017.

Phase (3): Planning phase:
The researcher developed the educational program using the baseline information gathered in the assessment phase and the application of the main Health Belief Model. The educational program included materials to improve children’ knowledge regarding the definition of agricultural pesticide, types, training on applying personal protective equipment (PPE) during pesticide mixing and application, the definition of pesticide poisoning, it’s signs and symptom), first aides for pesticide poisoning, pesticides impact on human and environmental health.

Phase (4): Program Implementation
The educational program was carried out in the Al Qassasin Al Kadima preparatory school. The subjects were divided into small groups (10 groups), 9 groups contained 10 children workers and 1 group contained 7 children workers. The program was conducted through eight sessions; each group obtained the eight sessions through 8 weeks (1 session/week), each session took about 40 minutes. The total allocated time for achieving program objectives for the ten groups was 80 hours (10 groups’ × 8 hours). Each session started with a summary of the previous session and objectives of the new session, using a very simple language that suits the level of students’ workers without ignoring motivation and reinforcement techniques. Students' workers were allowed to ask any interpretation, elaboration or explanation of any item included in the sessions. The duration of program implementation was five months (at the beginning of December 2017 to the end of April 2018).

Phase (5): Evaluation (Post-test)
After implementation of the program, post-test was done to evaluate the effect of the educational program sessions; the post-test was done immediately at the end of April 2018 by end of the educational program sessions implementation using the same tools which were used in the pretest, then the follow-up test was done when planting summer crops and sprayed with pesticides at the end of July and August 2018.

4.6. Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent Quantitative data were described using range (minimum and maximum), mean, and standard deviation. The significance of the obtained results was judged at the 5% level. The used tests were

1. ANOVA with repeated measures: For normally distributed quantitative variables, to compare between more than two periods or stages
2. Friedman test: For abnormally distributed quantitative variables, to compare between more than two periods or stages.

5. Results

Table 1: shows that the age of the studied group ranged from 13- 15 years with a mean age 13.93± 0.83 and number of a family member working in agriculture range from 1-8 with a mean 3.34±1.59.

Figure 1: illustrates that 62.9% of children working in agriculture were males, wherever 37.1%. of them were females.

Figure 2: presents that 37.1% of children working in agriculture were in the first preparatory and 33% in the second preparatory.

Table 2: represents that the open land was 75.3% of agricultural land and the vegetables and crops were the most frequent types of plants grown. Also, 61.9% of children worked in the farm for less than two days and lower than 5 hours, but 45.4% of them have used pesticides for more than 5years, and 77.3% of them worked in the family farm without money.

Figure 3: clarifies that 59.8% of children working in agriculture had adequate knowledge but, 40.2%, of them, had inadequate knowledge in the posttest phase. Also, in the follow-up phase, 55.7% % of children working in agriculture had adequate knowledge but, 44.3% of them had inadequate knowledge.

Figure 4: reveals that total mean scores relating to the studied group's perceived susceptibility domain were 6.76% in the pre-test phase compared to 10.68% and 10.41% in the post-test phase and follow-up phase respectively. For the perceived severity domain, the total mean score throughout pre, post, and follow-up phases of the educational program, they were in the following ratios 12.29%, 18.32%, and 19.11% respectively. Concerning to perceived benefit domain, the highest score of 8.15% was in the immediate posttest compared to 5.12% in the pre-test phase and 8.10% in the follow-up phase. Also perceived barrier domain; it was 8.64% in the pre-test phase compared to 13.85% and 13.53% in the post-test phase and follow-up phase respectively. Moreover, cues to action domain were 7.21% in the pre-test phase compared to 10.81% and 10.56% in the post-test phase and follow-
up phase respectively and the self-efficacy domain was 6.18% in the pretest phase compared to 10.76% and 10.44% in post-test phase and follow-up phase respectively.

Figure 5: represents that the mean practice changed in posttest for mixing pesticides practice equally (4.41%), spraying pesticides equally (4.56%), break time equally (1.67%), personal hygiene equally (2.77%), cleaning the tools (2.72%), disposal pesticides (1.22%), pre-harvest period (0.6%), when compared to pre-test. But the score of storing pesticides not changed in posttest or follow-up when compared to the pre-test.

Figure 6: clarifies that the mean of self-report toxicity symptoms changed in post and follow up phases as nervous symptoms, eyes, respiratory system, skin & muscles, and gastrointestinal system were the toxicity decline to (0.51), (0.41), (0.21), (0.32), (0.22) respectively in posttest phase and follow up phase. According to overall toxicity symptom, the percentage slightly change in the follow-up test (2.49) when compared with immediate post-test (2.91).

Figure 7: displays the mean of first aids’ practice of studied cases in cases of poisoning with pesticides after implementation of tutorial program reach to (5.57), and the follow-up phase (4.49) when compared to pre-program test (1.42).

Figure 8: shows that the mean of using personal protective equipment after implementation of the program changed in the posttest (5.32) and the percentage in the follow-up test (5.09) when compared with pre-test (2.96).

Table 3: reveals that there was a statistically significant correlation (p = 0.041*) between total knowledge and practice of the studied group throughout the post and follow-up phases of the educational program. Also, there was a statistically significant correlation between the total knowledge and attitude of the studied group throughout the post phases of the educational program. Moreover, there was no statistically significant correlation (P = 0.127) between total practice and attitude of the studied group throughout all phases of the educational program.
Figure 4. The total mean scores of attitude about pesticides hazards and safety procedures using the health belief model through pre, post, and follow up phases (n = 97)

Figure 5. The mean scores of their reported-practice about the applications of pesticides through pre, post, and follow up phases (n=97).

Figure 6. Mean scores of self-report toxicity symptoms through pre, post, and follow up phases (n=97)
6. Discussion

According to the socio-demographic characteristics of the current study, the sample indicates that the age of the children working in agriculture ranged from 13-15 years. Also, almost all children working in agriculture were males. This result is consistent with a study conducted by [12] in Turkey titled "knowledge level, attitude, and behaviors of farmers in Çukurova Region regarding the Use of Pesticides". They found that a sample embrace 420 seasonal agricultural farmers and a majority of farmers’ children who applying pesticides were males and their ages ranged between 9 and 15 years and 16 and 19 years.

From the researcher's point of view, the age of working children in agriculture is one of the social and economic factors that affect their level of awareness. The young farmer has limited experience and is less familiar with banned pesticides and their health risks to human health and the environment.

On the topic of working hours, the present study showed that approximately two-thirds of children worked in the farm for less than two days per week and lower than 5 hours per day, but regarding year of experience, about nearly half of them were used pesticides for more than 5 years, and more than three quarters of them worked in family farm without pay.

These findings are in contrast with the results of the study titled "Interaction between paraoxonase1 polymorphism and prenatal pesticide exposure on metabolic markers in children using a multiplex approach in Thailand" by [13] whose findings revealed that farmers and their children usually worked in the field for about 8-10 hours a day, with pesticide applications for 3-8 days each month during the growing season. These indicate a high potential risk of pesticide exposure among farmers and their children farmworkers, while the poison risk in males was greater than female.

This findings may be interpreted as children are increasingly exposed to and treated with pesticides may be due to most of the children were working in agriculture lived in rural areas and their parents own agricultural land and the main occupation of their parents is agriculture. Some other children worked for wages on farmland for other people to earn money to spend on their education and help their families with living expenses.

Regarding types of fields of agriculture, the present study indicated that three-quarters of children working and using pesticides in the open agriculture field. Also, the most frequent types of plants grown in these fields were vegetables and crops. In the same context, [14] in their research titled "Proximity to agricultural fields as a proxy for environmental exposure to pesticides among children:
The birth cohort in the Netherlands reported that the most frequent crops were corn, cereals, and potatoes. Also, a small proportion of participants lived close to agricultural open fields with crops relevant to pesticide use.

On the contrary, a study about "Pesticide handling practices, health risks, and determinants of safety behavior among Iranian apple farmers in Ardabil Province, Iran" done by [15] who found that nearly one-third participant was using pesticides in open fields, almost three quarter in closed fields and one of the most famous types of plantings are fruits such as apples.

About researcher point of view, the factors that affect the cultivation and selection of a particular type of plants: climatic conditions and soil type and the availability of water for agriculture and also according to the instructions of the Agricultural Association of farmers during the agricultural cycle, where these factors change from agricultural land to another.

According to the total score of knowledge of the current study results, nearly two-thirds of children working in agriculture and more than half of them had adequate knowledge in the posttest phase and the follow-up phase respectively. But, less than half of children working in agriculture had inadequate knowledge in the posttest and follow-up by equally than before in the pretest.

This could be explained due to the lack of formal training or participation in educational programs on pesticides and this lack of knowledge adversely affects farmers' and their children's quality of life as well as occupational health and safety. Also, it highlights the importance of providing training on knowledge about pesticides for children working in agriculture. So, appropriate coaching programs ought to be organized to extend their level of information.

In the same respect, a study was done by [16] about "market incentive, government regulation and the behavior of pesticide application of vegetable farmers in China" clarified that most trained farmers had higher levels of knowledge of pesticide use than non-trained farmers. While [17] in their research about "exposure to pyrethroid pesticides and the risk of childhood brain tumors in East China" observed that only one-quarter of children working in agriculture had inadequate knowledge in the posttest and follow-up by equally than before in the pretest.

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that pesticides were commonly applied during day time, but very few paid attention to the wind direction during pesticide application.

In contrast to these findings, [18] who performed a study about "cognitive impairment in agricultural workers and nearby residents exposed to pesticides in the Coquimbo Region of Chile" reported that almost of farmers used the available home utensils such as spoon, cup, or jar, while half of them used their hands to roughly estimate the dosage and mix pesticides. It was an irony that only one percent of farmers followed the standard rule for dose calculation.

This finding can be interpreted as, the failure of farmers and their children working in agriculture to the direction of the wind creates problems such as the lack of concentration of spraying on the target crop, and inhalation of bad smells of pesticides, which causes difficulty in breathing and may reach suffocation and poisoning from inhalation of the pesticide. They are not aware of safety precautions against pesticide poisoning and the appropriate use of pesticides to promote health and prevent environmental hazards.

Concerning the storage of pesticides, the results of the current study showed that almost three-quarters of children working in agriculture stated that they store pesticides and more than one-third of them stored pesticides in the home and special store, nearly one quarter stored in the farm, and the majority mix pesticides by the farm. On the same respect, a study of [24] about "a task-based assessment of parental occupational exposure to pesticides and childhood acute lymphoblastic leukemia in California, USA" stated that more than three-quarters of the farmer quantified that they kept pesticide in the general storeroom at the house.

These results don’t agree with a finding of [25] in their research about "longitudinal assessment of occupational determinants of chlorpyrifos exposure in adolescent pesticide workers in Egypt". They stated that almost all the respondents store partly-used portions of pesticides in their bedrooms, usually occupied by all the members (including children) of the relatively large households.

The results of the survey different from the results of the current study due to strawberry and chrysanthemum farmers try to minimize storage by only purchasing the number of pesticides that are needed for the application, which is a good solution for reducing the dangers of pesticides. But for the current study, children were unaware that transporting and storing chemical containers together with the food zone unit is extremely dangerous and causes contamination of food, poisoning, and collective effects.

Concerning occupational hygiene and safety period, the results of the current study whitened that there was an improvement in the studied group practices after giving them a tutorial when compared before giving the program. The most prominent improvement in the immediate post-test was in their practice as the majority takes a shower immediately after mixing or spraying, and moves the sprayer (spray device) to a suitable area for washing. Also, more than half committed to the pre-harvest period "the period between the last spraying and harvesting".

These results were matching with [26] in their survey about "Dicamba and 2,4-D residues following applicator cleanout: a potential point source to the environment and worker exposure as conducted by 46 volunteer operators across Colorado". They clarified that only about more than one-third of the farmers and their children take a shower after use and more than half changed their clothes after pesticide application work. The majority of them have washed their sprayers after every use. But still, more than one-third of them did not wash the sprayer after use.

From the researcher’s point of view, children working in agriculture are not well aware that bathing after mixing or spraying pesticides protects their bodies from the side effects of pesticides on the skin, and they are not aware that washing the spray machine and tools prevents clogging from the remaining dry pesticides that cause a malfunction of the machine.

Regarding rid of an empty container of pesticide, the current study found that there were statistically significant improvements regarding practice methods of rid of empty pesticide containers (bottles or cans) in the post and follow up compared to pre-implementation of the program. Almost one quarter burn empty container in the open air or hand over to the agricultural association. While almost two-third whole and buried empty containers in the land not suitable for agriculture.

On the same line, a study of [27] about "pesticide poisoning in Chitwan, Nepal: a descriptive epidemiological study" stated that observed final disposal of the empty containers represents a potential risk for the environment; these unsafe practices (disposal in the field, burning in open fires or burying) are reported as a major problem. Also, a study conducted by [28] about "the importance of personal protective equipment in pesticide applications in agriculture" found that almost one-third of the farmers’ children buried empty pesticide packages in the ground, nearly one-quarter of them burned them, one-quarter of them left them on the field, more than ten percent of them threw them away, and a few numbers of them washed and reused them.

This could be explained by children working in agriculture with their parents gained bad experience from them in dealing with empty pesticide containers and disposing of by throwing them on the side of the road or using them to feed and drink animals and others. They don’t know the right methods of rid of empty pesticide containers due to little experience. They do not know that safely disposed of and recycled empty preserves the soil, fish, birds, and atmosphere.

According to personal protective equipment, the pretest of the current study showed that almost half of children wear overall, gloves, brimmed hat, nearly two-third wear a protective boot and respirator/face mask, around one-quarter wear glasses/goggles. This percentage improved in the posttest and this improvement declined slightly in the follow-up test compared with the immediate post-test.

These results are consistent with a study of [29] titled "the chemistry component of agricultural pesticide regulatory technology in Canada". They determined that two-third of the farmers and their children wore long-sleeved shirts, almost two-thirds of them wore long trousers and wore glasses, half of them wore gloves, nearly one-third of them used masks, one-quarter of them used hats, few numbers of them wore overalls, boots, and aprons.
The findings of this study are contrary to a survey of [30] about "understanding farmers' safety behavior towards pesticide exposure and other occupational risks: The case of Zanjan, Iran", a survey of 301 tomato farmers of Zanjan Province of Iran. They indicated that most farmers showed potentially unsafe behavior for PPE use. "Hat and boots were the foremost unexpectedly used protective things. However, most of the farmers surveyed confirmed low frequency of use for gloves, goggles, face mask, overalls, and respirator. Especially the respirator was reported to be the least used PPE item amongst farmers."

In the opinion of the researcher, the age of children working in agriculture and their farming expertise negatively affected PPE use and safety behavior, namely young and not experienced farmers and their children did not follow safety rules. "They did not use the face masks because they do not feel comfortable while wearing them as it causes profuse sweat and difficulty breathing, and also reduces the wearing of gloves and footwear to feel unable to move easily and work faster, when ignoring the safety instructions increases the risk for pesticide poisoning."

Regarding self-reported toxicity symptoms associated with pesticide use, the current pretest results found that more than half of children working in agriculture experience of headache, dizziness, excessive sweat, skin rash. "More than one third experience salivation, excessive urination, abdominal pain, fever, more than two-thirds had a burning sensation in eyes/face. The most prominent improvement in symptoms of posttest when compared to pre-phase, but this improvement declined slightly in the follow-up test compared with immediate post-test, whereas some symptoms slightly increase in the follow-up phase as an example one quarter had increased secretion of tears and breathlessness. Moreover, nearly half of children working in agriculture go to the hospital when experience toxicity symptoms."

Corresponding with the current results, research of [31] about "use of personal protective equipment towards pesticide exposure: Farmers' attitudes and determinants of behavior in Mohgan Plain region in Iran". They showed that nearly half had a skin rash, headache, almost one quarter had excessive sweating and diarrhea. Also, there is a high significant negative correlation (r = −0.78; p < 0.001) between self-reported toxicity symptoms and practice scores for protective measures.

Moreover, a study conducted by [32] about the "relationship between LINE-1 methylation pattern and pesticide exposure in urban sprayers in Nayarit, Mexico" and the study population consisted of 190 individuals. They stated that a few numbers of the farmers and their children’s workers had headaches, dizziness, vomiting, respiratory distress, nausea, and abdominal pain, diarrhea, fever, skin pruritus, and eye burning. The high incidence of adverse symptoms (intoxication) such as dizziness, vomiting, and skin problems have been reported after pesticide use.

From the researcher's point of view, the symptoms of poisoning increase as a result of direct contact with pesticides during storage, handling, mixing and spraying or as a result of food or consumer goods contaminated with the pesticide or lack of personal protective equipment. Also, other factors such as hot climate and prolonged exposure to sunlight may increase the severity of the toxicity symptoms of children working in agriculture. They are less aware, less educated, and less experienced by the seriousness of the toxicity of these pesticides on their bodies.

Regarding first aid, the current study indicated that studied children practice done correctly in the immediate post-test as that more than two-thirds of children drink water, milk or activated charcoal in case of swallowed pesticides, and wash skin with running water when pesticide spill on clothes or skin. Also, more than three-quarters wash eyes with running water when pesticide enters the eyes and distance from the source of the pesticides when inhales pesticide (through the nose) by equally; this continued during the follow-up phase, but unfortunately, there was a slight decline in the values of follow up phase than immediate post-program. On the same line, a study of [33] about "the effectiveness and cost-effectiveness of first aid interventions for burns given to caregivers of children: a systematic review in UK" showed that the first aid standards as recommended by the British Burns Association are to cool the skin’s burn by pesticides under cold running water for 20min, remove clothing and jewelry, call emergency services or doctor for advice and cover the skin’s burn with cling film or a sterile, non-fluffy dressing or cloth and ensure the patients kept warm. The studies included advice to discourage the use of inappropriate potentially harmful remedies.

On the contrary, in the research of [34] about "acute poisonings at a regional referral hospital in Western Kenya" clarified that sampled studied often used raw eggs or porridge to induce vomiting after exposure to these agents. This leads to aspiration pneumonia, which further complicated the management of the cases. Likewise, a study of [35] about "patterns and outcome of acute poisoning among children in rural Sri Lanka" reported that coconut milk as a first-aid measure to induce emesis following poisoning and it likely indicates better education and awareness among current generations as compared to previous generations.

This findings could be clarified by the number of reported cases of pesticide poisoning is usually increased during the growing season of many crops, especially rice in the rainy season between May and August each year. It was found primarily in farmers and their children working in agriculture and people who do not follow the instructions for spraying pesticides and do not wear PPE. The present study showed that there was a statistically significant correlation (p = 0.041*) between the total knowledge and practice of the studied group throughout the post and follow-up phases of the educational program. Also, there was a statistically significant correlation between the total knowledge and attitude of the studied group throughout the post phases of the educational program. Moreover, there was no statistically significant correlation (P = 0.127) between total practice and attitude of the studied group throughout all phases of the educational program.

This finding can be clarified as the knowledge may be seen as power by these farmworkers. Farmworkers who know what behaviors will keep them safe from pesticides feel they have greater control over pesticide exposure. More important, farmworkers who feel they have greater
control are more likely to report that they behave in a manner that reduces their risks of pesticide exposure.

On the contrary, [36] in their research about "assessment of genotoxicity in female agricultural workers exposed to pesticides" and the sample included 106 female agricultural workers employed in cotton fields from India. They processed that there's a powerful important indirect correlation among self-reported toxicity symptoms and practice scores for protective measures. Moreover, research [37] indicated that there is a strong significant negative correlation between self-reported toxicity symptoms and practice scores for protective measures.

In the opinion of the researcher, knowledge, and attitudes alone are not enough to change the behavior of farmers to work healthy and safe. The gap between knowledge and practice should be bridged by appropriate training or education on the correct use of pesticides to ensure that children working in agriculture understand the health risks of pesticides, use the means of protection properly, follow hygiene measures, adopt proper working practices, and recognize early symptoms of overexposure for pesticides, get first aid as soon as possible. Thus, appropriate training is needed not to enhance knowledge but to motivate agricultural workers to at least practice known safety measures.

7. Conclusion

On the light of the main study results and answers on the research hypothesis, the study was concluded that:

Concerning, Knowledge of children working in agriculture about pesticide present the two tests post and follow up had shown higher improvement compared to the pre-program test. Regarding, the attitude of children working in agriculture on pesticide hazards and safety procedures using the belief health the two tests post and follow up had shown higher improvement compared to the preprogram test. Concerning, the practice of children working in agriculture about the application of pesticide the two tests post and follow up had shown higher improvement compared to the preprogram test.

There was a statistically significant relationship between socio-demographic data as gender, hours working per day of children working of agriculture and their knowledge, practice score in the post-test phase and follow-up phase at p<0.001. Also, there was a statistically significant correlation (p=0.041*) between total knowledge and practice of the studied group throughout the post and follow up phases of the educational program. Also, there was a statistically significant correlation between the total knowledge and attitude of the studied group throughout the post phases of the educational program. Moreover, there was no statistically significant correlation (P= 0.127) between total practice and attitude of the studied group throughout all phases of the educational program.

8. Recommendations

Regarding the results of the present study, the following recommendations can be suggested:

○ Periodical checkup or screening tests should be done by the school nurses for children who were working in agriculture with every agricultural cycle.
○ Distribute educational booklets about prevention from pesticide hazards for preparatory school students who work in agriculture.
○ Replication of the program in other schools to improve the students’ knowledge, attitude, and practices regarding pesticide hazards.
○ Organizing workshops and school activities such as drama plays, painting, and games about pesticides and their dangers with each agricultural cycle in schools located in rural areas to raise health awareness among children working in agriculture and their parents.
○ Ensure availability of library books and handouts that containing all necessary information and procedures about pesticides and its hazards on humans and the environment in preparatory schools.
○ Dissemination of information about pesticides through mass media, posters, and leaflets for children working in agriculture in preparatory schools.

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