Journal of American Science

Websites:
http://www.jofamericanscience.org
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Effect Of An Educational Intervention About Occupational Safety On Knowledge And Practices Of Male Students In Technical Mechanical Secondary Schools In El-Behira Governorate

Mariam haggag soliman *, Abeer Abdel Aziz Madian **, Amira Abdel Raheem Mohamed Ali ***, Shaimaa Mohammed Amin****

* Professor of Community Health Nursing, faculty of nursing, Damanhour University
** Assistant Professor of Community Health Nursing, faculty of nursing, Damanhour University
*** Lecturer of occupational hygiene and air pollution, High Institute of Public Health, Alexandria University
**** Assistant lecturer at community health nursing, faculty of nursing, Damanhour University

Abstract: Background. Occupational health and safety is one of the most important aspects of human concern. **The Aim of this study** is to evaluate the effect of educational intervention about occupational safety on knowledge and practice of male students in technical mechanical secondary schools in El-Behira governorate**. Sample**: the study was carried on 280 students (140 were cases and 140 were control). **Research Design:** Quasi experimental (pre-posttest) study design was adopted to carry out this study. **Data collection tools:** data were collected using three tools: structured self-administered questionnaire, Students' knowledge regarding occupational safety and observation check list regarding safety measures practices in the training workshops. **Results:** conveyed that less than half (46.4%, 47.9%) of both the study and the control group respectively were aged between 16 to less than 17 years. All the study group and the control one had poor knowledge regarding occupational health and safety before conduction of the educational intervention, whereas after implementation of the educational intervention, more than three quarters of the study group (85.7%) had good knowledge whereas the vast majority of the control group (99.3%) still had poor knowledge. There was a statistically significant relation between the department and the total knowledge score of the study group (X2= 14.150**,** P=0.007*). ***Conclusion:*** The educational program is successful in attaining its aim of positively improving knowledge, and practice of the study group about Occupational Health and Safety. a ***Recommendations:*** this study recommend the necessity of provision of personal protective equipment to the students in the school workshops and integrating occupational safety topics in their curriculum.

[Mariam haggag soliman, Abeer Abdel Aziz Madian, Amira Abdel Raheem Mohamed Ali, Shaimaa Mohammed Amin. **Effect Of An Educational Intervention About Occupational Safety On Knowledge And Practices Of Male Students In Technical Mechanical Secondary Schools In El-Behira Governorate.** *J Am Sci* 2021;17(1):23-45]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org. 4. doi:10.7537/marsjas170121.04.

Keywords: Educational intervention, occupational health, Knowledge, Technical secondary schools.

Introduction

Young people spend an expansive extent of their day in school or seeking after school-related exercises. Whereas, the essential reason of school is the scholastic advancement of students, its impacts on youths are distant broader. Moreover, enveloping their physical and mental wellbeing, security, civic engagement, and social **(WHO 2018)**. development [(WHO 2018). A secure environment is a prerequisite for successful learning, so there must be school programs in place to diminish levels of injuries as part of its wider plan to improve academic performance **(The National Agency for Education 2017).**

Technical education is the cornerstone for all advancement efforts at any society. It plays a critical part in pushing up the advancement wheel and in accomplishing its maximum rates **(Moustafa 2016)**. Whatever the improvement plans quality is, they couldn't accomplish their goals and their targeted rates without the existence of scientifically and technically qualified human cadres in all production fields **(Olumade 2013)**.

Vocational Secondary School is one of the branches in which the students will acquire the potential of technical talent from the technical field. To produce the potential of this professional future, specialized training is essential. In producing students who are exceedingly talented, they ordinarily utilize the practical training workshop more frequent for their technical practices. This is to reinforce the knowledge gained by students before they enter the real working environment **(Paul 2014)**.

A secure school is one where the entire school environment enables students, teachers, administrators, and staff to communicate in a favorable, non-threatening way that reflects the educational mission of school while fostering positive relationship and personal development **(Schmidt 2015)**. Safety at school includes identifying and implementing suitable policies and programs to ensure the health of students and staff **(Zidan 2016)**.

Creating a healthy school environment requires the inclusion of virtually everyone in the school students, administrators, teachers, guardians, school counselors, and nurses. Hence safe and supportive schools refers to the provision of an environment that protects the emotional, psychological and physical prosperity of students **(Su-Chang C 2015)**.

Students in technical school face risks at their work stations in schools and furthermore at their work such as physical, chemical and psychosocial hazards. Since the scheme of the technological and vocational education is career oriented, the mentality of the students usually emphasizes specialized subjects and overlooks the overall curricula **(Cohen H 2013).**

Occupational health and safety (OHS) training is a principal component in work environment risk control programs. Various safety and health standards for hazard control contain requirements for training pointed at diminishing risk factors for injury, disease or death. Combined with management responsibility, which is fundamental, training is a vital portion of a comprehensive risk control program. Improving the effectiveness of OHS training efforts and other interventions is vital particularly as workplaces and workforces change **(Burke MJ 2014 & NIOSH 2015)**.

Unintentional injuries are harmful acts that occurred without any intention of causing damage to oneself or others. Unintentional accidents amongst teenagers and young adults age 21 and younger, an already susceptible, vulnerable subpopulation, are ongoing public health issue **(NIOSH 2011)**. Nearly 18.1 million young workers under age 24 comprised about 13% of the workforce in the U.S. in 2013. In 2017, 375 young U.S. workers died from work-related injuries. Several researches published that there have been high occurrence of injuries amongst young people due to knowledge deficit about occupational fitness and safety and also lack of training about occupational dangers **(Friend et al 2014)**.

Occupational health and protection is the concern of human wellbeing. Nowadays industrialization and service giving sectors development is accelerating resulting in enormous occupational health problems. Occupational safety and health hazards currently regarded as a driving force toward finding solutions how to prevent it from the manufacturing industries worker bad consequence **(Adebola 2014)**. In latest years, the quality, health, knowledge and protection necessities in several countries have been greater stringent than was the case seen before. Several studies concluded that pressures from communities have led to the enactment of a range of safety legislations and safety standards in different regions for several industries **(Guzys 2014)**.

A study carried out in United States (2018) revealed that extra than half (57%) of the study group of students had experienced injury during training in the mechanical workshops. The most commonly injured body parts had been hands, fingers, and legs. The most commonly reported injury kind was cuts/lacerations. Moreover, the study revealed that these injuries have been due to lack of knowledge about occupational fitness and safety **(Shendell et al 2018)**.

A study conducted in USA 2018 illustrated that more than three quarters (77%) of technical education students have poor knowledge about occupational fitness. More over the study illustrated that the majority of the students didn't wear personal protective equipment's during training in the workshop and therefore about 30 % of them had experienced injuries during training **(Apostolico et al 2018)**.

The Occupational health nurse (OHN) performs an important role in assisting to defend the fitness of workers. The role of OHN is to authorize workers to make informed health decisions while also overseeing the fitness dangers and costs linked with the employment relations between employees and the enterprise **(Cooper K et al 2015)**. The main functions of the occupational health nurse are to keep employees healthy, prevent illness and ensuring a safe working environment. The occupational health nurse is in an ideal situation to provide guidance, counseling, and coaching for employees who choose to enhance their health **(Friend et al 2016)**.

Significance of the study

Students in technical school face risks at their work stations in schools and furthermore at their work such as physical, chemical and psychosocial hazards. Since the scheme of the technological and vocational education is career oriented, the mentality of the students usually emphasizes specialized subjects and overlooks the overall curricula **(Cohen H et al 2013)**.

A study conducted in Ethiopia (2019) revealed that more than two-thirds (48.1%) of the welders never heard about occupational hazards. With respect to fire hazards more than half (56%) of the study subjects didn't have knowledge about fire hazards, whereas more than three fourth (78%) of the respondents didn't have knowledge about electrical hazards. However, less than one third (28%) of the study subjects didn't

have knowledge about accident prevention **(Gebrezgiabher et al 2019)**.

A study conducted in Sweden (2014) concluded that vocational education pupils had poor knowledge regarding occupational risks and protective measures. Post program implementation about occupational safety, the majority (95%) of the students had good knowledge concerning occupational health and personal protective equipment **(Andersson et al 2014)**.

Although some studies are done on the prevalence of injuries among technical education students, information on occupational health and safety among technical mechanical secondary school students is still minimal. Furthermore, there are limited studies that specifically determine effect of educational intervention about occupational safety on knowledge and practice of male students in technical mechanical secondary schools. Therefore, the intent of the present study was to evaluate the effect of an educational intervention about occupational safety on knowledge and practice of male students in technical mechanical secondary schools in El-Behira Governorate in order to improve their knowledge, practice toward occupational safety, hence improve their health.

Aim Of The Study

To evaluate the effect of educational intervention about occupational safety on knowledge and practice of male students in technical mechanical secondary schools in El-Behira governorate.

Objectives

1) Assess students' knowledge, and practice regarding Occupational Health and Safety.

2) Develop an educational intervention for students about occupational health and safety.

3) Determine the effect of the educational intervention on student's knowledge and practice regarding occupational health and safety.

Hypothesis

Technical Mechanical secondary school male students who engage in occupational safety intervention will demonstrate higher level of knowledge and practice than those who are not.

Subjects And Method

Study Design & Setting

Quasi experimental (pre-posttest) study design was carried out to demeanor this study. The study was conducted in Four schools out of 13 schools (around one quarter) harvesting the highest numbers of students at the second level namely; Damnhour Technical Mechanical Secondary School, Kafr-El-Dawar Technical Mechanical Secondary School, Abo Homos Technical Mechanical Secondary School, and Hosh Eisa Technical Mechanical Secondary School.

Total population

Total number of the students in the four selected school was 1104.

Study Sample

The sample size was calculated by using EPI info7software based on the total population of 1104 and an expected frequency of 50% of hazards with margin error of 5% and confidence interval of 95%. This resulted in minimum required sample size of 280 students. 140 students were selected as an experimental group and 140 students were randomly selected as control group from each of the previously selected settings.

Number of Students Selected From Different Departments

School / Workshops	Department						Total
	Welding		Lathing		Foundry		
	Cases	Control	Cases	Control	Cases	Control	
Damnhour Technical Mechanical Secondary School	13	13	13	13	12	12	**76**
Abo Homos Technical Mechanical Secondary School			34	35			**69**
Kafr-El-Dawar Technical Mechanical Secondary School	19	19	19	19			**76**
Hosh Eisa Technical Mechanical Secondary School	10	10	10	10	10	9	**59**

Tools of data collection:

Data were collected using the following three tools.

Tool (I): structured self-administered questionnaire:

It was developed by the researcher and is composed of three parts. **The first part** is developed to collect data related to socio-demographic characteristics of the students: such as age, Academic department, residence, crowding index, family income, father & mother education and occupation.

The second part included assessment of student's general health status like presence of health problems in the last 6 months, medication used, lab investigation done before, and presence of vision or hearing problems. **The third part** involved questions related to lifestyle of the students as physical exercises, sleeping patterns, eating habits, risk taking behaviors such as smoking, alcohol consumption, and drug abuse.

Tool (II): Students' knowledge regarding occupational safety

It was concerned with the following items:

- Occupational safety in schools (definition, occupational safety committee in schools, activities of occupational safety committee)
- Possible environmental hazards present in school from their point of view
- Accidents hazards and their prevention
- Safety measures needed and adopted to overcome these hazards
- Personal protective equipment, and importance of using it
- First aid measures
- Fire hazards and their prevention

Scoring system:

The students' knowledge about safety measures were calculated for each item. It consists of 62 items. A score of (2) will be given to the complete and correct answer, a score of (1) for correct but incomplete answer and a score of (0) for the wrong or missed answer. The total knowledge score was calculated and ranged from (0-124) which further categorized into three levels as follows:

Classification	Score
Good	75%-100% (93-124 points)
Fair	< 75%-50% (62- < 93 points)
Poor	< 50% (< 62 points)

Tool (III): Observation check list regarding safety measures practices in the training workshops

An observational checklist was developed by the researcher after reading the recent literature in order to assess safety measures utilized in the mechanical workshops. It included the following parts:

Part I: Workshops Environmental safety measures

This part included data as: housekeeping, ventilation, noise control, lighting system, fire protection, electrical safety and workshop design.

Part II: Work process safety measures

This part included safety measures adopted in various departments like Welding, lathing, and foundry.

Part III: Protective devices used by students:

This part included different personal protective equipment utilized by students in different departments of workshops such as safety glasses, mask, ear plug, gloves, apron, safety shoes…etc

Scoring system:

Safety measures adopted in training workshops composed of 75 items and was calculated for each one. Every item was scored (1) if present and (zero) if not present. The total observational score was calculated and ranged between 0-100 and categorized into two levels as follows:

- 75% or more items of safety measures was considered as having complete safety measures **(≥ 75-100 points**).
- Less than 75% items of safety measures was considered as having incomplete safety measures. (**< 75 points**).

Tool Content Validity and Reliability:

Tools of the study were examined for content validity by a jury of five experts in the field of community health nursing from the Faculty of Nursing (Damnhour and Alexandria university) and the necessary modifications were done based on their recommendations. The reliability was assured by utilizing test-retest, and the result was 0.9.

Pilot study

Twenty-eight (10% of the estimated sample) were piloted to ascertain the clarity, applicability and feasibility of the tools and to detect the obstacles that might impede the data collection process (not included in the original sample) consequently, all needed modifications were done.

Administrative and Ethical Considerations:

- Permission was obtained from ethical committee in the Faculty of Nursing Damnhour University.
- Permission was obtained to collect the data from the selected settings.
- Written consent was obtained from every student participated in the study after explanation of the aim of the study and participants were assured that collected data will be used only for the study purpose.

Statistical Analysis

Data were coded and transferred into specially designed formats to be suitable for computer feeding. Following data entry, checking and verifying process were carried out to avoid any errors during data entry. Frequency analysis, cross tabulation and manual revision were all used to detect any errors.

- Data was analyzed using PC with statistical package for social science (SPSS) version 20.
- The level of significance selected for this study was p equal or less than 0.05.

The next statistical procedures were employed:

1. Descriptive: count, percentage, arithmetic mean, standard deviation.
2. Inferential: the mean change in the overall score of the studied variables was employed for comparison at baseline and follow-up after the educational intervention based on the total maxing allowable score for each variables using: Chi-square

test, Fisher's Exact or Monte Carlo correction, Student t-test, ANOVA with repeated measures, Pearson coefficient.

Field Work:

The study was implemented through the following three phases: Preparation of the educational intervention, implementation of the educational intervention and evaluation of the educational intervention. Collection of the data covered a period of six months from September 2019 to February 2020.

First Phase: preparation of the educational intervention:

I. Assessment phase

- The researcher visit the study setting and explain the questionnaire to both the study and control group.
- Pre intervention assessment for the students' knowledge and practice about occupational safety was done by the researcher after distributed tool II to be completed by both groups as pretest and to detect their learning needs in the first week before starting the program in each school.
- The observational assessment was calculated by the researcher for both study and control groups to assess safety measures practices in the training workshops by using tool III.

II. Planning phase

The intervention of occupational safety was developed by the researcher for the study group according to student's needs assessment and review of literature as to the following steps:

a) Setting the program objectives

➢ **General objective**

To improve the knowledge and practices of male students regarding occupational safety

➢ **Specific objectives**

By the end of the educational intervention, the students were able to:

- Define occupational safety.
- List activities of occupational safety.
- Mention the possible environmental hazards present in their schools.
- Mention prevention of accidents and hazards.
- Apply safety measures needed to overcome the occupational hazards.
- Apply personal protective equipment and mention its importance.
- List first aid measures.
- Apply prevention of fire hazards.

b) Preparation of the content

- The content of the educational intervention of occupational safety was designed to by the researcher to cover all the predetermined objectives. it was developed based on review of relevant recent literature, results of pre-assessment as well as characteristics of students.
- The content was comprised and formulated as regard to numbers of sessions and teaching methods.
- Different educational strategies were utilized as lectures, brain storming, group discussion, and role play.
- Different teaching aids were used to facilitate and illustrate teaching such as posters, handout, slide data show and videos.

Second Phase: Implementation of the Educational Intervention

1) This phase included the implementation of the planned educational intervention.

2) The students were divided into groups at each school, each group was contain around (15-20) students.

3) At the beginning of the first session, students were oriented to the aim of the study, phases and the educational intervention sessions (time, duration, and contents). The researcher focused on the importance of continuous attendance and active participation. In each session students questions were answered, then handout were distributed to them.

4) Timetable of the educational intervention regarding occupational health and safety

Days	Contents	Teaching methods	Media	Time	Evaluation
First day Session 1	➢ Orientation of the participants ➢ Explain the purpose and nature of the study for them ➢ Introduction (Technical education in Egypt and its importance) ➢ Overview about school safety (definition of school safety, type of hazards in school, safety precautions in school, the role of school safety committee)	• Discussion • Lecture • Brain storming	• Brochure • Data show	1 hour	➢ Pretest ➢ Post test
Second day Session 2	➢ Occupational health (definition of occupational health, objectives of occupational health, definition of occupational hazard, different types of occupational hazards)	• Discussion • Lecture • Brain storming	• Data show • Brochure • Poster	1 hour	➢ Pretest ➢ Post test

Days	Contents	Teaching methods	Media	Time	Evaluation
Third day Session 3	➢ Safety precautions in mechanical workshops (occupational hazards and protective measures in welding, lathing and foundry workshops, identification of safety precautions that must be taken during working in the workshop)	• Discussion • Lecture • Brain storming	• Data show • Brochure • Video about occupational hazards	1 hour	➢ Pretest ➢ Post test
Fourth day Session 4	➢ Personal protective equipment (definition, importance and different types of personal protective equipment)	• Discussion • Lecture • Brain storming	• Data show • Brochure • Video about personal protective equipment	1 hour	➢ Pretest ➢ Post test
Fifth day Session 5	➢ First aid (definition, first aid box contents, principles of first aid, priorities of first aid, first aid survey ➢ Heart attack first aid measures ➢ (definition, signs and symptoms, application of first aid) ➢ Burn (definition, causes of burn, degrees of burn, application o first aid)	• Group discussion • Lecture • Brain storming • Role play • Demonstration and re-demonstration	• Data show • Brochure • Video about heart attack first aid • Video about burn first aid	1 hour	➢ Pretest ➢ Post test

Days	Contents	Teaching methods	Media	Time	Evaluation
Sixth day Session 6	➢ Wounds (definition, types of wounds, application of first aid) ➢ Bleeding (definition, causes, types, complications, application of first aid ➢ Fractures (types, application of first aid) ➢ Convulsion (definition, signs and symptoms, application of first aid) ➢ Poisoning (definition, signs and symptoms, application of first aid) ➢ Bites and stings (definition, different types of bites and stings ➢ Eye injuries (definition, application of first aid) ➢ Amputation (definition, application of first aid)	• Discussion • Lecture • Brain storming • Role play • Demonstration and re-demonstration	• Data show • Brochure • Video about wound first aid • Video about bleeding first aid • Video about fracture first aid • Video about Convulsion first aid • Video about eye injuries first aid • Video about poisoning first aid	2 hours	➢ Pretest ➢ Post test

Days	Contents	Teaching methods	Media	Time	Evaluation
Seventh day	➢ Emergency evacuation drill (definition, objectives, duties	• Discussion • Lecture	• Data show • Brochure	1hour	➢ Pretest ➢ Post

Session 7	of emergency team, measures that must be available in school, duties of firefighting teams in schools, evacuation exercises in school)	• Brain storming • Role play • Demonstration And re-demonstration	• Video about emergency evacuation drill for fire		test
Eighth day Session 8	➢ Types of common accidents in mechanical workshops and protective measures (definition of accident, different types of accidents inside the mechanical workshops, causes of accidents, and protective measures.	• Discussion • Lecture • Brain storming • Role play • Demonstration and re-demonstration	• Data show • Brochure • Poster	1 hour	➢ Pretest ➢ Post test

Days	Contents	Teaching methods	Media	Time	Evaluation
Ninth day Session 9	➢ Principles of proper nutrition (benefits of proper nutrition, food groups, factors affecting food group's requirements, well balanced diet).	• Discussion • Lecture • Brain storming • Role play • Demonstration and re-demonstration	• Data show • Real objects • Brochure	1 hour	➢ Pretest ➢ Post test
Tenth day Session 10	➢ Health maintenance importance (definition, factors affecting health, ways of health maintenance, benefits of health maintenance)	• Discussion • Lecture • Brain storming • Role play • Demonstration and re-demonstration	• Data show • Brochure	1 hour	➢ Pretest ➢ Post test

Third Phase: Evaluation of the Educational Intervention

- Evaluation of the intervention was done two times: immediately and after 3 months of the completion of the intervention for the study group and the control one through posttest structured questionnaire using tool II.

Results

Table (I) displays distribution of the studied sample according to their personal and socio demographic characteristics. The total number included in the study was 280 (140 cases and 140 control. concerning age, it ranged from 15-18 years with a mean age of 16.39 ± 0.71 among the study group whereas among the control group 16.21 ± 0.71. Less than half (46.4%, 47.9%) of both the study and the control group respectively were aged between 16 to less than 17 years. While, a minority (3.6%) of both groups were aged from 18 to less than 19 years. No statistically significant difference between both groups. (x^2=4.974, = ^{mc}p 0.174).

Regarding the place of residence, less than two thirds (63.6%) of the study group were living in urban areas compared to two thirds (66.4%) of the control group, whereas the rest (36.4%, 33.6%) of both groups were living in rural areas. No statistically significant difference between both groups (X^2= 0.251, = ^{MC}p 0.616).

With respect to family income, the vast majority of both groups (90%) had not enough income to meet the demands of their lives, and the minority of both groups (10%) had enough income. No statistically significant difference between both groups (X^2=0.000, ^{MC}p =1.000).

In relation to crowding index, it ranged from 1 to 10 persons/bed room among the study group and from 1-5 among the control group with a mean of (2.4+0.9) and (2.1+0.6) respectively. It was found that around less than three quarters (71.5%) of the study group had a crowding index of four persons/ room or more compared to around two thirds (67.8%) of the control group. on the other hand, a crowding index of less than 2 persons/room constituted (7.1%, 3.6%) of both groups respectively, with a statistically significant difference between both groups (X^2=11.497, = ^{MC}p 0.001).

As regard to mother's level of education, the table portrays that nearly half (49.3%) of the study group mother's had secondary education compared to nearly two fifth (39.3%) of the control group. On the other hand, a minority of the study group and control group mother's (2.1%) could read and write. No statistically significant difference between both groups (X^2 =4.225, ^{MC}p =0.524).

With respect to father's level of education, the table shows that more than half (51.4%) of the study group father's had university education, compared to less than two thirds (60.7%) of the control group, whereas the minority (0.7%, 2.9%) of the study group and control group father's respectively had primary education. No statistically significant difference between both groups (X^2 = 5.839, ^{MC}p =0.304).

Pertaining to mothers' occupation, the table depicts that more than half (52.9%) of the study group mothers' and two fifth (40.7%) of the control group mothers' were housewives. On the other hand, a minority (4.3%,2.1%) of both groups mothers' respectively worked at semiprofessional work. In addition, trades/ business occupation constituted (19.3 %,16.5 %) of both groups mothers respectively, with a statistically significant difference between both groups (X^2 =23.635, $^{MC}p<0.001^*$)

In relation to fathers' occupation, the table shows that more than half (57.1%) of the study groups' fathers were professional compared to less than two thirds (64.2%) of the control groups' fathers. Additionally, less than one third (32.1%) and less than one quarter (20.7%) of the study and control group fathers were traders. Moreover, a minority (1.5%, 9.3%) of both groups' fathers were not working /retired, with a statistically significant difference between both groups (X^2 =17.581, $^{MC}p<0.001$).

Table (1): Distribution of The Studied Sample According to Their Socio Demographic Characteristics

Socio-demographic characteristics	Study group (n = 140)		Control group (n = 140)		Test of Significance
	No.	%	No.	%	
Age in years					
15 < 16	13	9.3	24	17.1	
16 < 17	65	46.4	67	47.9	χ^2=4.974
17 < 18	57	40.7	44	31.4	^{MC}p =0.174
18 < 19	5	3.6	5	3.6	
Min. – Max.	15.0 – 18.0		15.0 – 18.0		t=1.948
Mean ± SD.	16.39 ± 0.71		16.21 ± 0.71		^{MC}p =0.052
Residence					
Urban	89	63.6	93	66.4	χ^2=0.251
Rural	51	36.4	47	33.6	^{MC}p =0.616
Family income					
Enough	14	10.0	14	10.0	χ^2=0.000
Not enough	126	90.0	126	90.0	^{MC}p =1.000
Crowding index					
< 2	10	7.1	5	3.6	
2- < 4	30	21.4	40	28.6	χ^2=11.497*
≥ 4	100	71.5	95	67.8	^{MC}p =0.001*
Min. – Max.	1 -10		1-5		t=3.627*
Mean ± SD.	2.4 ±0.9		2.1±0.6		p<0.001*
Mother Level of education					
Illiterate	13	9.3	14	10.0	
Read and write	3	2.1	3	2.1	
Primary school	5	3.6	3	2.1	χ^2=4.225
Preparatory school	10	7.1	12	8.6	^{MC}p=0.524
Secondary school	69	49.3	55	39.3	
University education	40	28.6	53	37.9	

χ^2: **Chi square test** MC: **Monte Carlo** **t: Student t-test**

p: p value for comparing between **Experimental** and **Control**

*: Statistically significant at p ≤ 0.05

Table (I): (CONT.):

Socio-demographic characteristics	Study group (n = 140)		Control group (n = 140)		Test of Significance
	No.	%	No.	%	
Father level of education					
Illiterate	5	3.6	5	3.6	
Read and write	1	0.7	0	0.0	
Primary school	1	0.7	4	2.9	χ^2=5.839
Preparatory school	15	10.7	12	8.5	^{MC}p=0.304
Secondary school	46	32.9	34	24.3	
University education	72	51.4	85	60.7	
Mother's occupation					
House wife	74	52.9	57	40.7	
Unskilled manual worker	3	2.1	0	0.0	
Farmer	5	3.5	0	0.0	χ^2=23.635*
Trades/business	27	19.3	23	16.5	^{MC}p<0.001*
Semiprofessional /clerk	6	4.3	3	2.1	
Professional	25	17.9	57	40.7	
Father's occupation					
Non-working/retired	2	1.5	13	9.3	
Unskilled manual worker	5	3.6	4	2.9	
Skilled manual worker/farmer	5	3.6	0	0.0	χ^2=17.581*
Trades/business	45	32.1	29	20.7	^{MC}p<0.001*
Semiprofessional / clerk	3	2.1	4	2.9	
Professional	80	57.1	90	64.2	

χ^2: **Chi square test** MC: **Monte Carlo**
p: p value for comparing between **Experimental** and **Control**
*: Statistically significant at $p \leq 0.05$

Table (II) Illustrates distribution of the studied sample according to their life style pattern. Concerning the dietary pattern, around two thirds of the study group (61.4%) reported that they had three meals per day compared to more than two thirds (69.3%) of the control group. No statistically significant difference between both groups (X^2= 4.893, ^{MC}p = 0.070).

The table also portrays that nearly two fifths (41.4%) of the study group always had breakfast daily compared to more than half (52.9%) of the control group. While the minority (13.6%, 2.1%) of the study and the control group respectively never had breakfast. A statistically significant difference was observed between both groups (X^2= 13.576, ^{MC}p = 0.001).

With respect to intake of fast food, it was found that half of the study group (50%) reported always intake of fast food compared to less than two third (63.6%) of the control group. On the contrary, the minority of both groups (12.1%, 1.4%) never had fast food. A statistically significant difference was observed between both groups (X^2= 14. 269, ^{MC}p = 0.001).

Pertaining to daily water intake, the table depicts that the highest percent of the study group (43.6%) drank eight cups of water per day, while the highest percent of the control group (57.1%) drank less than eight cups of water per day. However, the lowest percent of both groups (15%, 4.3%) drank more than eight cups of water daily. Moreover, the mean for the study group was 9.86±3.07, whereas the mean for control group was 10.56 ±3.07. A statistically significant difference was found between both groups (X^2= 12. 267, ^{MC}p = 0.002).

Regarding intake of beverages like coffee and tea, it were reported by (90%, 100%) of the study group and the control group respectively. In addition, less than half (42.9%, 46.4%) of both groups stated that they were drinking beverages three times per day, while a minority (13.5%, 7.9%) of both groups reported that they were drinking beverages more than three times daily, with a statistically significant difference between both groups (X^2= 12.267, ^{MC}p =0.002).

Concerning exercise, it was evident that, less than two thirds (60.7%) of the study group didn't practice any type of exercise compared to more than three quarters (83.6%) of the control group, whereas the rest of both groups were practicing exercises. A statistically significant difference was observed between both groups (X^2=18.198, ^{MC}p = 0.000). Moreover, the majority of the study group (92.7%)

stated that they were practicing exercises once per week compared to nearly two thirds (65.2%) of the control group, whereas twice per week reported by (7.3%, 34.8%) of the study group and the control group respectively. A statistically significant difference was observed between both groups (X^2= 26.039, ^{MC}p <0.001). Furthermore, the table depicts that the majority (90.9%, 82.6%) of both groups were not practicing exercises due to lack of time, while a minority (9.1%, 17.4%) of both groups due to sickness reasons. A statistically significant difference was observed between both groups (X^2= 16.014, ^{MC}p<0.001).

It is apparent from the table that sleeping hours/night ranged from 4 to9 hours among the study group and from 4 to 8 hours among the control group with a mean of5.75 ± 1.68 for the study group and 5.59 ± 1.40 for the control group, with a statistically significant difference between both groups (t=0.851, ^{MC}p =0.396). In addition, less than two thirds (60.7%) of the study group were sleeping less than six hours at night, compared to more than half (57.1%) of the control group whereas, the rest of both groups (39.3%, 42.9%) respectively were sleeping six or more hours at night. No statistically significant difference between both groups (X^2= 0.369, ^{MC}p =0.544). The table also reveals that nearly one tenth (10.7%) of the study group had sleeping problems compared to less than half of the control group (48.6%). The majority of the study groups (46.6%) were sleeping a lot and the minority (13.3%) had disturbed sleep, whereas the majority (57.3%) of the control group had difficulty sleeping and the minority (17.6%) were sleeping a lot. A statistically significant difference was observed between both groups (X^2=51.617, ^{MC}p <0.001).

With respect to risk-taking behaviors, the table depicts that more than one third (37.1) of the study group reported that they were smokers compared to about one fifth (20.7%) of the control group. A statistically significant difference was observed between both groups (X^2= 9.189, ^{MC}p =0.002). Additionally, more than one third (42.3%) of the study group started smoking two years ago compared to more than half (58.6%) of the control group. However, more than one third (38.5%,41.4%) of both groups respectively reported that they started smoking a year ago, with a statistically significant difference between both groups (X^2=17.547*, ^{MC}p=0.001).

Concerning the number of cigarettes smoking per day, it range from 5 to 9 among the study group and from 5 to 7 among the control group with a mean of (5.91 ± 1.27) and (5.55 ± 0.91) respectively. Furthermore, it was found that nearly two thirds (65.4%) of the study group were smoking from 5 to less than 7 cigarettes per day compared to less than three quarters (72.4%) of the control group. Moreover, smoking from 7 to less than 9 cigarettes daily was reported by more than one quarter (26.9%, 27.6%) of both groups respectively. A statistically significant difference was found between both groups (X^2= 13.403*, ^{MC}p= 0.003). The table reveals also that neither of the study nor the control group was addicted to any drug.

Table (II): Distribution of the Studied Sample According to their life style pattern

Life style pattern	Study group (n = 140)		Control group (n = 140)		Test of Significance
	No.	%	No.	%	
A. Eating habits					
Number of meals per day					
One meal	0	0.0	0	0.0	
Two meals	4	2.9	0	0.0	χ^2=4.893
Three meals	86	61.4	97	69.3	^{MC}p=0.070
More than three	50	35.7	43	30.7	
Intake of breakfast meal					
Always	58	41.4	74	52.9	χ^2=13.576*
Sometimes	63	45.0	63	45.0	^{MC}p =0.001*
Never	19	13.6	3	2.1	
Fast food intake					
Always	70	50.0	89	63.6	χ^2=14.269*
Sometimes	53	37.9	49	35.0	^{MC}p =0.001*
Never	17	12.1	2	1.4	
Number of water glasses per day					
< 8 cups/ day	58	41.4	80	57.1	χ^2=12.267*
8 cups/ day	61	43.6	54	38.6	^{MC}p =0.002*
> 8 cups/ day	21	15.0	6	4.3	

Mean ± SD	9.86±3.07		10.56 ±3.07		t=3.627* MCp <0.001*
Beverages intake					
No	14	10.0	0	0.0	χ^2=14.737* MCp <0.001
Yes	126	90.0	140	100.0	
Beverages intake frequency	**n=(126)**		**n=(140)**		
Three times per day	54	42.9	65	46.4	χ^2=12.267* MCp=0.002*
Two times per day	55	43.6	64	45.7	
More than three times per day	17	13.5	11	7.9	

χ^2: **Chi square test** MC: **Monte Carlo**
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05

Table (II): (CONT.):

Life style pattern	**Study group (n = 140)**		**Control group (n = 140)**		**Test of Significance**
	No.	**%**	**No.**	**%**	
B. Exercise					
Practicing exercise					
No	85	60.7	117	83.6	χ^2=18.198* MCp <0.001*
Yes	55	39.3	23	16.4	
Frequency of practicing exercise per week	**(n=55)**		**(n=23)**		
Once	51	92.7	15	65.2	χ^2=26.039* MCp <0.001*
Twice	4	7.3	8	34.8	
More than twice	0	0.0	0	0.0	
Causes of not practicing exercise					
Lack of time	50	90.9	19	82.6	χ^2=16.014* MCp <0.001*
Sickness reasons	5	9.1	4	17.4	
C. Sleeping pattern					
Sleeping at night (per hours)					
<6 hours	85	60.7	80	57.1	χ^2=0.369 MCp =0.544
≥6 hours	55	39.3	60	42.9	
Min. – Max.	4.0 – 9.0		4.0 – 8.0		t=0.851 MCp =0.396
Mean ± SD.	5.75 ± 1.68		5.59 ± 1.40		
Presence of sleep problems					
No	125	89.3	72	51.4	χ^2=48.102* MCp <0.001*
Yes	15	10.7	68	48.6	
Type of sleep problems	**(n=15)**		**(n=68)**		
Sleeping a lot	7	46.7	12	17.6	χ^2=51.617* MCp <0.001*
Difficulty in sleeping	6	40	39	57.4	
Disturbed sleep	2	13.3	17	25	
Others	0	0.0	0	0.0	

χ^2: **Chi square test** **t: Student t-test**
p: p value for comparing between the studied groups
*: Statistically significant at p ≤ 0.05

Table (II): (CONT.):

Life style pattern	Study group (n = 140)		Control group (n = 140)		Test of significance
	No.	%	No.	%	
D. Risk taking behaviors					
Students' smoking habit					
No	88	62.9	111	79.3	χ^2=9.189*
Yes	52	37.1	29	20.7	^{MC}p =0.002*
Duration of starting smoking	**(n=52)**		**(n=29)**		
2 years ago	22	42.3	17	58.6	χ^2=17.547*
1 year ago	20	38.5	12	41.4	^{MC}p =0.001*
Three years ago	10	19.2	0	0.0	
Number of cigarettes per day					
5 -	34	65.4	21	72.4	χ^2=13.403*
7 -	14	26.9	8	27.6	^{MC}p = 0.003*
9 +	4	7.7	0	0.0	
Min. – Max.	5.0 – 9.0		5.0 – 7.0		t=1.488
Mean ± SD.	5.91 ± 1.27		5.55 ± 0.91		p=0.141
Taking drugs					
No	140	100.0	140	100.0	–
Yes	0	0.0	0	0.0	

χ^2: **Chi square test** **t: Student t-test**
p: p value for comparing between the studied groups
*: Statistically significant at $p \leq 0.05$

Table (III): Reveals Distribution of the Studied Sample According To Their Total Knowledge Score before and After Program. It is apparent from the table that concerning occupational health and safety in the school before the educational intervention all the study group and the control one scored poorly. Conversely, after the educational intervention, more than half (52.8%) of the study group had good knowledge and more than one tenth (13.6%) had fair knowledge, whilst one third of them still had poor knowledge. However, the entire control group still had poor knowledge, with a statistically significant difference between both groups (X^2= 139.251,^{MC}p = <0.001).

Pertaining to occupational hazards, the table shows that before the educational intervention, the vast majority of both groups (97.1%, 98.6%) had poor knowledge, and the rest of both groups (2.9%, 1.4%) had fair knowledge, with a statistically significant difference between both groups (X^2= 6.272, ^{FE}p=0.684). By contrast, after the educational intervention, more than one third (41.4%) of the study group had good knowledge compared to only 0.7% of the control one. Additionally, less than half (47.9%) of the study group had fair knowledge compared to just 2.1% of the control group. Moreover, around one tenth (10.7%) of the study group had poor knowledge, whereas the vast majority of the control group still had poor knowledge, with astatically significant difference between both groups (X^2= 210.542,^{MC}p = <0.001).

In relation to school accidents, the table conveys that before the educational intervention the vast majority (92.9%, 97.1%) of the study group and the control one respectively scored poorly and the minority of both groups (2.9%) had good knowledge, with a statistically significant difference between both groups (X^2= 6.272,^{MC}p = 0.047).Otherwise, after the educational intervention, two-fifth (40%) of the study group had correct knowledge compared to a minority (2.9%) of the control group. In addition, more than one third (37.9%) of the study group had fair knowledge compared to only 2.9% of the control one. As well as that, less than one quarter (22.1%) of the study group had poor knowledge, whilst the vast majority (94.2%) of the control group still had poor knowledge, with astatically significant difference between both groups (X^2=149.77,^{MC}p = <0.001).

The table also represented that before the educational intervention all the study group and the control one had poor knowledge regarding safety measures that must be available in the workshop. Nevertheless, after the educational intervention, more than two thirds (68.5%) of the study group had good knowledge, whilst more than one fifth (23.6%) of

them had fair knowledge and the rest of them (7.9%) had poor knowledge. Furthermore, all the control group still had poor knowledge, with a statistically significant difference between both groups (X^2= 239.205,^{MC}p = <0.001).

The table also depicts that all the study group and the vast majority (98.6%) of the control one had poor knowledge regarding first aids before the educational intervention, with no statistically significant difference between both groups (X^2= 2.014, ^{FE}p=0.498). Unlike, after the educational intervention, less than two thirds (63.6%) of the study group had good knowledge, whereas less than two fifth (15.7%) had fair knowledge and the rest of them (20.7%) had poor knowledge. Along with, the vast majority (98.6%) of the control group and only 1.4% of them had fair knowledge. A statistically significant difference was found between both groups (X^2= 176.320,^{MC}p = <0.001).

Table (III): Distribution of the Studied Sample According To Their Total Knowledge Score before and After Program

Knowledge Level	Before				After			
	Study group (n = 140)		Control group (n = 140)		Study group (n = 140)		Control group (n = 140)	
	No.	%	No.	%	No.	%	No.	%
Occupational health and safety in the school								
Poor	140	100.0	140	100.0	47	33.6	140	100.0
Fair	0	0.0	0	0.0	19	13.6	0	0.0
Good	0	0.0	0	0.0	74	52.8	0	0.0
χ^2 (p)	–				**139.251* (<0.001*)**			
Occupational hazards								
Poor	136	97.1	138	98.6	15	10.7	136	97.2
Fair	4	2.9	2	1.4	67	47.9	3	2.1
Good	0	0.0	0	0.0	58	41.4	1	0.7
χ^2 (p)	**0.681 (^{FE}p=0.684)**				**210.542* (<0.001*)**			
School accidents								
Poor	130	92.9	136	97.1	31	22.1	132	94.2
Fair	6	4.2	0	0.0	53	37.9	4	2.9
Good	4	2.9	4	2.9	56	40.0	4	2.9
χ^2 (p)	**6.272 (^{MC}p=0.047*)**				**149.772* (<0.001*)**			
Safety measures that must be available in the workshop								
Poor	140	100.0	140	100.0	11	7.9	140	100.0
Fair	0	0.0	0	0.0	33	23.6	0	0.0
Good	0	0.0	0	0.0	96	68.5	0	0.0
χ^2 (p)	–				**239.205* (<0.001*)**			
First aids								
Poor	140	100.0	138	98.6	29	20.7	138	98.6
Fair	0	0.0	2	1.4	22	15.7	2	1.4
Good	0	0.0	0	0.0	89	63.6	0	0.0
χ^2 (p)	**2.014 (^{FE}p=0.498)**				**176.320* (<0.001*)**			

χ^2: **Chi square test** MC: **Monte Carlo**
FE**: Fisher Exact** p: p value for comparing between **Experimental** and **Control** *: Statistically significant at p ≤ 0.05

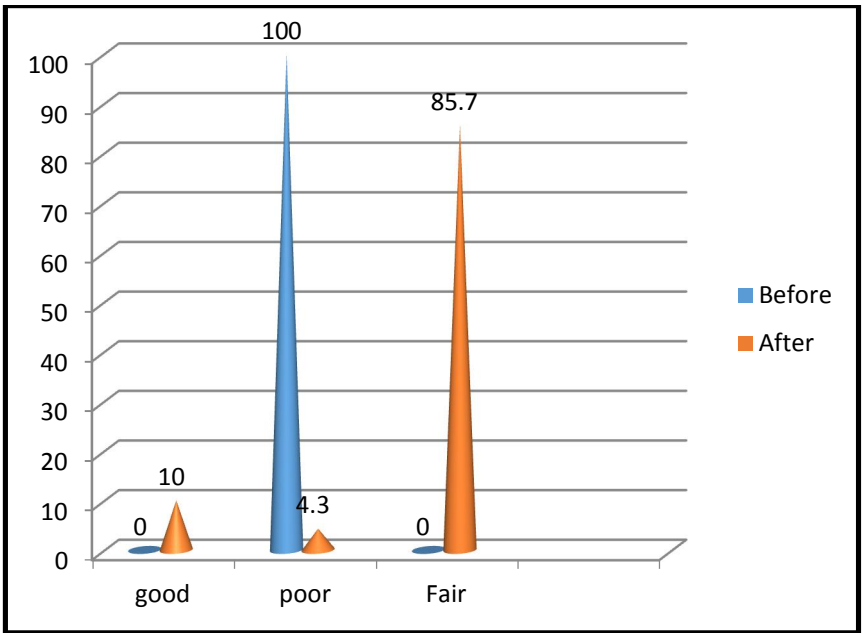

Figure (I): Study group overall knowledge scores before and after program implementation.

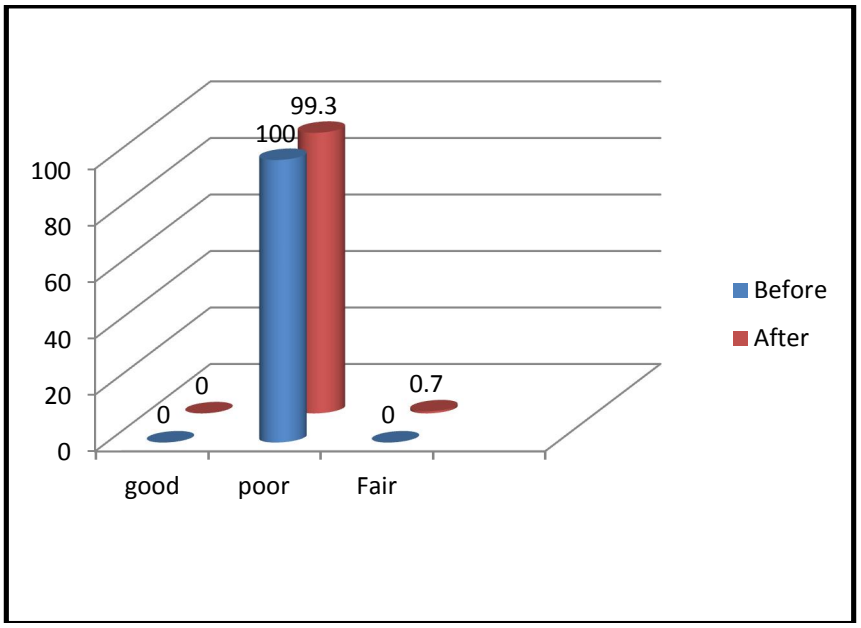

Figure (II): Control group overall knowledge scores before and after program implementation

Figure (III) Portrays Distribution Of The Studied Sample According To Their Overall Total Mean Score.

It is apparent from this figure that the overall mean score for the study group before the educational intervention was (12.79 ± 7.99), whereas the control group was (13.03 ± 8.26), with no statistically significant difference between both groups (t-test= 0.243, P = 0.808). On the contrary, after the educational intervention, the mean score for the study group rose to (79.24 ± 11.62), whereas the control group remained the same (13.20 ± 8.27), with a statistically significant difference between both groups (t-test= 54.792, P = <0.001). Additionally, three months after the educational intervention, the mean score for the study group was (78.79 ± 11.49), whereas the control group was (14.10 ± 9.18), with a statically significant difference between both groups (t-test= 52.037, P = <0.001).

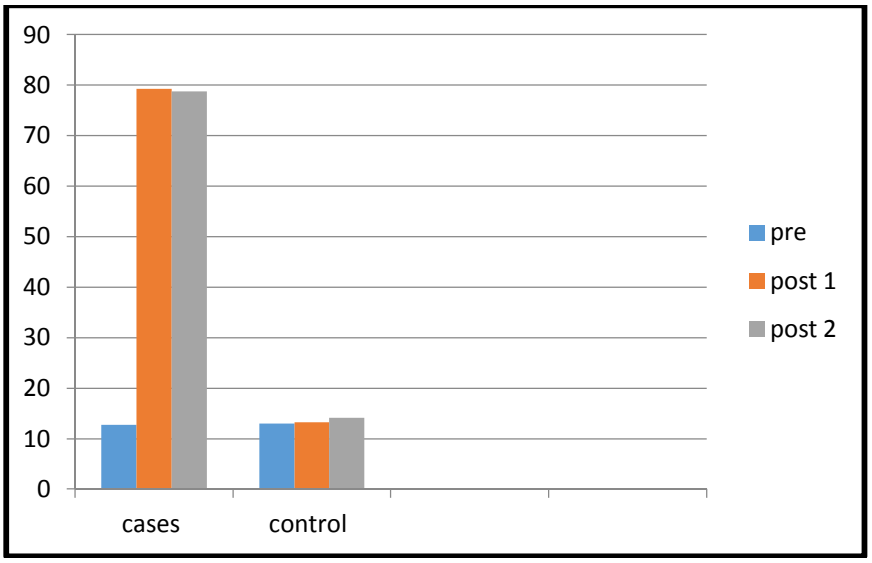

Figure (IV): Distribution Of The Studied Sample According To Their Overall Total Mean Score.

Table (IV): Puzzles out the Relation between the students' knowledge level and their socio-demographic characteristics. It was evident that two fifth (40%) of the students aged from 18 to less than 19 years had good knowledge, whereas the majority (90.8%) of the students aged from 16 to less than 17 years had fair knowledge. Moreover, it can be noticed that the age had significant effect on the knowledge score (X2= 15.929, P=0.014*).

Concerning the department, the table reveals that less than one fifth (15.8 %) of the students in the welding department had good knowledge score, whilst the vast majority (95.5%) of the students in the foundry department had fair knowledge. There was positive significant relation between the department and the knowledge score of the students (X2= 14.150**,** P=0.007*).

It can also observed from the table that factors such as place of residence, family income, crowding index, Mother's level of education, Mother's occupation, Father's level of education, and Father's occupation of the studied sample had an insignificant effect on their knowledge score. (X2= 1.897**,** P=0.387, X2= 2.593, P=0.274, X2= 0.809, P=0.667, X2= 9.028, P=0.529, X2= 5.503, P=0.064, X2= 4.377, P=0.929, X2= 0.338, P=0.844).

Table (V): Relation between the students' knowledge level and their socio demographic characteristics

Item	Knowledge level						Total n=140		Test of significance
	Poor (n=6)		Fair (n=120)		Good (n=14)				
	No.	%	No.	%	No.	%			
Age									
- 15-	1	7.7	8	61.5	4	30.8	13	9.3	X2= 15.929
- 16-	1	1.5	59	90.8	5	7.7	65	46.4	P=0.014*
- 17-	4	7.0	50	87.7	3	5.3	57	40.7	
- 18-<19	0	0.0	3	60.0	2	40.0	5	3.6	
Department									
- Welding	1	1.3	63	82.9	12	15.8	76	54.3	X2= 14.150
- Lathing	5	11.9	36	85.7	1	2.4	42	30.0	P=0.007*
- Foundry	0	0.0	21	95.5	1	4.5	22	15.7	
Place of residence									
- Urban	3	3.4	75	84.3	11	12.4	89	63.6	X2= 1.897
- Rural	3	5.9	45	88.2	3	5.9	51	36.4	P=0.387
Family income									
- Enough	0	0.0	14	100.0	0	0.0	14	10.0	X2= 2.593
- Not enough	6	4.8	106	84.1	14	11.1	126	90.0	P=0.274
Crowding index									
- < 1.5	2	3.6	46	83.6	7	12.7	55	39.3	X2= 0.809
- ≥ 1.5	4	4.7	74	87.1	7	8.2	85	60.7	P=0.667
Mother's level of education									

- Illiterate	0	0.0	11	84.6	2	15.4	13	9.3	X2= 9.028
- Read & write	0	0.0	2	66.7	1	33.3	3	2.1	P=0.529
- Primary education	0	0.0	4	80.0	1	20.0	5	3.6	
- Preparatory education	0	0.0	9	90.0	1	10.0	10	7.1	
- Secondary education	5	7.2	61	88.4	3	4.3	69	49.3	
- University education	1	2.5	33	82.5	6	15.0	40	28.6	
Mother's occupation									
- Working	5	7.6	52	78.8	9	13.6	66	47.1	X2= 5.503
- Not working	1	1.4	68	91.9	5	6.8	74	52.9	P=0.064
Father's level of education									
- Illiterate	0	0.0	4	80.0	1	20.0	5	3.6	X2= 4.377
- Read & write	0	0.0	1	100.0	0	0.0	1	0.7	P=0.929
- Primary education	0	0.0	1	100.0	0	0.0	1	0.7	
- Preparatory education	0	0.0	12	80.0	3	20.0	15	10.7	
- Secondary education	3	6.5	40	87.0	3	6.5	46	32.9	
- University education	3	4.2	62	86.1	7	9.7	72	51.4	
Father's occupation									
- Working	6	4.3	118	85.5	14	10.1	138	91.4	X2= 0.338
- Not working	0	0.0	2	100.0	0	0.0	2	8.6	P=0.844

X2 Chi square test * statistically significant at ≤ 0.05

Figure (V):. Conveys Distribution of the Study Group according To Overall Score of Knowledge by Department after the Educational Intervention. It can be observed from the figure that more than half (59.2%) of the study group in the welding department had good knowledge, whereas more than one third (34.3%) of them had poor knowledge and only 6.5% of them had fair knowledge. Pertaining to lathing department, more than three quarters (83.3%) of the students had good knowledge and more than one tenth (16.7%) had poor knowledge. Also it can be noticed that more than half (59.1%) of the students in foundry department had good knowledge, whereas more than one quarter (31.8%) of them had fair knowledge and the minority (9.1%) had poor knowledge.

Figure (VI): Portrays Distribution Of The Control Group According To Overall Score Of Knowledge By Department After The Educational Intervention. It is clear that none of the control group had good knowledge. Concerning welding department, the majority of the students had poor knowledge and the minority (9.1%) had fair knowledge. Regarding lathing department, more than three quarters (85.7%) of the students had poor knowledge and the rest of them had fair knowledge. Moreover, less than three quarters (71.4%) of the students in foundry department had poor knowledge, whereas the rest of them had fair knowledge.

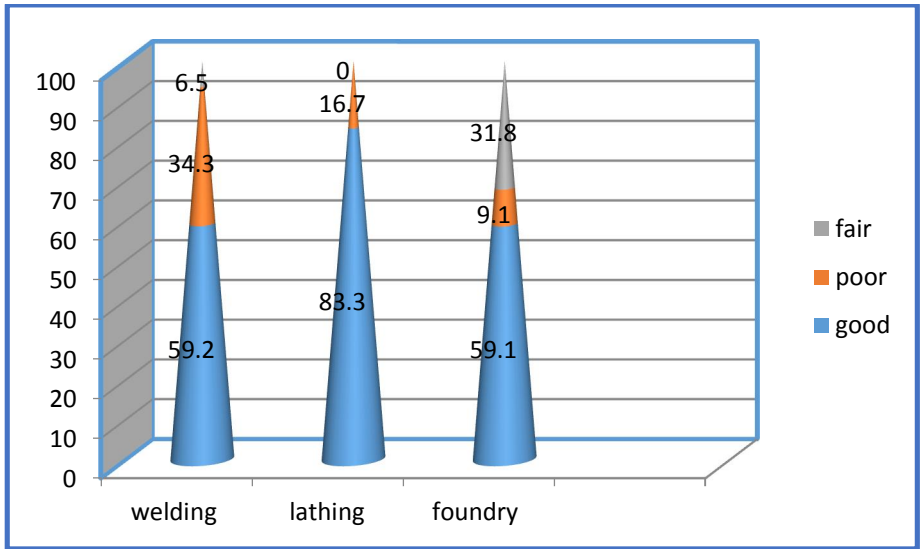

Figure (VII): Distribution of the Study Group according To Overall Score of Knowledge by Department after the Educational Intervention

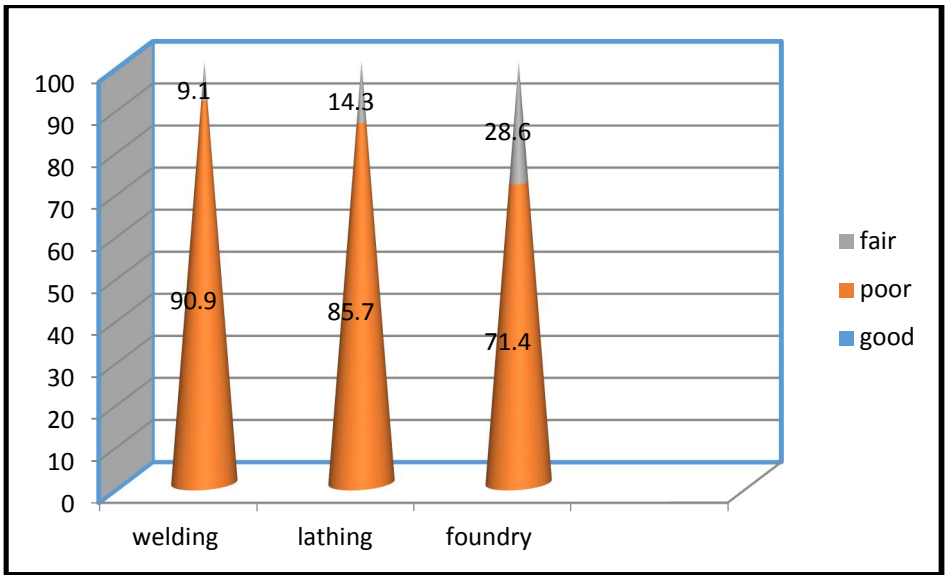

Figure (VII): Distribution Of The Control Group According To Overall Score Of Knowledge By Department After The Educational Intervention.

Table (VII): Available Environmental Safety Measures In Different Mechanical Workshops

Items	Pre program						Post program					
	Welding (n = 3)		Lathing (n = 4)		Foundry (n = 2)		Welding (n = 3)		Lathing (n = 4)		Foundry (n = 2)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
House keeping												
Incomplete	3	100.0	4	100.0	2	100.0	1	33.3	1	25	0	0.0
Complete	0	0.0	0	0.0	0	0.0	2	66.7	3	75	2	100
Ventilation												
Incomplete	3	100.0	4	100.0	2	100.0	3	100	4	100	2	100
Complete	0	0.0	0	0.0	0	0.0	0	0	0	0	0	0
Noise												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lighting												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	3	75.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0
Machine safe working												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Manual tool												
Incomplete	3	100.0	4	100.0	2	100.0	3	100	4	100	2	100
Complete	0	0.0	0	0.0	0	0.0	0	0	0	0	0	0
Electricity												
Incomplete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Complete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Fire protection												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
First aid facility												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Communication facility												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Table (VI): Available environmental safety measures in different mechanical workshops according to the scoring used in this study.

It was observed that before the educational intervention all workshops had incomplete safety measures as regards the house keeping of the workshops. On the other hand, after the educational intervention, complete safety measures were found in all foundry workshops, three quarters of lathing workshops, and two thirds (66.7%) of the welding workshops. Additionally, it is clear that all of the observed workshops had incomplete safety measures as regards the ventilation system before and after the educational intervention. It is also worth mentioning that before and after the educational intervention all the observed workshops had incomplete safety measures regarding noise.

Moreover, the table shows that in preprogram period all the observed workshops had incomplete safety measures concerning lighting system. Conversely, in the post program period one quarter (25%) of the lathing departments had complete safety measures with respect to lighting system, whereas the rest of the observed workshops still had incomplete safety measures. In addition, the table reveals that before and after the educational intervention all the observed workshops had incomplete safety measures pertaining to machine safe working. It is sorrowfully to mention that none of the observed workshops had complete safety measures regarding manual tools either before or after the educational intervention.

The table also depicts that all the observed workshops had complete safety measures as regards electricity both before and after the educational intervention. As well as that, it was evident that none of the observed workshops had complete safety measures concerning fire protection, first aid facility and communication facility in the entire phases of the educational intervention.

Table (IX): Safety Measures Adopted In Different Workshops During Work Process. It can be observed from the table that none of the welding workshops adopted complete safety measures during working process neither before nor after the educational intervention. On the contrary, complete safety measures were adopted in both lathing and foundry workshops in the pretest and posttest phases.

Table (IX): Safety Measures Adopted In Different Workshops during Work Process

Items	Pre program						Post program					
	Welding (n = 3)		Lathing (n = 4)		Foundry (n = 2)		Welding (n = 3)		Lathing (n = 4)		Foundry (n = 2)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Welding safety												
Incomplete	3	100.0	–	–	–	–	3	100.0	–	–	–	–
Complete	0	0.0	–	–	–	–	0	0.0	–	–	–	–
Lathing safety												
Incomplete	–	–	0	0.0	–	–	–	–	0	0.0	–	–
Complete	–	–	4	100.0	–	–	–	–	4	100.0	–	–
Foundry safety												
Incomplete	–	–	-	-	0	0.0	–	–	-	-	0	0.0
Complete	–	–	-	-	2	100.0	–	–	-	-	2	100.0

Table (X): Protective Devices in Different Mechanical Workshops. The table pointed out that body protection, feet protection, ear protection; hand protection, eye and face protection devices were not adopted in the all observed workshops before and after the educational intervention.

Table (X): Protective Devices in Different Mechanical Workshops

Items	Pre program						Post program					
	Welding (n = 3)		Lathing (n = 4)		Foundry (n = 2)		Welding (n = 3)		Lathing (n = 4)		Foundry (n = 2)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Body protection												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Feet protection												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ear protection												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Hand protection												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eye and face protection												
Incomplete	3	100.0	4	100.0	2	100.0	3	100.0	4	100.0	2	100.0
Complete	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Discussion

World Health Organization (WHO) considers the workplace a priority setting for health promotion in the 21st century. Like other settings where WHO has developed health-promoting initiatives (schools, cities, hospitals, and industries), the workplace can have a very positive impact on the health and well-being of workers, their families, communities, and society at large **(WHO 2011)**.

Safe work and workplace, for increased production and higher productivity, are necessary and hence promotion and protection of safe work and workplace are the complementary aspects of industrial development **(Upadhyaya 2013 & OSHA 2011)**. However, industrial occupations may create unsafe work and work environment because of the inherent sources of hazard present in their material, process, technologies, or products. These sources of hazards may pose the risk of accidents and work related disease to the people within the industrial premises in particular and the general public in the vicinity and the environment in general **(Shafik & Abd-El Mohsen 2012)**.

In technical schools, students have the highest injury rates, as they not only exposed to hazards from school environment, but also from workshops. Moreover, they spend nearly half of their time in workshop training, facing different types of actual and potential hazards **(Guidotti 2011)**.

If students have to participate in activities to promote their health, they must be aware of the risks at work. Young workers (15–24 years old) have a disproportionately high rate of injuries in the workplace and many are employed on a casual, temporary or intermittent basis, in jobs that require low technical skill. One approach to reduce the burden of young worker injury is through improvements in the provision and effectiveness of safety training, initially at school and then in the workplace **(Thamrin 2010)**.

The primary aim of any occupational health and safety program is the prevention of accidents and illness, which employs knowledge as the principal tool. Only accurate knowledge of the risks and adequate training in handling them can enable the worker to adopt appropriate behavior in a hazardous working environment **(Magoro 2012)**.

Previous studies concluded that technical education students had a limited knowledge of how to prevent health risks at work and lacked a systematic way to approach hazard control. Therefore, the aim of this study was to evaluate the effect of educational intervention about occupational safety on knowledge and practice of male students in technical mechanical secondary schools in El-Behira Governorate.

The current findings illustrated that less than half (46.4%, 47.9%) of both the study and the control group respectively were aged between 16 to less than 17 years. While, a minority (3.6%) of both groups were aged from 18 to less than 19 years. With a mean age of 16.39 ± 0.71 among the study group whereas among the control group 16.21 ± 0.71. Furthermore, less than two thirds (63.6%) of the study group were living in urban areas compared to two thirds (66.4%) of the control group.

Concerning the family income, the current study demonstrated that the vast majority of both groups (90%) had not enough income to meet the demands of their lives, and the minority of both groups (10%) had enough income. As regards to the crowding index, the present study demonstrated that the crowding index ranged from 1 to 10 persons/bed room among the study group and from 1-5 among the control group with a mean of (2.4+0.9) and (2.1+0.6) respectively.

Adolescents are a group of apparently healthy individuals. The health status of an adolescent determines the health status in his/her adulthood. Many serious diseases in adulthood have their roots in adolescence. Also, many adolescents do die prematurely due to various reasons that are either preventable or treatable and many more suffer from

chronic ill-health and disability **(Sivagurunathan et al 2015)**.

The nutritional status of adolescents contributes significantly to the health status of the community in which they reside. One of the major global health problems faced by developing countries today is under nutrition **(Mushtaq et al 2011)**. The present study revealed that around two thirds of the study group (61.4%) reported that they had three meals per day compared to more than two thirds (69.3%) of the control group. This was consistent with the study conducted by **Al-Isa A (2018)** who found that nearly two thirds (66%) of the studied sample had three meals daily. Moreover, nearly two fifths (41.4%) of the study group always had breakfast daily compared to more than half (52.9%) of the control group. Furthermore, half of the study group (50%) reported always intake of fast food compared to less than two third (63.6%) of the control group.

Physical activity habits during adolescence and youth are likely to be important influences on habitual physical activity throughout adult life **(Leslie E et al 2012)**. Opportunities for physical activity are largely determined by social, economic, and cultural factors as well as physical environments that influence access, availability and utilization **(Ziglio E 2013)**.The present findings illustrated that less than two thirds (60.7%) of the study group didn't practice any type of exercise compared to more than three quarters (83.6%) of the control group.

Sleep disorders in adolescents are common problems in families and can affect the social, emotional and educational performance **(Dimitriou D 2015)**. The present study illustrated that the mean duration of nocturnal sleep was 5.75 ± 1.68 for the study group and 5.59 ± 1.40 for the control group. This was contradicted with the study conducted by Reisi et al (2017) as the mean duration of nocturnal sleep was 8.38±1.17 **(Reisi M, 2017)**. Moreover, the current findings revealed that nearly one tenth (10.7%) of the study group had sleeping problems compared to less than half of the control group (48.6%). These findings also lend credence to the research findings of **Marques A et al (2019)**.

Male students were significantly more likely than female students to engage in risk behavior in school **(SINGH 2014)**. Such behavior involving substance abuse, un-safe sex and irresponsible driving, may be seen as ways to prove their manliness **(FOX H 2015)**.

The results of the present study illustrated that more than one third (37.1) of the study group reported that they were smokers compared to about one fifth (20.7%) of the control group. However, different picture was reported by **(Mostafa et al 2018)** who indicated that more than one fourth (26.5%) of the studied group were smokers. Furthermore, the current findings demonstrated that neither of the study nor the control group was addicted to any drug. These results disagreed with the study conducted by **(Boini S, et al 2017)** who indicated that more than three quarters (78.8%) of the studied sample were alcoholic and less than one tenth (9.7%) were cannabis user.

Occupational safety and health should be the subject of education, as it prepares students for their future occupation, and further adult education, including retraining. Nowadays, as society supports technical education via dual learning, this issue is becoming particularly necessary. Schools ensure students' safety and health in education, training and other related activities as well as in the provision of school services **(Raykov, M 2013)**.

The present study portrayed that, before the implementation of the educational intervention, all the study group and the control one had poor knowledge regarding occupational health and safety in the school. This may be due to the limited access of information and there were no regular and periodic educational sessions about occupational hazards and occupational health and safety offered to them. In addition, there was a remarkable lack of clear policy, lack of investment and interest in occupational health and safety issues and a shortage of preventive strategies, implemented by the school managers and occupational health and safety supervisors which probably resulted in that significant decline in knowledge, before implementation of the program.

This finding is supported by **(Tetemke et al 2014)** who reported that the practice towards safety information is inadequate. In addition, found that the workers have less knowledge level compared to other studies. Moreover, **(Nasab et al 2009)** depicted that knowledge, attitude and safe behaviors of the workers are unacceptable, so they suggested and concluded that managers should design and implement educational interventions to promote knowledge of workers.

Although after the implementation of the educational intervention more than half (52.8%) of the study group had good level of knowledge concerning occupational safety, whilst the entire control group had poor level of knowledge. There was highly significant impact of education on study's group's knowledge throughout the study. This remarkable and obvious improvement could be attributed to the effect of the implemented program. These findings strongly support the hypotheses that the level of workers' knowledge will be improved after implementation of the educational intervention.

Safe work and workplace, for increased production and higher productivity, are necessary, therefore promotion and protection of safe work and workplace are the complementary aspects of industrial

development **(Upadhyaya 2015 & OSHA 2011)**. However, industrial occupations may create unsafe work and work environment because of the inherent sources of hazard present in their material, process, technologies, or products. These sources of hazards may pose the risk of accidents and work related disease to the people within the industrial premises in particular and the general public in the vicinity and the environment in general **(Sultan 2011)**.

The current findings depicted that the vast majority of the study and the control group had poor knowledge regarding occupational hazards before implementation of the educational intervention. This could be due to lack of periodic health education sessions about occupational hazards. These findings are congruent with other studies conducted by **(Shafik S 2016)** and **(Gebrezgiabher et al 2019)**. However, these findings were contradicted with **(Adebola et al 2014)** who stressed that the education and advice concerning specific work hazards are essential.

While after the educational intervention, the results of the study revealed that, around two-fifths of the study group expressed higher total knowledge score compared to the control group. There was highly significant impact of education on study group knowledge throughout the study. This remarkable and obvious improvement could be attributed to the effect of the implemented program. This finding correspond with the results of **(Padmini et al 2013)** and **(Sayapathi B 2014)**.

Every year, International Labor Organization (ILO) reports that, job related accidents and diseases claim estimated 2.34 million lives of men and women giving daily loss of 6,300 lives due to work related causes. Moreover, 160 million occupational diseases are reported each year **(ILO 2013)**.

The current study elaborated that the vast majority of both the study and the control group had poor knowledge regarding school accidents before the implementation of the educational intervention. This finding may be explained by the lack of training programs. These findings are congruent with **(Esaiyas et al 2018)** and **(Deebom et al 2019)**.

In point of fact, after implementation of the educational intervention, the study group showed significant improvement in their knowledge compared with the control group as less than half (40%) of the study group had good knowledge regarding school accidents compared to only 2.9% of the control group. There was highly significant impact of education on study's group's knowledge across the three stages. This is in the same line with the results of other studies by **(Saleh DA 2009)**.

Safety is the prime requisite in all the work places. Workplace safety affects everyone in school workshop environment, including staff, students, and visitors. A safe and healthy working atmosphere is a basic necessity and has to be ensured in the technical education workshop without fail **(Moksen 2013)**.

The current findings demonstrated that before the educational intervention, the entire study group and the control one had poor knowledge about safety measures that must be available in the workshop. This may be due to the limited access of information and there were no regular and periodic educational sessions about safety measures. These findings were in agreement with other studies conducted by **(Andersson et al 2014)** and **(Balanay et al 2014)**.

However, after the educational intervention, the current findings portrayed that the study group expressed higher total knowledge score compared to the control group as more than two thirds (68.5%) of the study group had good level of knowledge concerning safety measures that must be available in the workshops whereas the entire control group still had poor level of knowledge. There was highly significant impact of education on study's group's knowledge throughout the study.

This remarkable and obvious improvement could be attributed to the effect of the implemented program, which included all information and skills required for the study group to help them to understand the necessity of safety measures that will help them to avoid the occurrence of higher levels of occupational hazards at the workplace and to the fact that it was custom-tailored to workers' needs. These findings strongly support the hypotheses "that the level of students' knowledge and practice will be improved after implementation of the educational intervention. These findings were comparable with other study conducted by **(Gyekye et al 2015)**.

In the general, school students have poor knowledge about safe working conditions during injuries, so most of them must be motivated to learn about first aid and basic life support which are components of chain survival for a person experiencing a life threatening injuries **(Altintas 2015)**.

The present study demonstrated that all the study group and the vast majority of the control one (98.6%) had poor level of knowledge regarding first aids before administration of the educational intervention. This finding may be explained by lack of training and health education sessions about first aid. These results were in agreement with **(Dasgupta, et al 2014)** and **(Behairy et al 2015)**.

However, the current findings revealed that after implementation of the educational intervention less than two thirds (63.6%) of the study group had good level of knowledge concerning first aids, whereas the vast majority of the control group still had poor level of knowledge. There was highly significant impact of

education on the study group's knowledge throughout the study. These findings were matching with the other studies conducted by **(Al-Robaiaay 2013) and (Abd El-Hay et al 2015)**.

Regarding the relationship between the study group total knowledge score and their socio-demographic characteristics, the findings of the current study exhibited that, there was a statistical significant association between age of the study group and their total knowledge score. This can partly be explained by the fact that educated workers have better access to occupational health and safety information. This finding is in agreement with **(Malik et al 2010)** who reported that age is significantly associated with good knowledge about occupational health and safety.

The current study elaborated that there was a statistical significant association between the department and the total knowledge score of the study group. This may be due to variations in number of the students in several departments which enable the students in retention of knowledge. This finding comes in line with the study conducted by **(Tetemke, D et al 2014)** who reported that there was a statistical significant association between the work section and the knowledge score of the study subjects.

On the other hand, it was apparent that there was no statistical significant relation between place of residence, family income, crowding index, mother's level of education, mother's occupation, father's level of education, father's occupation and the study group total score of knowledge. This finding is agreed with **(Ibrahim et al2017)** who reported that there was no statistical significant association between monthly income, place of residence and total knowledge score of the study group.

School workshops offer opportunities for practical training of students in skill acquisition in their technical trade areas for future development of the key sectors of the economy in order to meet the basic needs of electricity, roads and machinery, among others. Availability of appropriate workshop facilities enhances student learning by allowing them to be involved in demonstrations, and practice which will help them to continue to build their skills **(Umar 2010)**.

However, one of the issues of great controversy among TVE educators today is the issue of the poor state of workshop tools and equipment in TVE institutions in underdeveloped nations. The majority of TVE institutions in developing countries have been forced to perform below standard due to non-availability, poor management of the required facilities in the workshops for effective skills acquisition. Therefore, there is the need to provide adequate workshop tools, equipment and machines for effective implementation of TVE programs in developing nations **(Umunadi 2011)**.

The present study illustrated that all the observed workshops had incomplete environmental safety measures as regards to housekeeping, ventilation, noise, lighting, electricity, fire protection, manual tools, machine safe working, first aid facility and communication facility. This may be due to low financial resources allowed to technical mechanical secondary school workshops. Similar findings were reported by (**Shafik S et al 2016) and (Deebom et al 2018)**. The study conducted by Shafik S et al (2016) illustrated that that half (50) of factories environment having good applicable of sanitation, ventilation and lighting while 100.0% had poor applicable for presence of safety measure and precaution sign. Deebom et al (2018) et al revealed that the workshops environment were restricted, had poor housekeeping, poor ventilation, poor illumination, the power tools were not properly grounded and insulated, had defective tools and equipment.

It was noticed in the present study that none of the welding workshops adopted complete safety measures during working process neither before nor after the educational intervention. These findings were in agreement with **(Olagbegi et al 2013) and (Yekinni et al 2016)**. The study carried out by Olagbegi et al (2013) portrayed that there were inadequate fire extinguisher in the laboratory; poor ventilation including hot shop and machine shop, faulty and old door locks, especially in the thermo fluid laboratory; little or no use of personal protective equipment, no working fire alarm, uncovered electrical panels and fuse boxes are related to causes of accidents in thermo fluid laboratory. Also, these findings corroborates with that of Yekinni (2016) who submitted that there were defective conditions of equipment; lack of signals and barricades; improper use of mechanical aid; power tools not properly grounded and insulated; floors, and inside passageway not kept clean.

Personal Protective Equipment or PPE is designed to protect employees from serious workplace injuries or illnesses resulting from contact with.

Chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal Protective Equipment includes face shields, safety glasses, hard hats, safety shoes, coveralls, gloves, ear protection, vests and respirators **(Anaele 2014)**.

The current findings demonstrated that different means of personal protective equipment were not available in the different observed workshops. This might be due to financial resources shortage in these workshops and lack of awareness of the authorized persons about the necessity of personal protective equipment utilization. Otherwise, the current study is

contradicted with the study conducted by **(Sabitu K. et al 2009)** who found that around one third (34.2%) of the welders used one or more types of protective devices against workplace hazards with eye goggles (60.9%), hand gloves (50.3%) and boots (34.5%) being more frequently used.

Conclusion

The entire of the study group had poor total knowledge and practice regarding Occupational Health and Safety before implementation of the educational intervention. However, after conduction of the educational intervention a drastic improvement was occurred with highly statistical significant differences during pre-, post- and follow-up stages. So, the educational intervention was successful in attaining its aim of improving knowledge of the study group regarding occupational health and safety.

Recommendation

- Provision of personal protective equipment's for technical mechanical students in their training workshops.
- Conducting periodic health education sessions about the necessity of personal protective equipment utilization.
- It is necessary that first aid and basic life support courses must be a part of the curricula in industrial secondary school.
- The ministry of education should monitor technical mechanical workshops periodically.
- Conducting health education sessions about dangers of risk taking behaviors among male students in secondary schools.

عن السلامة المهنية على معلومات تعليمي تدخل ثيرأت الميكانيكية ماراسات طلبة المدارس الثانوية الفنيةوم بمحافظة البحيرة البنين

عبير عبد العزيز /د.ا.م [2] - د/ مريم حجاج سليمان.ا[1]
أميرة عبد الرحيم محمد على /د [3] – مدين
م.م/ شيماء محمد أمين[4]

[1]-كلية التمريض - أستاذ تمريض صحة المجتمع جامعة دمنهور
[2]كلية - يض صحة المجتمعتمر مساعد أستاذ جامعة دمنهور -التمريض
[3]المعهد -صحة بيئة العمل وتلوث الهواء مدرس الاسكندرية جامعة - العالى للصحة العامة
[4]جامعة دمنهور – كلية التمريض – مدرس مساعد

الخلاصة

الصحة والسلامة المهنية هى واحدة من أهم جوانب ثيرأت الى تقييم وتهدف هذه الدراسة .الاهتمام البشرى عن السلامة المهنية على معلومات تعليمى تدخل الميكانيكية وممارسات طلبة المدارس الثانوية الفنية وقد اشتملت عينة الدراسة بمحافظة البحيرة البنين على 280 طالب وتم استخدام تصميم شبه تجريبى وتم .خضع لتقييم قبلى وبعدى لتنفيذ هذه الدراسة استمارة :باستخدام ثلاثة أدوات وهى جمع البيانات استمارة ،للطلاب الديموجرافية الخصائص لقياس لقياس معلومات طلبة المدارس الفنية الميكانيكية عن الوسائل ملاحظة لتقييم استمارة ،السلامة المهنية هذا وقد أسفرت.الأمنية داخل ورش التدريب المختلفة مجموعة (46.4%, 47.9%)النتائج على أن أقل من نصف تتراوح أعمارهم بين الدراسة والمجموعة الضابطة مجموعة) وأن كلا المجموعتين .السادسة والسابعة عشر كانت لديهم معلومات (الدراسة والمجموعة الضابطة ولكن بعد ضعيفة وذلك قبل تنفيذ البرنامج تطبيقه حدث تحسن كبير وملحوظ وذو دلالة احصائية ، (85.7%) ديهم معلومات جيدة الىحيث زادت نسبة من ل من المجموعة الضابطة (99.3%) بينما الغالبية العظمى الى وأشارت النتائج أيضا .مازال لديهم معلومات ضعيفة وجود علاقة ايجابية وذات دلالة احصائية بين القسم وخلصت الدراسة الى أن .وبين معلومات مجموعة الدراسة حا فى تحقيق الهدف المرجوكان ناج البرنامج التعليمى منه حيث أدى الى تحسين ايجابى فى معلومات مجموعة وقد أوصت الدراسة .المهنية الدراسة حول السلامة والصحة بضرورة توفير أدوات الوقاية الشخصية للطلاب أثناء دراج موضوعاتالتدريب داخل الورش بالمدارس وضرورة ا السلامة والصحة المهنية فى مناهجهم الدراسية.

الكلمات الدالة المرشدة: تدخل تعليمى ، الصحة المهنية ، معلومات ، المدارس الثانوى الفنى الميكانيكى.

1/21/2021