Adolescents Agriculture Workers' Knowledge and Practices about Pesticides Hazardous

Amany Samir Mahmoud [(1)], Seham Guirguis Ragheb [(2)], Mona Abo Bakar Abd Ellatif [(3)]

1. M.S.N., Community Health Nursing, Faculty of Nursing Ain Shams University.
2. Professor of Family &Community Health Nursing Faculty of Nursing Ain Shams University.
3. Assistant Professor of Family &Community Health Nursing Faculty of Nursing Ain Shams University.

Abstract

Background: Pesticides have become an integral part of present day farming, and play a major role in increasing agricultural productivity. However, the indiscriminate and extensive use of pesticides represents one of the major environmental and public health problems faced by adolescents' workers all over the world. **The aim of this study:** Assess the adolescents' agriculture workers' knowledge and practices about pesticides hazardous. **Study Design:** A descriptive research design was utilized to fulfill the aim of this study. **Setting:** The study was conducted at 2 governmental preparatory schools in the rural of Fayoum governorate. **Subjects:** A purposive sample consisted of 163 preparatory school students**. Tools:** Tool was used for data collection to assess the adolescents' agriculture workers' knowledge and practices related of pesticides handling. **Results:** The study results showed that, 81.0% of adolescent students were their age range from 13-15 years and 56.4% of students were females. 63.2% of adolescent students had unsatisfactory knowledge, while 63.8% of them had inadequate pesticides handling practices. **Conclusion:** There was a positive correlation between total knowledge and total practices among studied adolescents regarding to pesticides handling with r=.166 and with p value > 0.001. **Recommendation:** Further research need to be conducted with a wide scale and in another high density schools, as first aid program for students who working in agriculture to assess the effectiveness of intervention associated with changes in health behavior outcomes and generalize the results.

Keywords: Adolescent, Pesticide, Agriculture, hazardous

INTRODUCTION

Adolescent health encompasses changing transitions within multiple domains, including the physical, social, emotional, cognitive, and intellectual. The fast-paced development of these different domains can lead to phenomenal growth during this period. International organizations such as: World Health Organization (WHO) and United Nations (UN) refer to the period between adolescent hood and adulthood as early adolescent (the ages of 10-19), youth (15-24) years) **(Axxe et al., 2022).**

Agriculture is in the top three most hazardous sectors of work and has the highest percentage of all hazardous adolescent labor. Some of the most common risks for children and adolescents working in agriculture include handling pesticides and fertilizers. Pesticides are widely used in the agricultural sector to increase production through cutting costs and improving the quality of produce. However, these chemicals come with serious health effects when an individual is exposed to large quantities at once or low quantities over time. In addition to this, safe pesticide handling is not strictly enforced, most especially in developing countries **(*Malanski et al., 2021).***

These health effects may be exacerbated by lack of information on pesticide hazards the perception and attitude of farmers regarding risk from pesticide exposure, and to lack of education and poor knowledge and understanding of safe practices in pesticide use, including storage, handling and disposal. Higher levels of education give pesticide users better access to information and more knowledge of the risks associated with pesticides, and how to avoid exposure. While less educated farmers may be hampered in their ability to understand

the hazard warnings on pesticide labels, how to avoid exposure, and how to follow recommended safety and application guidelines (**Khan et al, 2023).**

Illiteracy and lack of knowledge on the extent to which pesticides represent a hazard have been considered the most important barriers for the adoption of self-protective behaviors by farmers, in particular the use of personal protective equipment (PPE). Due to the potential health effects of pesticides, most countries, have developed laws and regulations to encourage safe pesticide use (**Rajak et al., 2023).**

School health nurse should ensure every adolescent who use pesticides must be competent and have received adequate guidance, instruction or training for their correct use. Manufactures of agriculture equipment and agriculture chemicals should be encouraged to apply existing technologies and invest research funds in the development of new technologies to decrease the number of agriculture injuries and poisoning **(Yawson, 2022).**

Significance of the study

The agricultural sector represents the highest percentage (77.7 percent) of adolescent laborers in Egypt. Approximately 1.6 million adolescents between the ages of 12-17 years old are working in Egypt and most working adolescent are in rural areas, they face a high risk of exposure to pesticides in everyday life and sometimes use pesticides themselves. Adolescents agriculture workers 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 **(Fathy et al., 2020) (Khan et al., 2023).**

AIM OF THE STUDY

This study aimed to assess the adolescents' agriculture workers' knowledge and practices about pesticides hazardous, **through:**

1- Assessing the adolescents' agriculture workers' knowledge about pesticides.

2- Assessing the adolescents' agriculture workers' practices related handling of pesticides.

3- Detecting protective devices using in handling pesticides.

Research Questions:

- What are adolescents' agriculture workers' knowledge about pesticides?
- What are adolescents' agriculture workers' practices related handling of pesticides?
- Is there relation between adolescents' agriculture workers' knowledge and their practice about handling pesticides?

Subjects and Methods

I- Technical Design:

Technical Design for this study included a description of the research design.

Research setting:

The study was conducted at 2 governmental preparatory schools in the rural of Fayoum governorate, because these schools have a high density and are located in an agricultural area, and the majority of students work in the agriculture field.

Sampling:

A purposive sample was used in this study within the following inclusive criteria:

- Parent's consent to the adolescent's participation in the study.
- The adolescent must be enrolled at the school during the collection of the sample.
- The adolescent should work in agriculture besides the school.

The sample size was composed of 163 students who working in agriculture, and the sample size was calculated by using the sample size equation

$$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES} \right)^2$$

Tools for data collection:

Two tools of this study were designed after reading related literature and taking experts' opinions, it was written in Arabic language.

Adolescents' Agriculture Workers Assessment Structured Interviewing Questionnaire: Developed by the researcher after reviewing the relevant literature to collect the data required and it will be written in Arabic language and will be refilled by the researcher, it consist of four parts and entitled the following items:

- ✓ **Part I:** Socio-demographic and occupational characteristics of adolescents' agriculture workers this part will compose of close-ended questions such as; age, sex, educational grade, family numbers working in agriculture, type of agricultural land, duration of using a pesticide, working days per week and working hours per day.
- ✓ **Part II**: Assessing knowledge of adolescents' agriculture workers regarding pesticide: It will form of 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. **(Norkaew et al., 2010).**

- ✓ **Scoring system for adolescent's knowledge:**
- ✓ It will be categorized as the scores ranged between zero (0) for incorrect answers, (1) for incomplete answers and (2) for correct answers. The total scores of all questions will be categorized into three levels: unsatisfactory <50%, neutral 50% to less than 75% and satisfactory ≥ 75%**.**
- ✓ **Part (III):** Assessment of reported-pesticides practices for adolescents' agriculture workers. It will include 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 (**Norkaew et al., 2010).**
- ✓ **Scoring system of practices for adolescent's agriculture workers:**
- ✓ Measuring the score adolescent's worker practices toward agriculture pesticides hazardous were scored as follows, "Done correctly"=1 "Not done" =0.
- ✓ The total practices score of all questions categorized into two levels as adequate practices ≥60% and inadequate practices < 60%.
- ✓ **Part (IV):** Assessment of reported using for personal protective equipment (PPE) such as (overall uniform, eye google, gloves, safety boots and respiratory mask) **(Suratman et al., 2016).**

- ✓ **Scoring system:**
- ✓ Each item was scored " Compliance "=1 for use of personal protective devices and " Non Compliance " =0 for not use of personal protective devices.
- ✓ The total score of all (PPE) questions categorized into two levels as compliance practices ≥60% and non-compliance practices < 60%.

II- Operational Design:

The Operational design included the preparatory phase, validity, reliability, ethical consideration, pilot study, and fieldwork.

Preparatory phase

An extensive review of recent, current, national and international related literature in various aspects of the problems was done to design the study tools and to be acquainted with various aspects of the problems.

Content validity:

To achieve the criteria of trust worthiness of the tool of data collection in this study. Tools of data collection were tested for content validity by five expert's professors of community health nursing in Ain-Shams and Fayoum university for clarity, relevance, comprehensiveness, simplicity, and applicability.

Reliability of tool:

The developed tool was tested for reliability on all of each part. The reliability process was assessed by measuring their internal consistency by using the Cronbach alpha coefficients. it was including the following:

Items	Cronbach's alpha coefficients
Reliability for knowledge	0.714
Reliability for mixing pesticide practices	0.801
Reliability for spraying pesticide practices	0.844.
Reliability for general practices	0.772
Reliability for total practices	0.757

Pilot study:

The pilot study was carried out on 10% of the study subjects (16 adolescents) working in agriculture who were selected randomly, to test applicability of the tools and determine time needed to collect data. Based on pilot study findings no modifications were made. Pilot sample was included in the study sample.

Field Work:

The actual process of data collection was carried out in three months consequently the period from the beginning of October 2023 to the end of December 20223. Data was collected from the students during free time in school day in the social worker's room, library, garden or any other suitable place. Schools visited 2days\ week, these days was Tuesday from 8 am to 1pm and Wednesday from 8 am to 11am every week, and the time needed to fill out the tool was 30 minutes for every student. The researcher introduced herself to the students and also explained the aim of the study to all of them. Confidentiality for all collected information was strictly assured.

III- Administration Design:

A written letter should be issued from the faculty of nursing Ain Shams University. Approval should be obtained from the selected schools administration.

Ethical Considerations:

Ethical approval was obtained from the scientific ethical committee, Faculty of Nursing, - Ain Shams University, after submitting a proposal for the research and examining all papers by the concerned committee. Then the purpose and nature of the study were explained to the participants and formal consent were taken and informed that each study subject is free to withdraw at any time through the study without giving any reasons.

Ethical code : 25.02.542

IV- Statistical Design:

Data collected from the studied sample was analyzed and tabulated using the Statistical Package for Social Science (SPSS) version 20. Qualitative data was presented as numbers and percentages. The statistical tests used the chi-square test, means, slandered deviation, and Correlation test which showed good internal consistency construct validity.

Results

Table (1): Shows that, 81.0% of adolescent students were their age from 13-15 years with Mean ± SD = 13.43±1.12**.** Also 56.4% of students were females, followed by 38.6% of them in first preparatory, and 46% worked in field more than three days weekly. The same table shows that 69.3% of adolescent worked less than 5 hours daily and 43.0 % had experience more than 5 years. Also illustrates that 83.4% of adolescents worked without pay or in family farm, while 10.4% of them received daily wage.

Table 2: Explains that, there was 6.1% of adolescent's students had correct answer about the agriculture pesticides definition. As well as there were only 2.5% of adolescent's students had correct answer about classification of agriculture pesticides and no one of adolescents has correct knowledge about internationally prohibited pesticides. In addition, 79.8% of them correctly answered about dangers of pesticides on human health.

Figure 1: Proves that, 63.2% of adolescent students had unsatisfactory level of knowledge about prevention of pesticides hazardous, 9.8% of them had satisfactory level of knowledge and 27% of adolescents had neutral level of knowledge**.**

Figure (2): Explains that there was only 4.9% of studied adolescents were used puncture and bury empty containers in fallow land as a method to dispose empty pesticide containers, and 74.2 % of them threw empty containers next to the field, street or canal. As well as there were 20.9% of

adolescents were reused empty pesticide containers in the storage of other pesticides.

Figure (3): Shows that, adequate practices of adolescents regarding to pesticides handling was 36.2%, while inadequate practices of them was 63.8%.

Table (3) Displays that, 39.3% of the total sample were worn mask during pesticide spraying, while 61.3% of adolescent students did not wear boot when working in the field. As well as 47.9% of adolescent were worn gloves and 24.5% of them were worn hat.

Table (4): Proves that, there was a highly statistical significant relation between total knowledge and total practices of adolescent students regarding to pesticides handling with **X^2=30.29** and with p value **≤0.001**.

Table (5): Proves that there was positive correlation between total knowledge and total practices among studied adolescents regarding to pesticides handling with r=.166 and p value .034*

Table (1): Distribution of studied students regarding their demographic characteristics (n=163).

Demographic characteristics	No	%
Age/ years		
11-<13	31	19.0%
↑13-15	132	81.0%
Mean ±SD	**13.43±1.12**	
Gender		
Male	71	43.6
Female	92	56.4
Grade		
First Preparatory	63	38.6
Second Preparatory	50	30.7
Third Preparatory	50	30.7
Family members working in Agriculture Field		
1:3	79	48.5
4:6 and more	84	51.5
Days in field\weeks		
less than 2 days	56	34.4
2-3 days	32	19.6
More than 3 days	75	46.0
Hours worked per day		
less than 5 hours	113	69.3
5-10 hours	38	23.3
More than 10 hours	12	7.4
Experience years in Agriculture Field		
Less than 2 Years	69	42.3
2-5 Years	24	14.7
More than 5 Years	70	43.0
Wages		
Daily	17	10.4
Weekly	10	6.2
Monthly	0	0
Without pay or family farm	136	83.4

Table (2): Distribution of studied adolescents regarding their knowledge about pesticide (n=163).

Items	Correct		Incomplete		Incorrect	
	No	%	No	%	No	%
Pesticides agriculture meaning	10	6.1	27	16.6	126	77.3
* Names of agriculture pesticides	88	54.0	0	0.0	75	46.0
Classification of agriculture pesticides	4	2.5	14	8.6	145	89.0
Commonly used pesticides in Egypt	0	0.0	0	0.0	163	100.0
Internationally prohibited pesticides	0	0.0	2	1.2	161	98.8
Ways of entering pesticides into the human body	10	6.1	25	15.3	128	78.5
* Dangers of pesticides on human health	130	79.8	0	0.0	33	20.2
Ways of protection	2	1.2	4	2.5	157	96.3

*Answers are not mutually exclusive

Figure (1): Distribution of studied adolescent regarding their total knowledge level (n=163).

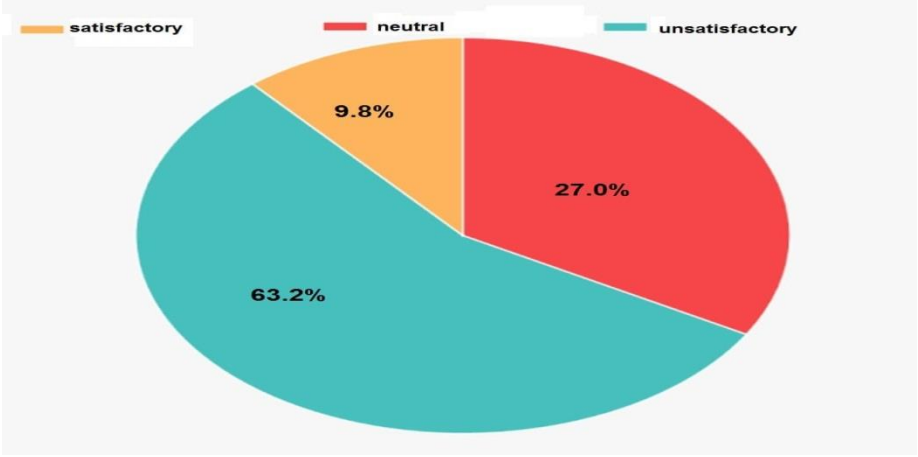

Figure (2): Distribution of studied adolescents regarding methods used to dispose empty pesticide containers (n=163).

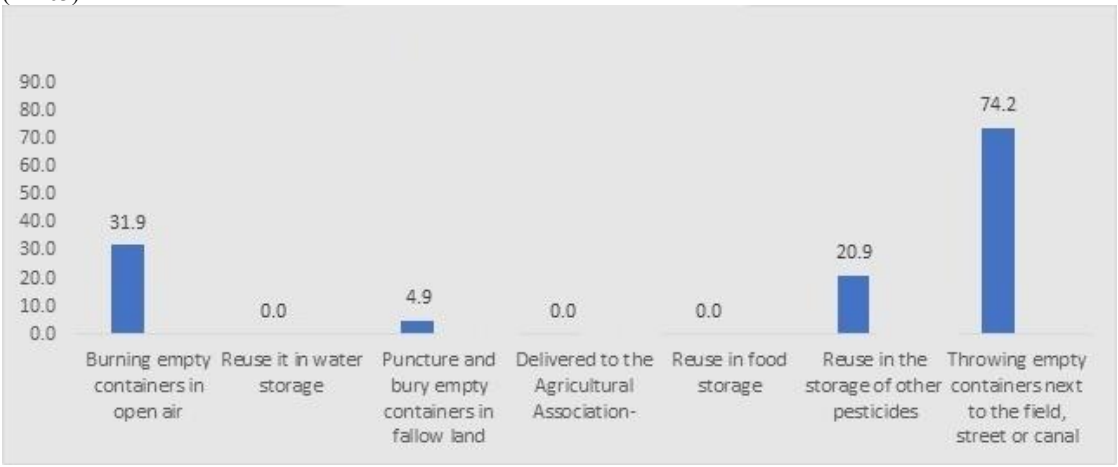

Figure (3): Distribution of studied sample regarding their total practices level (n=163)

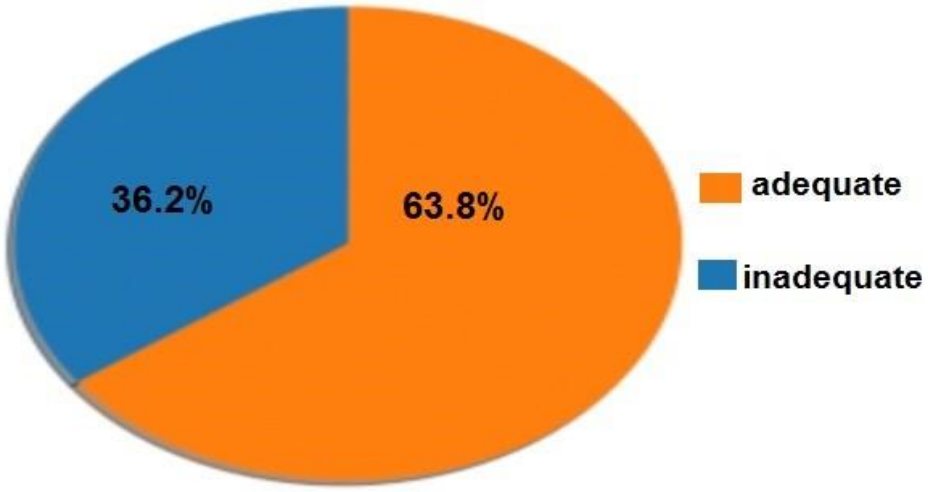

Table (3): Distribution of studied students regarding their use of personal protective equipment during pesticide spraying (n=163).

Items	Practice			
	Compliance		Non Compliance	
	No	%	No	%
Wear overalls	52	31.9	111	68.1
Wear boot	63	38.7	100	61.3
Wear eye google	62	38.0	101	62.0
Wear mask	64	39.3	99	60.7
Wear gloves	78	47.9	85	52.1
Wear hat	40	24.5	123	75.5

Table (4): Statistically relation between total knowledge and total practices (n=163)

Items	Practices				X^2	p-value
	Inadequate		Adequate			
	No	%	No	%		
Knowledge						
Unsatisfactory (103)	81	77.9	22	37.3	30.29	.000**
Neutral (44)	20	19.2	24	40.7		
Satisfactory (16)	3	2.9	13	22.0		

. **Table (5):** Correlation between total knowledge and total practices scores among studied adolescents (n=163)

Items	Knowledge	
	r	p-value
Total practices	.166	.034*

DISCUSSION

Pesticides have become an integral part of present day farming, and play a major role in increasing agricultural productivity. However, the indiscriminate and extensive use of pesticides represents one of the major environmental and public health problems all over the world. Adolescent's farm workers' exposure to pesticides has been associated with adverse health effects like cancer and birth defects resulting in hundreds of fatalities **Kassab et al., (2024**. These risks may be exacerbated by lack of information on pesticide hazards the perception and attitude of adolescents regarding risk from pesticide

exposure, and to lack of education and poor knowledge and understanding of safe practices in pesticide use, including storage, handling and disposal **Sarkar et al., 2021).**

Part I:Demographic characteristics of the studied adolescent students.

As regard age, the present study indicated that, the majority of adolescent students were aged from 13-15 years with Mean ± SD = 13.43±1.12 **(Table 1**). This result came in the same line with **Kassab, et al., (2024)** who studied "Occu-pational Safety Program regarding Preventive Measures of Occupational Health Hazards among Agriculture Child Labor" (No=132) and found that, the majority of studied children aged 13-15 years.

From the researcher's point of view, the age of adolescents working in the agriculture is one of the social factors that affect their level of awareness.

As regard adolescent's gender, the present study showed that more than half of studied sample of students were female. This result disagrees with **Fathy et al., (2020)** who studied "Effect of educational program on prevention of pesticides hazards among children working in agriculture" and found that almost of adolescents working in agriculture were male.

From the researcher's point of view, the number of adolescents' females working in agriculture has exceeded the number of males because parents prefer the males to work in money-making crafts professions in order to help them with the burden of living, while the females continue to work in their family's field in order to preserve the traditions and customs of the rural.

Concerning adolescent occupational data, the present study showed that less than half of adolescents worked in field more than three days weekly and more than two thirds of them worked less than 5 hours daily and less than half had experience more than 5 years. These findings came in line with. This result came in the same line with **Rohlman et al., (2020**) in the study about " Risk perception and behavior in Egyptian adolescent pesticide applicators" (No=119), who found that about two thirds of them worked less than 5 hours daily and less than half had experience more than 5 years.

As for the mechanism by which adolescents received their wages, the present study showed that, the majority of adolescents worked without pay or in family farm **(table 1).** These findings were consistent with **Arcury et al., (2020)** in their study titled "Health and occupational injury experienced by Latinx child farmworkers in North Carolina" (N= 220), who found that more than two third of children didn't get paid as financial return from working in agriculture. But this study was in contrast with **Rohlman et al., (2020**) who found that, two fifth of studied adolescents worked in agriculture in response to parents request and half of them gave all the money more returned from agriculture to family.

Part II: Adolescents' knowledge towards pesticides use

As regard of pesticides meaning and internationally prohibited\ banding pesticides, the present study showed that the minority of adolescent's students had correct answer about the meaning of pesticides and none of them had correct knowledge about internationally prohibited\ banding pesticides **(table 2).** These findings agreed with **Dewi et al., (2022)** who studied " Farmers' knowledge and practice regarding good agricultural practices (GAP) on safe pesticide usage in Indonesia**"** (No=298), who revealed that participants' knowledge about pesticides meaning was little. Also, these findings with **Jallow et al., (2017**) in their study about "knowledge and safety practices among farm workers in Kuwait" (No=250), who found that about half of adolescent's farm worker had correct knowledge about internationally prohibited\ banded pesticides.

On the researcher's point of view, this explained due to lack of formal training or participation in educational program on pesticides and this lack of knowledge adversely affects farmers and their adolescent's quality of life as well as occupational health and safety. Also it highlights the importance of providing a training program on knowledge about pesticides for adolescents working in agriculture.

Regarding adolescent's total knowledge level about pesticides, the present study

indicated that the minority of the studied adolescents had satisfactory total knowledge level regarding about pesticides (**figure 1). On the researcher's point of view**, this attributed to adolescents not had courses at school related to health hazards at agriculture and pesticides handling.

This finding was in the same line with **Mohammed et al. (2020),** who studied on "The impact of health education program about the safe use of pesticides among farmers at a Village in El-Minia City (No= 322)", and showed that the total knowledge regarding prevention of pesticides hazardous of agriculture labor among studied sample were unsatisfactory.

Part III: Adolescents' reported practices about pesticides use

Regarding to methods used by adolescents to dispose empty pesticide containers, the present study showed that, the minority of studied adolescents were used puncture and bury empty containers in fallow land as a method to dispose empty pesticide containers while less than three quarter of them threw empty containers next to the field, street or canal **(figure2).** This finding disagreed with **Ben Khadda et al., (2021).** In the study titled " Farmers' knowledge, attitudes, and perceptions regarding carcinogenic pesticides in fez meknes region (Morocco)" a cross-sectional survey in 15 rural Meknes communities of Morocco's Fes region that the empty containers were buried or burnt by half of the responders, while the remainder were thrown at the edge of fields or in public dumps.

On the same line the study of **Fathy et al., (2020)** who found that three quarter of adolescents threw empty containers next to the field, street or canal and the minority of them bury empty containers in fallow land.

Also the finding of this study are in contrary with study conducted by **Yarpuz-Bozdogan, (2018)** about " The importance of personal protective equipment in pesticide applications in agriculture" found that almost one third of farmer adolescents buried empty pesticides 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 number of them washed and reused them.

From the researcher's point of view, adolescents who were working in agriculture with their parents gained unsafe experience from them in dealing with empty pesticides containers and disposing of by the throwing them on the side of the road. Also adolescents do not know the right methods of rid of empty pesticides containers due to little experience and do not know that the safely disposal and recycled container preserve soil, birds and atmosphere.

As regards to adolescent's total practices about handling with pesticides, the current study findings indicated that more than one third of adolescents had adequate level of practices while less than two thirds of them had inadequate level of practices **(figure3**). This finding was similar with **Cevik et al. (2023),** who carried out study on "How to reduce pesticide exposure in farmers: An interventional study in Turkey (No=750)", and demonstrated that there was highly inadequate level of practices adopted by adolescent's farmers regarding to spray pesticides and chemicals during agriculture work.

In the opinion of the researcher, improvement of adolescent's total practices due to adolescent's practice some of preventive measure in spraying \storing pesticides and adopt of personal hygiene behavior which improved post program implementation.

Part IV: personal protective equipment's used during pesticide spraying.

Table (3): As regard to adolescent's self- reported practices about using protective equipment the present study demonstrated that, more than one third of adolescent's worn boot (special shoes) for working in agriculture, more than one third of the studied adolescents used mask as well as, about less than one quarter of them worn hat when working in the field .These findings were in the same line with **Kassab et al., (2024),** in the study about " Occupational Safety Program regarding Preventive Measures of Occupational Health Hazards among Agriculture Child Labor (No=132)", and revealed that practice of using personal protective equipment including mask and

special shoes was not satisfactory and many adolescents did not use personal protective equipment properly and appropriately.

From the researcher's point of view, these attributed to lack of PPE availability and awareness regarding its importance's.

Part V: Statistical relation between study variables

regards to statistical relation between total knowledge scores and total practice score about pesticides hazardous among adolescent students, the present study showed that there was statistically significant relation between the adolescent's total knowledge scores and total practices score with $X^2=30.29$ and p value > 0.001. Also the present study proved that, there was positive correlation between total knowledge and total practices of adolescent students regarding to prevention of pesticides hazardous with r=.166 and p value .034*. **(Table 4, 5).** These findings were in the same line with **Mohammed et al. (2020),** who revealed that positive correlation were found of general knowledge of studied farmers and self-reported practice. Moreover, this study was supported by **Muenchamnan et al. (2023)** who carried out study on "A Two-pronged educational intervention for caregivers to prevent residential pesticide exposure among Thai Young children living in agricultural area in Thailand" (No=90), and revealed that there was high statistically significant positive correlation between the studied participants' total knowledge and practices score.

From the researcher's point of view, these findings can be clarified as the knowledge may be seen as power by farmworker. Adolescents who know what behaviors will keep them safe from pesticides feel they have greater control over pesticides exposure. More important, farmworker who feel they have greater control are more likely to report that they behave in a manner that reduces their risks of pesticides exposure

CONCLUSION

There was a positive correlation between total knowledge and total practices among studied adolescents regarding to pesticides handling with r=.166 and with p value >.034**.**

RECOMMENDATION

Based on the findings of the current study, the following recommendations can be suggested:

√ Periodical checkup or screening tests should be done by the school nurses for adolescents who were working in agriculture with every agriculture cycle.

√ Further research need to be conducted in Fayoum using long term intervention with a wide scale and in another high density schools, as first aid program for children who working in agriculture to assess the effectiveness of intervention associated with changes in health behavior outcomes and generalize the results.

REFERENCES

Arcury, T., Arnold, T., Quandt, S., Chen, H., Kearney, G., Sandberg, J., and Daniel, S. (2020). Health and ●Latinx child farmworkers in North Carolina on 220 children, USA. International journal of environmental research and public health, 17(1), 248.

Axxe, E., Hayford, S. R., & Eggum, N. D. (2022). Youth's Family and Non-Family Roles as Predictors of Subjective Adulthood in Three Low-Income Agricultural Settings. Journal of Research on Adolescence, *32*(4), 1546-1565.

Ben Khadda, Z., Fagroud, M., El Karmoudi, Y., Ezrari, S., Berni, I., De Broe, M., ... & Sqalli Houssaini, T. (2021). Farmers' knowledge, attitudes, and perceptions regarding carcinogenic pesticides in fez meknes region (Morocco). International journal of environmental research and public health, 18(20), 10879.

Cevik, C., Ozdemir, R., & Ari, S. (2023). How to reduce pesticide exposure in farmers: An interventional study. Work, 75(3), 887-897.

Dewi, Y., Yulianti, A., Hanifah, V., Jamal, E., Sarwani, M., Mardiharini, M. and Harsanti, E. (2022). Farmers' knowledge and practice regarding good agricultural

practices (GAP) on safe pesticide usage in indonesia. Heliyon, 8(1),13-14.

Fathy, E. G., Elkarmlawy, E. M., Mohamed, H. E., & Yousef, F. K. (2020). Effect of educational program on prevention of pesticides hazards among children working in agriculture. Am J Nurs Res, 8(2), 199-210.

Jallow, M. F., Awadh, D. G., Albaho, M. S., Devi, V. Y., & Thomas, B. M. (2017). Pesticide knowledge and safety practices among farm workers in Kuwait: Results of a survey. International journal of environmental research and public health, 14(4), 340.

Kassab, M., Abd El-Megeed, A., Mahmoud, A., & Abosree, H. (2024). Occupational Safety Program regarding Preventive Measures of Occupational Health Hazards among Agriculture Child Labor. Benha Journal of Applied Sciences, 9(4), 1-15.

Khan, B. A., Nadeem, M. A., Nawaz, H., Amin, M. M., Abbasi, G. H., Nadeem, M., ... & Ayub, M. A. (2023). Pesticides: impacts on agriculture productivity, environment, and management strategies. In Emerging contaminants and plants: Interactions, adaptations and remediation technologies (pp. 109-134). Cham: Springer International Publishing.

Malanski, P. D., Dedieu, B., & Schiavi, S. (2021). Mapping the research domains on work in agriculture. A bibliometric review from Scopus database. Journal of Rural Studies, 81, 305-314.

Mohammed, M. D., Bader EL-Din, S. A., Sadek, R. R., & Mohammed, A. A. (2020). The Impact of Health Education Program about the Safe Use of Pesticides among Farmers at a Village in El-Minia City. Minia Scientific Nursing Journal, 3(1), 88-96.

Muenchamnan, N., Naksen, W., & Ong-Artborirak, P. (2023). A Two-Pronged Educational Intervention for Caregivers to Prevent Residential Pesticide Exposure Among Thai Young Children Living in Agricultural Area. Journal of Multidisciplinary Healthcare, 2339-2350.

Norkaew, S., Siriwong, W., Siripattanakul, S., & Robson, M. (2010): Knowledge, attitude, and practice (KAP) of using personal protective equipment (PPE) for chilli-growing farmers in Huarua Sub-District, Mueang District, Ubonrachathani Province, Thailand. Journal of health research, 24(suppl 2): 93-100.

- ***Rajak, P., Roy, S., Ganguly, A., Mandi, M., Dutta, A., Das, K., ... & Biswas, G. (2023).*** Agricultural pesticides–friends or foes to biosphere? Journal of Hazardous Materials Advances, 10, 100264

Rohlman, D.S., Davis, J.W., Ismail, A., Abdel Rasoul, G. M., Hendy, O., Olson, J.R. & Bonner, M.R. (2020). Risk perception and behavior in Egyptian adolescent pesticide applicators: an intervention study. BMC public health, 20, 1-10..

Sarkar, S., Gil, J. D. B., Keeley, J., & Jansen, K. (2021). The use of pesticides in developing countries and their impact on health and the right to food. European Union.

Suratman, S., Ross, K. E., Babina, K., & Edwards, J. W. (2016)*:* The effectiveness of an educational intervention to improve knowledge and perceptions for reducing organo-phosphate pesticide exposure among Indonesian and South Australian migrant farmworkers. Risk management and healthcare policy, 1-12.

Yarpuz-Bozdogan, N. (2018). The importance of personal protective equipment in pesticide applications in agriculture. Current Opinion in Environmental Science & Health, 4, 1-4.

Yawson, D. O. (2022). Pesticide Use Culture among Food Crop Farmers: Implications for Subtle Exposure and Management in Barbados. Agriculture, 12(2), 288.