

## Environmental Health Hazards and Safety Measures among Secondary Technical Schools at El Fayoum City

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**Abstract: Background:** Technical education represents a large proportion of a secondary education schools, students with low experience may expose to many types of hazards, which may affect their health and safety. **Aim of the study:** Assess environmental health hazards and safety measures among secondary technical school students at El Fayoum City. **Design:** A descriptive study design was used in this study. **Setting:** This study was conducted in four technical secondary schools in El Fayoum City. **Sample:** 171 male students were chosen by multi stage random sample in this study. **Tools:** Two tools were designed, **I:** Interview questionnaire consists of three parts designed to assess: socio demographic characteristics, student's health history, student's knowledge about health hazards, safety measures, the role of the school nurse and student knowledge about reported practices regarding using of safety measures. **II:** part 1: Observational checklist to assess safety of the school environment, part 2: observational practices regarding use of safety measures. **Result:** The current study shows that more than two third (70%) have a satisfactory knowledge about health hazards, half of schools 50% have a safety school environment. 67.8 of the students reported that unavailability of safety measures is the barrier to use it. Less than half of them 45% have satisfactory knowledge about reported practices regarding safety measures, only 4.1% have First aid courses and 4.7 % have Industrial Safety courses. 28.7 of students exposed to noise and 20.5 exposed to Entry of flying dust in the eye. **Conclusion:** More than two third of Secondary technical students have satisfactory knowledge about environmental health hazards which can affect them in the school workshops, the majority of them exposed to one or more hazard in school workshops as they exposed to different types of hazards which may be physical, mechanical, chemical and electrical. **Recommendations:** It is recommended to: scheduling training courses about industrial safety and first aid.

**Keywords:** occupational hazards, safety measures, technical schools students, El Fayoum city

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### I. Introduction

Technical secondary education (industrial, agricultural and commercial), in Egypt technical secondary education has two strands. The first provides technical education in 3-year technical secondary schools, the second provides more advanced technical education in an integrated 5-year model; the first three years are similar to those of the former type and the upper two years prepare graduates to work as senior technicians[1].

The school setting can be seen as an occupational environment where future employees and employers develop their physical, social, cognitive, moral and ethical skills. Pupils are often exposed to similar physical and psychological hazards as workers[2], Since the nature of the technical and vocational education system is career oriented, the mentality of the students usually emphasizes specialized subjects and neglects general curricula[3]. Students' views of occupational safety are of great importance for their behavior and perception of risk. A Canadian study found that many young students considered accidents to be a part of their work, simply because work-related accidents are common and normally not very serious. These students were not aware that they could take certain measures to avoid such accidents to a great extent. Youngsters are eager to please their

superiors and fear to lose the job because of complaints or demands directed to supervisors or more experienced coworkers [4].

A healthy and safe physical school environment promotes learning by ensuring the health and safety of students and staff. The physical school environment including the school building and its contents, the land on which the school is located, and the area surrounding it ,a healthy school environment will address a school's physical condition during normal operation as well as during renovation (e.g., ventilation, moisture, temperature, noise, and (natural & artificial lighting), and protect occupants from physical threats (e.g., crime, violence, traffic, and injuries) and biological and Chemical agents in the air, water, or soil as well as those purposefully brought into the school (e.g., pollution, mold, hazardous materials, pesticides, and cleaning agents) [5].

The school nurse (SN) as the key personnel in school health services contributes to the protection, promotion and assessment of student and school staff health , recent research shows that the role of the SN has changed significantly. The complex role of the SN involves; developing and implementing a health plan; providing ongoing information on health by offering consultancy to students, parents and school staff for helping them solve health problems and acquire behaviors that assist them in maintaining a healthy lifestyle, promoting a healthy and safe environment for the students[6].

### **1.1 Significance of the Study**

In the academic year 2014/2015 in Egypt, out of the 3.2 million students enrolled in secondary school, 52% were in the ministry of education (MoE), administered vocational secondary schools, which offer three-year technical diplomas, five-year advanced diplomas and specializations in industrial, commercial and agricultural skills. The most popular of these was industrial (49%), then commercial (41%) and lastly agricultural (10%), a significant number of young Egyptians are in long-term and short-term vocation training centers (VTCs). Historically, a total of 16 ministries has been responsible for public VTCs and institutes offering courses that lead to diplomas[7].

Technical Schools are involved in many activities that present a range of hazards. These hazards and associated risks must be managed to ensure the safety of staff, students and others[8]. Injury is the leading cause of death and long term disability and a significant contributor to health care costs among youth worldwide, especially those aged 15 - 19 years. In Egypt, Injury represents 20% of total deaths. A total of 21.7% of nonfatal injuries occurred in the age group 10 -19 In spite of that, limited attention has been paid to injuries as a major public health problem, in the same study which conducted for 12 months on 897 secondary school students at Cairo government it was found that the prevalence of injuries among secondary school students was 68.5%, Unintentional injuries were the most common injuries falls (50%) and burns (38.6%)[9].

### **1.2 Aim of the study**

The aim of the current study was to assess the environmental health hazard and safety measures among secondary technical schools at El Fayoum city through:

- Assess the students' knowledge about environmental hazards and safety measures.
- Assess the safety environment.
- Assess the students reported practice regarding use of personal protective equipment and first aids

### **1.3 Research Question:**

- Are the students having knowledge about the environmental health hazard?
- Are the student previously exposed to any health hazards?
- Are the students having knowledge about safety measures?
- Are the students have a reported knowledge about practices regarding use of personal protective equipment and first aids.
- Is there any relation between socio, demographic characteristics and students' knowledge about health hazards?

- Is there any relation between student exposure to health hazards and their knowledge about using of safety measures?
- Is there any relation between socio, demographic characteristics and total satisfactory knowledge safety measures which needed to control these hazards?

## II. Subjects and methods

### 2.1 Research design:

A descriptive research design was used to conduct the present study.

### 2.2 Research Setting:

The study was conducted in 4 governmental secondary technical schools in El Fayoum city these were: El Fayoum Secondary industrial decorative School for male, Itsa Secondary industrial for male, El Fayoum secondary Agricultural school, and El Fayoum secondary mechanical school for male.

### 2.3 Subjects:

The subjects of the present study included 171 students from secondary technical schools chosen randomly from included schools

### 2.4 Sampling technique:

A multistage random sample technique used for selecting of the study sample, First stage was selected randomly 10% of the total number of government secondary technical schools in El Fayoum city which was (four schools) as the total number of government secondary technical schools in El Fayoum city is 36 schools, so four schools chosen randomly for this study. Second stage, one stage of the all grades has chosen (3rd year). Third stage, one class of the selected stage will be chosen randomly. Fourth stage, all students in the selected classroom have been taken, and according to certain criteria as male students have been involved only in the study. This sampling resulted in four classes with average from 35 to 52 students in each class and with total of 171 male students aged from 16 to 19 years

School name	No of 3 <sup>rd</sup> year classes	No of students in chosen class
El Fayoum Secondary industrial decorative School for male	21	35
Its Secondary industrial for male	19	44
El Fayoum secondary Agricultural school	19	52
El Fayoum secondary mechanical school for male	30	40
Total No of student		171 students

### 2.5 Tools of data collection

**Tool I: Interviewing Questionnaire:**(Appendix I): the investigator designed the questionnaire based on literature review and approved by supervisors, it was written in sample Arabic language, it consists of three parts:-

**Part I:** Socio demographic characteristics; it covered items such as (age, type of department and a number of training courses) (Q1-Q3)

**Part II:** students health history about hazards which faces them during their training in the school workshops previously, it includes questions about( Entry of sharp objects on the Foot, Collision with machines in workshops, Entry of flying dust in the eye, Expose to a Short circuit Contact between chemical materials and skin, Ingestion of toxic material, Burns caused by exposure to caustic materials, Fall from height , Loss of concentration during training, Exposure to noise, Notify the supervisor about the injury, Receive first aid inside the school, Enter the hospital due to injury). (Q1-Q14)

**Part III:A.** Student knowledge about environmental health hazards It including question covered all types of environmental health hazards (mechanical, chemical, electrical, physical). (Q1-Q4).

**B.** Student knowledge about safety measures which needed to control these hazards and first aid. It includes questions as Industrial safety goal in the school, Protection of electrical, fire and mechanical hazards, safety barriers, hand tools and personal protection clothes. (Q5-Q17)

**C.** Student knowledge about the role of the school nurse in promoting safe and healthy school environment. It includes question covered items as the presence a nurse in the school, the nurse role in the school. (Q18-Q19).

**Scoring system:**

For all knowledge items, correct answer was scored 1 and incorrect answers were scored 0.

Score for total knowledge were evaluated as:

- 1) Satisfactory knowledge is considered at  $\geq 70\%$
- 2) Unsatisfactory knowledge is considered at  $< 70\%$ .

**Tool II:Part I :Observational checklist:**

It was adopted from the national institution for occupational safety and health (2014)[10], and the university of Edinburgh; health and safety department (2017)[11]to assess environmental school conditions, as safety and sanitation of school training workshop It included **cleanliness and housekeeping** such as (items suitability placed, cleaning of workshop, dry& non-slippery floor, avoid eating and drinking and adequate washing materials), **communication facility** such as (presence of telephone in the school & workshops and presence of emergency telephone list), **lighting** such as (adequate level of illumination, availability of windows, suitable number of lamps& proper distribution of it and lighting system doesn't cause glare), **ventilation** such as (satisfactory ventilation system, suitable temperature, availability of fans and proper disturbance of fans) **fire requirement** such as (removing of waste materials, availability clarity of fire exit, availability of fire extinguisher& it closed, presence of extinguisher instruction, fullness of fire extinguisher, availability of sand pails& it nearly disturbed, avoidance of smoking, fire alarm is easy to be audible, availability of fire hoses& it is in good condition and presence of flammable wall ), **electrical requirement** such as ( electrical panel closed& easily accessible, every panel has label, used of acceptable cable, electrical switch for each machine, presence of master control and presence of safety signs ) **machine safeguarding** such as (all machines are guarded & has its power switch and availability of instructions precautions) **personal protective equipment** such as ( availability and appropriateness of body, protection , hand, foot, respiratory, face, eye and ear protection) and **medical services & first aid** such as ( availability of medical person, availability& adequacy of first aid box and clearly labeling each supply.)

**Scoring system:**

Evaluating the score observational checklist sheet of school safety environment. It was as follows Each item was scored as Available: (1), Unavailable: (0)

Total Score for evaluating environmental competency were evaluated as:

Competent is considered at  $\geq 60\%$

Incompetent is considered at  $< 60\%$ .

**Part II:** practices regarding use of safety measures using a rating scale of 2 levels; a know (1) mark, an unknown (0) because it is a positive practice as using of safety measures and barriers to using safety measures. (Q1-Q2). Scoring system:

Measuring the score of students practices toward occupational hazards: A known item was scored one point (1), An unknown item was scored zero (0)

These scores were converted into percent score. The students practices were considered done score was  $\geq 70\%$ , the score was considered not done if the percent was less than 75%

**Validity:** Tools are submitted to a panel of five reviewers and experts; they examined and reviewed the tools for the face and content coverage, clarity, length, and formatting of tools, redesigning and modifications done according to panel recommendations.

**Reliability:** Reliability test for questionnaire items was done by cronbach alpha test. The result was 0.80.

## **2.6 Pilot study**

The pilot study was conducted in December 2017 on 10% from the sample (17) secondary technical school student, students were chosen randomly from the included schools in the study to determine its clarity applicability and feasibility, each student was included in the pilot study already excluded from the main study sample, Pilot study was aimed to estimate the time needed for completing the study tools, time needed for the questionnaire was 20 to 25 minutes, after pilot study was done, data were analyzed and tools modified, redesigned, reviewed by the supervisors, and the final design was developed.

## **2.7 Fieldwork**

The collection of data was started from the middle of February until the middle of May 2018, the researcher visit the included schools, two days weekly in two periods of time from 9:00 am to 12:00 pm or from 1:00 pm to 3:00 pm. The researcher firstly explain and clarify the aim of the study to the school director, then for the school supervisor, class teacher and for the students included in the study to gain their support and to be aware of the study's importance, with the selected class from each school, the researcher distribute the questionnaire sheets for each student and asked them to answer individually to all questions. For the observational checklist the researcher assesses each school workshop and its environment during student training.

## **2.8 Administrative design**

An official letter requesting permission to conduct the study was submitted from, the faculty of Nursing Helwan University then from El Fayoum Directorate of Education, then from the director of each school included in the study.

## **2.9 Ethical considerations:**

Ethical Consideration: All relevant ethical aspects were considered for ensuring the confidentiality of the collected data through; gaining oral consent for participation in the study, explaining the purpose of the study, right to refuse to continue participation at any time without giving any reasons.

## **2.10 Data management:**

Data was analyzed using the statistical Package for Social Sciences (SPSS) version 20. The first part of the data were descriptive data, which were revised, coded, tabulated and statistically analyzed using the proportion percentage, arithmetic means, standard deviation, and range. The second part of data dealt with, relation between different variables. The mean and standard deviation of the total score were calculated.

1-The arithmetic mean (X) as an average describing the center tendency of observation.

2-The standard deviation (SD) as a measure of dispersion of the results around the mean.

3-Correlation study (r).

Degrees of Significance of the results were:

Non-significant (NS)            if  $p > 0.05$

Significant (S)                if  $p < 0.05$

Highly Significant (HS)        if  $p < 0.01$

## **III. Results**

Table (1): shows that 60.8 % of student with age  $17 \geq 19$  years with the mean age,  $18.2 \pm 4$ , regarding the types of department 30.4% were Tractors and agricultural machine, 25.1% were Cooling & Air Conditioning department, regarding the training courses the majority of them 91.2% didn't have any training courses.

Table (2): shows that 28.7 % of students exposed to noise, 20.5% exposed to Entry of flying dust in the eye, 19.3 % of them exposed to Loss of concentration during training while 12.3% exposed to Collision with machines in workshops, 1.2 % of students exposed to fall from height and Ingestion of toxic material 56.4% of

students notified their supervisors about their injury, 39.2 % of them received first aid in the school and only 6.4 % enter the hospital due to their injury.

Table (3), shows that 59.6% of students reported that the light body fluttering in the shape of the Reich is the most common, affecting their eyes and skin, 52.6 see that walking on sharp objects like nails or broken glass could also do harm. 49.7% of them see that non-insulated wire contact is the most common electrical hazards while 40.9 reported that contact with damage motor could occur. With the chemical hazards 61.9% of students reported that caustic materials can affect them while gases was the reason of harm for 32.2% of them. 52.6% of them reported that physical hazards may be in the form of lack of concentration while 35.1 % of them say that high temperature and high humidity is the reasons.

Figure (1): shows that 70% of students have satisfactory knowledge regarding environmental health hazards and 30% of them didn't have satisfactory knowledge about this hazards.

Table (4): shows that 58.5% of students reported that the condition of the electrical connections in the workshops safe and secure. While only 20.4 % see that connecting the equipment to the ground cable may protect. Regarding fire protection 65.4% of students reported that availability Emergency doors are the suitable way for fire protection, while availability of fire extinguishers is reported by 47.9% of students.

Table (5) represents that 66.6% of students agreed that the machines maintained and lubricated periodically. For the Safety measures should be available when dealing with machines 57.3% of them reported to Presence of an appropriate distance between the student and the machine. Also 52% see that presence of Safety barriers is needed. Regarding hand tools 69.0% reported that the Conditions which should be available in hand tools is weapons are intact, while 61.4 reported that its hands are intact.

Figure (2): shows that 60% of students have satisfactory knowledge regarding safety measures and 40% of them didn't have satisfactory knowledge.

Table (9): shows that 10.5 % of them agreed to the presence of a doctor in the school. 44 % of them

Table (6): shows that 38.6% of students know to disinfect wounds with betadine when injury occurs, 52.3% of them reported that they will wash burn with water. 32.2% of students reported that they will call the medical person if an electrical shock occurred. 58.5% of them reported that they will wash eye with soap and water if any flying dust enter the eye, 11.7% of students reported that to avoid moving person in case of fall from height

Figure (3): shows that 45% of students have done practices regarding using safety measures&first aid and 55% of them did not do practices regarding using safety measures&first aid

Table (7): shows that 44 % of them agreed to the presence of the nurse in the school while 11.6 did not know. Regarding to the role of the nurse in the school 70.1% of the students reported that nurses should provide necessary first aids when accident occur, 43.8% of them have knowledge that nurses should registrate the students who are suffering from accident inside the school.

Figure (4): shows that 60% of the students didn't have satisfactory knowledge about the role of the school nurse and only the 40% of them know about the role of the school nurse in promoting safe and healthy school.

Table (8): shows that 88.9% of workshop equipments are suitably placed in Its Secondary industrial school and 87.5of them in El Fayoum Secondary industrial decorative School. 100% of workshops floor are dry and non slippery. 100% of schools have a telephone.

Table (9): shows that 100% of workshops have an adequate general level of illumination, 88.9% of workshops in Its Secondary industrial school have suitable number and proper distribution of lamps, 100% of workshops have a satisfactory General ventilation system, Fire exit and Fire extinguishers. 71.4 % of fir exit paths from the workshop are clear of obstruction and suitably signed in El Fayoum secondary Agricultural school while only 44.4% in Its Secondary industrial. 87.5% of fire alarms are easily audible in the Secondary industrial decorative School. Non-flammable wall is not available in 100% of school workshops

Table (10): shows that Electrical panels are closed in 100% of workshops, 100% of workshops have an electrical switch for each machine, 75 % of the machines are guarded and 50% of them have master control switch in El Fayoum Secondary industrial decorative School and El Fayoum secondary mechanical school.

Table (11): shows that 100% of students wear safety clothes (Lab coats), while there is an absence of Head protection, Hand protection, Respiratory protection and Face, eye & ear protection in 100% of workshops.

Safety boots are available in 25% of El Fayoum Secondary industrial decorative School workshop. Medical person is available and first aid box is presented in El Fayoum Secondary industrial decorative School

Figure (5) shows that, total environmental safety assessment of all schools in El Fayoum City, where in El Fayoum Secondary industrial decorative School for male is 60.9% availability with safety items, 62.3% is the availability score of Itsa Secondary industrial for males, while 46.4% and 47.8% Respectively represent the availability of safety items in El Fayoum secondary Agricultural school and El Fayoum secondary mechanical school

Table (12): shown that. 87.7 % of students wear the Lab coat, 4.6% wear gloves and ear protection. Regarding the barriers of using personal protective measures, 67.8% of them chose that personal protective measures in the schools are not available while 57.8 said that the personal protective measures not suitable for using and only 21.6 agreed that it disrupt the work.

(13): As regard the relation between socio demographic characteristics of students and total correct knowledge score level about environmental health hazards Safety measures in Both Setting. The table shows that were statistically significances in relation between total correct knowledge score level about safety measures and age with ( $P < 0.001$ ) and there was no significant relation within a type of department and training courses.

Table (14): As regard the relation between socio demographic characteristics of students and total correct Knowledge Score level about Safety measures in Both Setting. The table show that was statistically significances in relation between total correct knowledge score level about safety measures and socio-demographic characteristics with ( $P < 0.05$ ) on which statically significant difference was detected by age and training courses.

Table (15): As regard the relation between socio demographic characteristics of students and total correct Knowledge Score level about Safety measures in Both Setting. The table show that was statistically significances in relation between total correct knowledge score level about safety measures was and socio-demographic characteristics with ( $P < 0.05$ ) on which statically significant difference was detected by age and training courses.

**(Table 1):** technical school Student's distribution according to their Socio-Demographic Characteristics (n=171).

<b>1. Socio-Demographic</b>	No	%
<b>Age</b>		
16 >17	67	39.2
17 ≥19	104	60.8
<b>Mean ± SD = 18.2 ± 4.7</b>		
<b>Types of department</b>		
Electricity	20	11.7
Wrought iron and welding	28	16.4
Precision equipment	1	.6
Fittings	4	2.3
Carpentry (Furniture - Building)	2	1.2
Cooling & Air Conditioning	43	25.1
Tractors and agricultural machine	52	30.4
Cars	21	12.3
<b>Training courses</b>		
First aids	7	4.1
Industrial Safety	8	4.7
Did not get any training courses	156	91.2

**Table (2):** health history among secondary technical school students about environmental health hazards which may face them previously in the school training workshop (n=171)

Items	YES		No	
	No.	%	No.	%
<b>Expose to health hazards during training in the school workshop?</b>				
1. Entry of sharp objects on the Foot	18	10.5	153	89.5
2. Collision with machines in workshops	21	12.3	150	87.7
3. Entry of flying dust in the eye	35	20.5	136	79.5
4. Exposer to a Short circuit	5	2.9	166	97.1
5. Contact between chemical materials and skin	4	2.3	167	97.7
6. Ingestion of toxic material	2	1.2	156	98.8
7. Burns caused by exposure to caustic materials	24	14	147	86
8. Fall from height	2	1.2	169	98.8
9. Loss of concentration during training	33	19.3	138	80.7
10. Exposure to noise	49	28.7	122	71.3
<b>In case of (yes) for (exposure to hazards)</b>				
11. Notify the supervisor about the injury	95	55.6	76	44.4
12. Receive first aid inside the school	67	39.2	104	60.8
13. Enter the hospital due to injury	12	6.4	159	93.6
<b>14. How was your treatment when you entered the hospital due to the injury? No (12)</b>				
Health insurance	9	75	3	25
Your expense	3	25	9	75

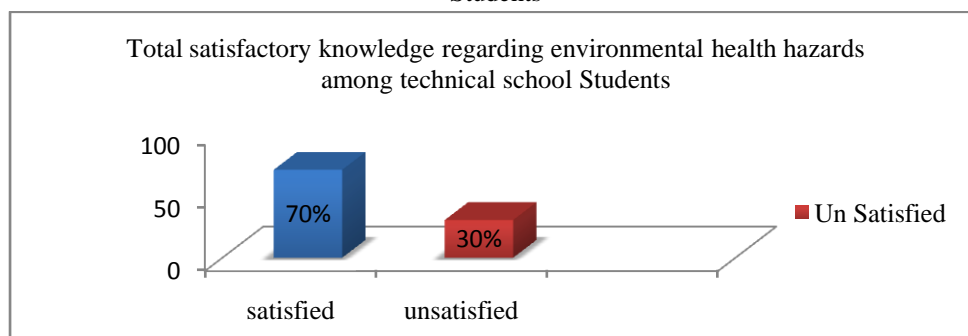
➤ **Items are not mutually exclusive**

**Table (3):** technical school Students satisfactory knowledge regarding environmental health hazards which face them in the school training workshop for both studies setting (n=171)

Items	Satisfactory knowledge	
	No.	%
<b>7. Mechanical hazards:</b>		
a. Walking on sharp objects like nails or broken glass	90	52.6
b. Collision with heavy solid objects	19	11.2
c. Enter or deflect Parts of the body inside machine parts	55	32.2
d. Light body fluttering in the shape of Reich affects the eye and skin	102	59.6
<b>8. Electrical hazards</b>		
a. Non-insulated wire contact	85	49.7
b. Short circuit	42	24.5
c. Contacting damaged motor	70	40.9
d. Ground separation	40	23.4
<b>9. Chemical hazards</b>		
a. Chemical liquids	42	24.5
b. Gases	55	32.2
c. Caustic materials	106	61.9
<b>10. Physical hazards</b>		
a. High temperature	60	35.1
b. High humidity	60	35.1
c. Low heat	32	18.7
d. Weak vision	15	8.7
e. Opacity of the eye lens	35	20.4
f. Lack of concentration	90	52.6
g. Occupational deafness	3	1.8



**Figure (1)** Total satisfactory knowledge regarding environmental health hazards among technical school Students



**Table (4):** Total satisfactory knowledge regarding safety measures which needed to electrical hazards and fire protection (n=171)

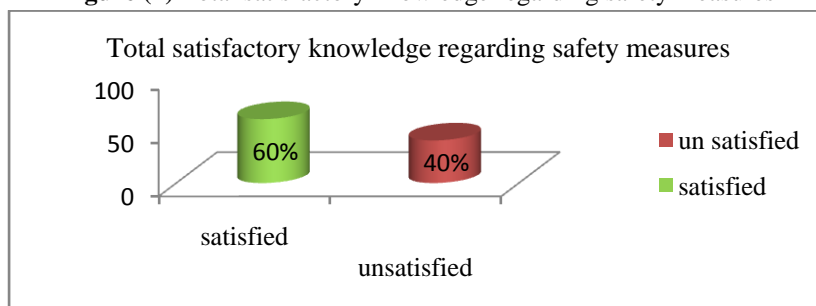
Items	Satisfactory knowledge	
	No.	%
<b>Protection of electrical hazards</b>		
<b>14. Protection from electrical hazards</b>		
a. The condition of the electrical connections in the workshops shall be safe and secure.	100	58.5
b. Provide the automatic separation switch for electricity during trouble occurrence.	39	22.8
c. Connect the equipment to the ground station.	35	20.4
d. Maintenance of electrical appliances periodically	49	28.6
<b>15. Electrical hazard protection available in school workshop</b>		
a. The presence of panels warning against approaching or touching electrical appliances.	89	52.0
b. Provide insulating gloves.	42	24.5
c. Maintenance of electrical connections	79	46.1
<b>Protection from fire</b>		
<b>16. Protection from fire:</b>		
a. Emergency doors are available	112	65.4
b. There are fire extinguishers	82	47.9
c. Flammable materials are stored safely	7	4.0
d. Training in dealing with fire	80	46.7
<b>17. Fire protection available in school workshop</b>		
a. Fire Extinguishers	117	68.4
b. Water hoses	46	26.9
c. Water source (fire faucet)	60	35.0
d. Sand Buckets	15	8.8
e. Fire alarm	106	61.9

**Table (5):** total satisfactory knowledge regarding safety measures which needed for the protection of mechanical hazards (n=171)

Items	Satisfactory knowledge	
	No.	%
<b>Protection of mechanical hazards</b>		
<b>18. Machines maintained and lubricated periodically</b>		
a. Yes	114	66.6
b. No	21	12.2
c. Do not know	36	21.0
<b>19. Safety measures should be available when dealing with machines</b>		
a. Presence of an appropriate distance between the student and the machine.	98	57.3
b. Presence of an appropriate distance between the machines and some.	28	16.3
c. There is a power switch for each machine	27	15.7
d. Presence of Safety barriers	89	52.0
<b>20. Conditions should be available in safety barriers</b>		
a. Do not prevent the maintenance and lubrication of the machine.	99	57.9
b. Prevent the student from being exposed to danger while training on the machine	105	61.4

c. Will not be a reason to disrupt production.	32	18.7
<b>Hand tools</b>		
<b>21. Conditions which should be available in hand tools</b>		
a. Hands are intact.	105	61.4
b. The weapons are intact.	118	69,0

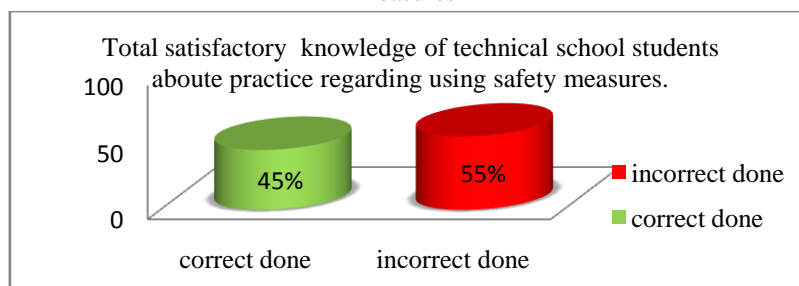
**Figure (2)** Total satisfactory knowledge regarding safety measures



**Table (6):**Frequency distribution of technical school Students’ knowledge about reported Practices towards first aid (n=171)

Items	Satisfactory practice			
	know		Do not know	
	No	%	No	%
<b>13- In the case of wounds &amp; bleeding</b>				
Wound disinfection with betadine	66	38.6	105	61.4
Put a bandage on wounds	16	9.4	155	90.6
linking the place of bleeding with a tight tie and be transferred to the hospital	9	5.3	162	94.7
<b>14- in case of burns:</b>				
Removal of clothing from burns	19	11.1	152	88.9
Wash the burns with water	90	52.3	81	47.7
<b>15- in case of electrical shock:</b>				
Check the safety around	33	19.3	138	80.7
Disconnect the source of electrical supply	20	11.7	151	88.3
Call the medical person immediately	55	32.2	116	67.8
<b>16- in case of entry of flying dust in the eye</b>				
Wash the eye thoroughly with soap and water	100	58.5	71	41.5
Avoid eye scrubbing	80	46.8	91	53.2
<b>17- in case fall from high</b>				
Avoid moving the person	20	11.7	151	88.3
Call the supervisor	51	29.8	120	70.2

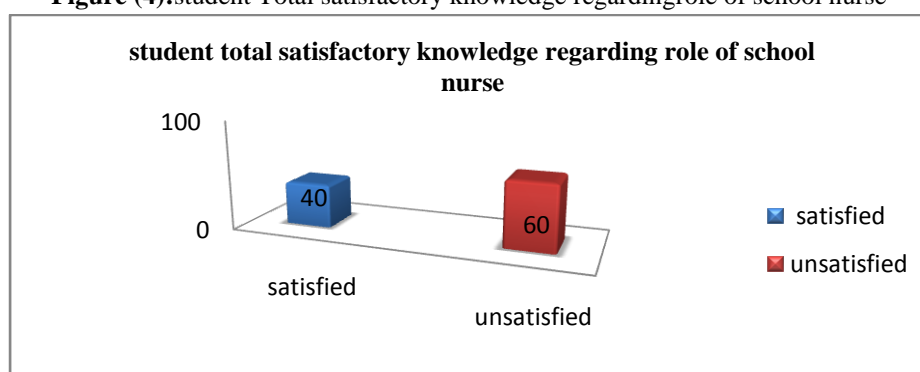
**Figure (3):** Total satisfactory knowledge of technical school students about practice regarding using safety measures



**Table (7):**Studentsatisfactory knowledge about the role of school nurse (n=171)

Items	Satisfactory knowledge	
	No.	%
<b>31. Is there a nurse in the school?</b>		
a. Yes	75	44
b. No	76	44.6
c. Don` t know	20	11.6
<b>32. The role of the nurse.</b>		
a. Provide health instructions on how to avoid accidents in the school workshop	31	18.2
b. Provide necessary first aids when the accident occurred	120	70.1
c. Participate with the doctor in the training of students on first aids	45	26.3
d. Maintain the school environment healthy and safe	24	14.0
e. Registration of students who suffer from an accident in the school	75	43.8
f. Obtain Preliminary schedule for students at the beginning of the academic year	14	8.2

**Figure (4):**student Total satisfactory knowledge regardingrole of school nurse



**Table (8):** Observational checklist for technical school environment, cleanliness& housekeeping and Communication facility:

Measures	El Fayoum Secondary industrial decorative School for male		Its Secondary industrial for male		El Fayoum secondary Agricultural school		El Fayoum secondary mechanical school for male		
	Available		Available		Available		Available		
	No	%	No	%	No	%	No	%	
<b>Cleanliness and housekeeping</b>									
1-All items of workshop equipment are suitably placed to avoid overcrowding.	7	87.5	8	88.9	5	71.4	10	83.3	
2- Workshop is clean & clear of obstructions.	7	87.5	7	77.8	5	71.4	9	75	
3-Workshop floor is dry.	8	100	8	88.9	7	100	12	100	
4- Floor is non-slippery.	8	100	8	88.9	7	100	12	100	
5- Eating and drinking are prohibited in the workshop area.	4	50	3	33.3	3	42.9	6	50	
6- Washing facilities and materials are adequate.	0	0.0	2	22.2	1	14.3	2	16.7	
<b>Communication facility</b>									
7-A telephone is present in the school.	8	100	9	100	7	100	12	100	
8- A telephone is present at every workshop and functioning.	4	50	5	55.6	3	42.9	6	50	
9- A list of emergency telephone numbers present in every workshop.	0	0.0	0	0.0	1	14.3	2	16.7	

**Table (9):** Observational checklist for technical school environment, Lighting, Ventilation and General Fire Requirements

Measures	El Fayoum Secondary industrial decorative School for male		Its Secondary industrial for male		El Fayoum secondary Agricultural school		El Fayoum secondary mechanical school for male	
	Available		Available		Available		Available	
	No	%	No	%	No	%	No	%
<b>Lighting</b>								
10- The general level of illumination of the workshop is adequate for the work to be carried out.	8	100	9	100	7	100	12	100
11- Windows are available, adequate and with proper distribution.	8	100	9	100	7	100	12	100
12- Number of lamps is suitable and functioning.	7	87.5	8	88.9	5	71.4	10	83.3
13. Proper distribution of lamps Department.	7	87.5	8	88.9	5	71.4	10	83.3
14-Lighting system doesn't cause glare.	8	100	9	100	7	100	12	100
<b>Ventilation</b>								
15-General ventilation or the workshop area is satisfactory.	8	100	9	100	7	100	12	100
16- Temperatures in the workshop suitable for the work to be carried out.	7	87.5	6	66.7	5	71.4	11	91.7
17- Fans are available and functioning.	7	87.5	6	66.7	5	71.4	11	91.7
18- Fans are properly distributed at the workshops.	7	87.5	5	55.6	5	71.4	10	83.3
<b>General Fire Requirements</b>								
19-Accumulations of flammable or combustible waste materials and residues are removed.	6	75	5	55.6	6	85.7	12	100
20- Fire exit is available.	8	100	9	100	7	100	12	100
21- All exit paths from the workshop are clear of obstruction and suitably sign posted.	4	50	4	44.4	5	71.4	7	58.3
22- At least one fire extinguisher is available in each laboratory, shop or other vocational room.	8	100	9	100	7	100	12	100
23- Fire extinguishers are enclosed in cabinets, and cabinets unlocked.	8	100	9	100	7	100	12	100
24- Extinguisher operating instructions are located on the front of the extinguisher and clearly visible.	8	100	9	100	7	100	12	100
25 Fire extinguishers are fully charged and operable and kept in their designated places at all times.	8	100	9	100	7	100	12	100
26 Sand pails are available.	2	25	0	0.0	4	57.1	4	33.3
27Sand pails are distributed near dangerous places.	1	12.5	0	0.0	2	28.6	2	16.7
28- Smoking is prohibited in the workshop.	7	87.5	5	55.6	5	71.4	8	66.7
29- The Fire Alarm is easily audible above machinery noise.	7	87.5	7	77.8	6	85.7	10	83.3
30- Fire hoses are available.	7	87.5	7	77.8	6	85.7	10	83.3
31- Fire hoses are in good condition (no holes).	7	87.5	7	77.8	6	85.7	10	83.3
32- Presence of non-flammable wall.	0	0.0	0	0.0	0	0.0	0	0.0

**Table (10):** Observational checklist for technical school environment Electrical-general requirements and Machine safeguarding

Measures	El Fayoum Secondary industrial decorative School for male		Its Secondary industrial for male		El Fayoum secondary Agricultural school		El Fayoum secondary mechanical school for male	
	Available		Available		Available		Available	
	No	%	No	%	No	%	No	%
<b>ELECTRICAL - GENERAL REQUIREMENTS</b>								
33- Electrical panels are closed.	8	100	9	100	7	100	12	100
34- Electrical panels are easily accessible.	4	50	3	33.3	5	71.4	7	58.3
35- Every switch in control panel is labeled.	3	37.5	3	33.3	4	57.1	7	58.3
36- Acceptable types of cables are used in cable trays.	8	100	9	100	7	100	12	100
37- Each machine has its own electrical switch.	8	100	9	100	7	100	12	100
38- There is a master control switch far all machines.	4	50	4	44.4	1	14.3	6	50
39- Safety signs, safety symbols, or accident prevention tags are used where necessary to warn students / teachers about electrical hazards.	3	37.5	2	22.2	2	28.6	6	50
<b>Machine safeguarding</b>								
40- All machines are guarded to protect the operator and other people in the machine area from hazards.	6	75	5	55.6	5	71.4	9	75
41- All machines are provided with a power cut off switch that can be reached from the operating position.	7	87.5	7	77.8	6	85.7	7	58.3
42- safety instructions about machine danger and using precautions are available near each machine.	3	37.5	4	44.4	3	42.9	5	41.7

**Table (11):** observational checklist for technical school environment Personal protective equipment and medical services & first aid

Measures	El Fayoum Secondary industrial decorative School for male		Its Secondary industrial for male		El Fayoum secondary Agricultural school		El Fayoum secondary mechanical school for male	
	Available		Available		Available		Available	
	No	%	No	%	No	%	No	%
<b>Personal protective equipment</b>								
<b>Body protection</b>								
43-Leather apron is available.	0	0.0	0	0.0	0	0.0	0	0.0
44- Clothes are made of cotton.	0	0.0	0	0.0	0	0.0	0	0.0
45-Teacher wear safety clothes.	0	0.0	0	0.0	0	0.0	0	0.0
46- Students wear safety clothes (Lab coats).	8	100	9	100	7	100	12	100
<b>Head protection</b>								
47- Protective helmets are used.	0	0.0	0	0.0	0	0.0	0	0.0
48-Teachers wear head protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
49- students wear head protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
<b>Hand protection</b>								
50-Appropriate protective gloves are used.	0	0.0	0	0.0	0	0.0	0	0.0
51- Teachers wear hand protection devices.	0	0.0	0	0.0	0	0.0	0	0.0

52- Students wear hand protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
<b>Foot protection</b>								
53-Safety boots are available in metal workshops.	2	25	2	22.2	0	0.0	1	8.3
54-Leather foot protection is available in the welding area.	0	0.0	0	0.0	0	0.0	0	0.0
55-Teachers wear foot protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
56- Students wear foot protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
<b>Respiratory protection</b>								
57-Masks are available.	0	0.0	0	0.0	0	0.0	0	0.0
58- Teachers wear respiratory protective devices.	0	0.0	0	0.0	0	0.0	0	0.0
59- Students wear respiratory protective devices.	0	0.0	0	0.0	0	0.0	0	0.0
<b>Face, eye &amp; ear protection</b>								
60- Face shields made from non-flammable material are available.	0	0.0	0	0.0	0	0.0	0	0.0
61- Appropriate number of goggles are available.	0	0.0	0	0.0	0	0.0	0	0.0
62- Ear muffs are available in noise area.	0	0.0	0	0.0	0	0.0	0	0.0
63- Ear plugs are washed after each use.	0	0.0	0	0.0	0	0.0	0	0.0
64- Teachers wear face, eye& Ear protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
65- Students wear Face, eye& Ear protection devices.	0	0.0	0	0.0	0	0.0	0	0.0
<b>Medical services and First aid</b>								
66-Medical personnel are readily available for advice and consultation on work related health issues No (1)	1	100	0	0.0	0	0.0	1	100
67- First aid box is present and easily accessible.	1	100	0	0.0	0	0.0	0	0.0
68- Adequate first aid supplies are readily available.	1	100	0	0.0	0	0.0	0	0.0
69- Each supply is clearly labeled.	0	0.0	0	0.0	0	0.0	0	0.0

Figure (5): shows Total school safety environment regarding school safety checklist in different study setting.

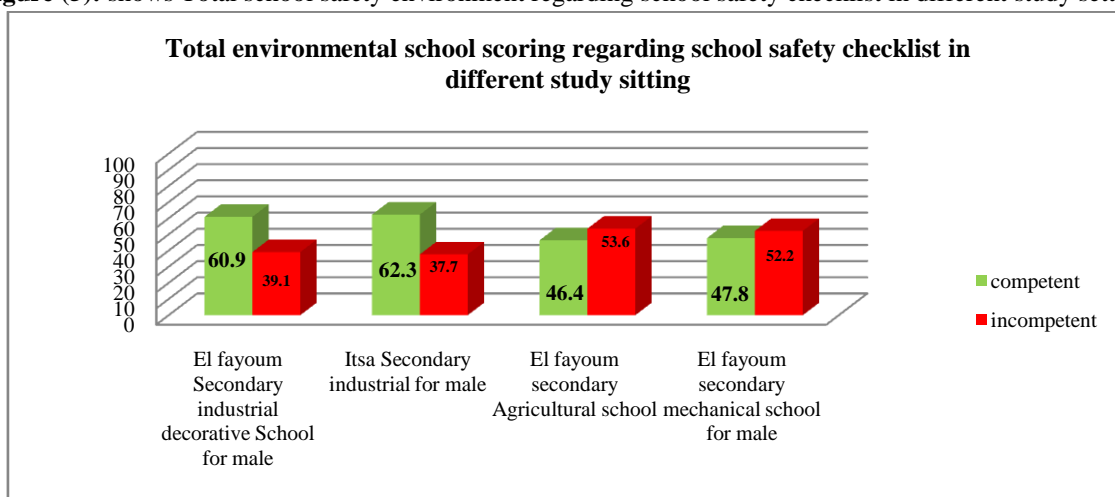


Table (12): Frequency distribution of technical school students' knowledge about personal protective equipment: (N=171)

Items	Done	
	No.	%
<b>1.using of Personal protection measures</b>		
a. Anti-sliding Protective footwear	0	0.0
b. Protective helmets for the head	0	0.0

c. Mask to protect the face	0	0.0
d. Eye color glasses	0	0.0
e. Hairnets	0	0.0
f. Gloves protect your hands	8	4.6
g. Stopper for ear protection	8	4.6
h. Lab coat	150	87.7
<b>2. Barriers of using personal protective measures</b>		
a. Not available	116	67.8
b. Work disruption	37	21.6
c. Not suitable for use	99	57.8

➤ **Items are not mutually exclusive**

**Table (13):** Relation between socio-demographic characteristics of students and total satisfactory knowledge about environmental health hazards.

socio-demographic data	Total satisfactory knowledge about environmental health hazards				Chi-square	
	Satisfied		Unsatisfied		X <sup>2</sup>	P value
	No	%	No	%		
<b>Age</b>					13.934	0.001*
16 >17	37	21.2	30	17.7		
17 ≥19	83	48.5	21	12.3		
<b>Types of department</b>					10.81	0.146
Electricity	16	9.4	4	2.3		
Wrought iron and welding	20	11.6	8	4.7		
Precision equipment	1	0.6	0	0.0		
Fittings	2	1.2	2	1.2		
Carpentry (Furniture Building)	1	0.6	1	0.6		
Cooling & Air Conditioning	29	16.9	15	8.8		
Tractors and agricultural machine	36	21	16	9.3		
Cars	15	8.8	6	3.5		
<b>Training courses</b>					0.652	0.722
First aids	5	2.9	2	1.2		
Industrial Safety	7	4.1	1	0.6		
Did not get any training Courses	108	63.1	48	28.1		

(\*) Statistically significant at p<0.001

**Table(14):**Relation between socio-demographic characteristics of students and total satisfactory knowledge safety measures which needed to control these hazards

socio-demographic data	Total satisfactory knowledge about safety measures				Chi-square	
	Satisfied		Unsatisfied		X <sup>2</sup>	P value
	No	%	No	%		
<b>Age</b>					5.808	0.001*
16 >17	46	26.9	21	12.3		
17 ≥19	57	33.3	47	27.5		
<b>Types of department</b>					12.742	0.79
Electricity	13	7.6	7	4.1		
Wrought iron and welding	21	12.3	7	4.1		
Precision equipment	1	0.6	0	0.0		
Fittings	1	0.6	3	1.8		
Carpentry (Furniture Building)	1	0.6	1	0.6		

Cooling & Air Conditioning	26	15.8	17	9.9		
Tractors and agricultural machine	32	18.7	20	11.7		
Cars	8	4.7	13	7.6		
<b>Training courses</b>					2.173	0.33
First aids	6	3.5	1	0.6		
Industrial Safety	4	2.3	4	2.3		
Did not get any training Courses	93	54.3	63	36.8		

(\*) Statistically significant at  $p < 0.001$

(\*) statistically significant at  $p < 0.05$

**Table(15):** Relation between technical student’s total satisfactory knowledge regarding practices using of safety measures and their health hazards.

Health hazards			Total satisfactory knowledge regarding practices using of safety measures				Correlation	
			Correctly done		Incorrectly done			
No	%	No	%	No	%	R	P	
Mechanical hazards	74	43.3	33	44.6	41	55.4	0.088	0.251
Electrical hazards	36	21.1	15	41.7	21	58.3	-0.040	0.604
Chemical hazards	43	25.1	20	46.5	23	53.5	0.080	0.300
Physical hazards	94	54.9	46	48.9	48	51.1	-.017	0.827

(\*) Significant  $P < 0.05$

**R: Pearson coefficient correlation**

#### IV. Discussion

Occupational health and safety is the concern of human wellbeing, this day, industrialization and services, giving sector development are accelerating resulting in workplace health problem booming. Workplace safety and health hazards nowadays considered as a driving force toward finding solutions how to prevent it from the manufacturing industries employing negative consequence. In recent years, the quality, health, knowledge and safety requirements in many countries have been more stringent than was the case previously seen [12].

The current study aimed to assess the environmental health hazards and safety measures among secondary technical students at El Fayoum City. As regards socio demographic characteristics of students the current study included 171 students, all of them were male and in school grade three, their age range from 16-19 years. About one third of them were in Tractors and agricultural machine department and one quarter were in Cooling & Air Conditioning department.

As regards socio demographic characteristics, The finding in the current study showed that the minority of students have courses about First aids and Industrial Safety, this finding agreed with the study done by [3] in Egypt which find that the minority of students have reported a previous training on occupational hazards, on the other hand the study done by [13] in United arab emirates found that more than one third of students attended a training course about occupational health and safety. Also in the study by [14] in Nigeria found that about one third of students had formal training on hazards and safety measures necessary on the job. Also high frequency of attending such students was reported by [15] in United States which presented that about more than two third of students reported that they received training courses.

According to student health history and their exposure to health hazards the current study showed that the students exposed to the environmental hazards with high rates within the workshops training as more than half of students reported that they exposed to high temperature and loss of concentration during training as also less than one quarter of them exposed Entry of flying dust in the eye, this finding is in the line with study conducted by [16] in Cape Coast presented that more than the half of all respondents reported that they were exposed to noise, burns, fumes/smoke and fire.

The finding in this study agreed with the study conducted by [17] in Zambia that more than three quarter of students exposed to cuts on hands/arms, also study conducted by [14] showed that the majority of the respondents reported symptoms relating to hazard exposure. According to the investigator opinion, this high



rate of hazard exposure may be due to low experience of students, poor preparation for school workshop and the absences of safety measures.

This finding disagreed with the finding in the study done by [15] that only Twenty percent of working students experienced injury at work as less than half of reported exposure to noise and less than one third exposed to extreme cold conditions, Also study conducted by [18] in “Gaza ,Palestine on Prevalence and Response to Occupational Hazards among Nursing Students” showed that more than one third of students exposed to physical hazards.

The finding in the current study showed that the minority enjetry due to Short circuit and Contact between chemical materials and skin, this finding agreed with the study conducted by [19] in “Dubai on Incidence and determinants of severity of unintentional injuries among students of private schools in Dubai: a cross-sectional study” that the minority of students exposed to electrical hazards. On the other hand study conducted by [18] found that less than half of students exposed to chemical hazards as Irritation of skin, eyes and nose. also the study conducted by [16] found that more than two third of students were exposed to burns and fire due to chemicals substances, the study conducted by [17] found that more than three quarter of studenets exposed to burns due to chemical hazards and. According to the investigator point of view this this mainly low percentage of chemical exposure is that such schools don't use chemical laboratories much times and they almost dependent on workshops and machines.

As regards student health history and exposure to health hazards the finding in the current study shows that about more than the third of injured students had received first aids in the school and only half of injured students notified their supervisors about the injury. while on the other hand in the study conducted by [20] in Nigeria found that more than two third of the study sample received treatment when they exposed to injury or ill.

Regarding hospitalization due to hazards exposure in the current study the minority of injured students have to enter the hospital due to exposure to hazards, this finding agreed with the study conducted by [21] in Nepal found that less than one ten of students were visited to doctor to receive first aid. While in study conducted by [15] found that about one third of injured students exposed to some injuries were severe enough to limit students' normal activities for >3 days and or require medical attention. On the invistigator point of view, this low percentage of students receiving first aid may be due to; half of students didn't report their supervisors about the injuries as mentioned before, the majority of students haven't receive any first aid courses and less of half of them didn't knew about presence of the school nurse.

As regards students' knowledge about environmental health hazards, the finding in the current study showed that more than two third of students have a satisfactory knowledge about environmental health hazards. This finding agreed with study conducted by [22] in Nigerial which found that more than two third of the welders were aware of one or more workplace hazards. Also this on the same line with the finding in study done by [17] and [15] who reported that about three quarter of the students were aware of at least one or more hazard. Also the finding matched with study conducted by [14] who presented that more than two third are aware of the hazards associated with their training. While high ratio presented in the study conducted by [20] which found the majority of the study samples have knowledge about occupational hazards. Also stud conducted by [21] found that 86% students had satisfactory knowledge regarding disease and occupational hazards which may occurred.

As regards the student's knowledge about safety measures, the finding in the current study showed that about two thirds of students have a satisfactory knowledge about safety measure. This finding is on the same line with the result on the study conducted by [3] found that about two third knew that wearing PPEs during work is protective to their health, also in another study done by [13] reported that the majority of students have good knowledge about protective measures, the same results presented in study conducted by [23] in Ethiopia found that More than two third of the students had a good knowledge about occupational health and safety practice.

According to the Barriers for using personal protective measures the finding in the current study showed that more than two thirds of students said that it is not available and more than the half of them said that it isn't suitable for use. While in the study conducted by [24] in Ghana found the majority of them said that the reasons about not using PPE like gloves, goggles and sleeves they is it does not help to protect them in any way from any health hazards and not easily available. But in study conducted by [20] found that the reasons for not

using PPE were more than one third of them said that forgetfulness, affordability, inconvenience and less than one third reported that not being a necessity.

According to the role of school nurse the finding in the current study shows that, less than the half of students knew that there is a school nurse, the majority of them see that the main role of school nurse is to Provide necessary first aids when accident occurs while the minority of them didn't know any knowledge, half of schools have available medical person, on the other hand, the study conducted by [25] in "Nigeria on Assessment of the physical school environment of selected private high schools" which showed that about one third had a school clinic. Also the study conducted by [26] in "Nigeria on Assessment of the physical school environment of selected private high schools" found that the minority of schools had a school nurse.

As regards the student's knowledge about reported practice regarding safety measures the finding in the current study showed that less than the half of the students have a correct/satisfactory knowledge about practice regarding using safety measures. This finding disagreed with the study conducted by [23] found that about the half of participants has a good adoption of safety precautionary measures and use of personal protective equipment, while the study conducted by [14] found that more than the half of participants has knowledge about use personal protective devices. On the other hand Low percentage in the finding of study by [21] found that the minority of students had some skill about how to use machines and PPE. Also the study conducted by [3] found that the minority of the study subjects knew properly, how to deal with chemical spills. In the investigator point of view this low percentage about correct knowledge regarding uses of safety measured is mainly related to the low percentage of attending first aid courses and industrial safety courses.

According to environmental safety assessment check list the finding in the current study showed that all schools have at least one fire extinguisher available in each laboratory, shop or other vocational rooms, only one quarter of schools has a first aid box in the school workshops, and there is presence of only (lab coat) from the Personal Protective Equipment, this finding agreed with study conducted by [24] found that the majority of schools did not have or use first aid box. Also study conducted by [16] presented low rates of availability and use of Personal Protective Equipment (PPE). On the other hand study by [26] found that the majority of schools in had first aid boxes. Also the finding in this study disagreed with study conducted by [24] which represent that in the schools haven't fire extinguisher available in the event of fire.

As regards the relation between socio demographic characteristics and total students' satisfactory knowledge about health hazards, the finding in the present study showed that there is positive relation between age and total students' satisfactory knowledge, This finding is supported by the study done by [27] in "United States on Measuring Environmental Health Perception Among College Students" found that there was a positive relation between total knowledge and age. Also the finding in the study by [22] found that there was significance relation between educational attainment, age, nature of training and knowledge. Also in study by [23] which found that there was significant association between knowledge of occupational risks and hazards and age. While on the other hand, study conducted by [28] in Pakistan presented that there was no statically significance between socio demographic characteristics and level of knowledge.

According to the relation between health hazards which face students during training and their knowledge regarding the practice for using safety measures, The finding of the current study showed that there is no significance relation between health hazards which face students during training and their knowledge regarding practice for using safety measures. This finding agreed with studies conducted by [15] and [27] which also presented that There was no relationship between the use of safety measures and exposure to hazards. Regarding the investigator's opinion, this absence of significance relation is due to unavailability of PPE and other safety measure and that mainly they use a lab coat in the school workshop

## **V. Conclusion**

The majority of the technical school students exposed to one or more hazard in school workshops as they exposed to different types of hazards. More than two third of them have satisfactory knowledge about environmental health hazards which can affect them in the school workshops. There are statistically significances in relation between student's knowledge about health hazards and age.

## **VI. Recommendations**

1. Scheduling training courses about industrial safety and first aids for all students on the admission of the school and Focusing on preventing hazards by clarifying the safety signs and safety precautions on every school workshop.
2. Assuring the presence of school nurses and clarify their role in the school and the importance to be announced for both teachers and students
3. Registrat the injured students periodically to minimize recurrence of the hazards.
4. Periodic monitoring of school workshop and school environment to fix unreported problems immediately.

5. Plan and implement educational programs about occupational health hazards and safety measures to increase students' awareness.
6. **Further research:**
  - Assess the role of the school health nurse in providing a healthy school environment
  - Impact of industrial Safety Training Programs on Using PPE among Technical Students.

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