

General safety awareness in science laboratory: An Overview

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Abstract: Any laboratory can be a dangerous place if it is not used by trained and attentive person. So it is necessarily for each and every person entering the laboratory to have sense of possible danger and safe working conditions. This paper specifically deals with creating awareness regarding safety measures in science laboratories which is major area of experimentation and exposure to physical working objects. Without dedicated training it is not possible to create healthy and safe working environment. It also covers risk management in laboratory, standard lab practices, possible injuries due to lab accident and use of first aid skills for laboratory injuries and guideline to deal with different types of hazards. Aim of this paper is to create awareness among the students, faculties regarding safety rules of laboratory and to minimize accidental injuries in laboratory.

Keywords: Laboratory Awareness, Safety measures, School laboratory, first-aid kit.

I. INTRODUCTION

In the aspect of education in science and technology, application of knowledge and acquiring experiential learning is core part. In that case science laboratory becomes area of exposure to convert theoretical knowledge to actual experiments and results and conclusions can be found through that learning. With the advancement in technology there are lot of up gradation in practical work but still it is mandatory to work in laboratory for actual learning also to make studies more interesting. From childhood to the very advanced stage of life it necessary to know how we can apply our knowledge in real life aspects. However, it is observed that very less attention is provided regarding seriousness of the proper laboratory facility utilization. So it is important to provide exposure on various aspects related to lab utilization.

II. PROBLEM STATEMENT

Quality of students' knowledge in the institute can be related directly to the realization of significance of laboratory and its connection with theory courses. Hence for effective teaching-learning process strong linking between theoretical knowledge and practical working environment is mandatory for advancement in scientific program and projects. (Aldandani, 2010). Another aspect of introducing utilization of laboratories to create common awareness regarding safety, training for handling injuries, knowledge regarding first aid is mandatory. (Julius and Thomas, 2014).

Following aspects are involved to ensure safety and security in laboratories,

2.1 Risk Analysis:

It preventive measure to reduce risk and losses to facilities available and focus accident prone areas and activities. Hence it is necessary to have idea of safe lab practices, to be aware of expected injuries due to accidents. Actually having presence of mind at working area is key factor of handling provoking situations (Petro, 2015). Fig.1 shows average injuries occur in science laboratories.

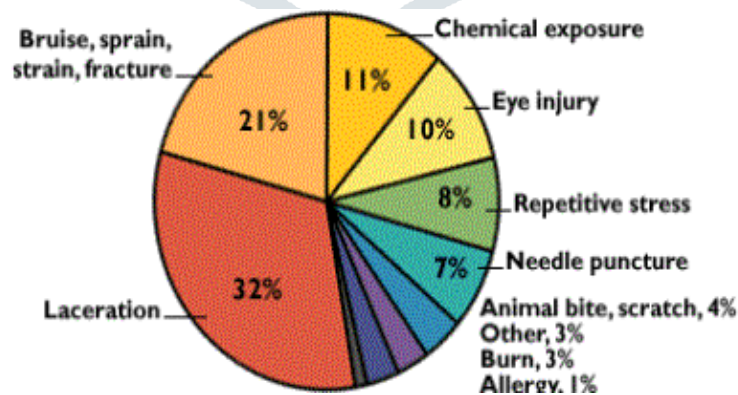


Fig1:Chart on survey of laboratory injuries

2.2 Standard Laboratory practices:

It is clearly set of instructions in the form of Do's and Don'ts. So that, any neophyte person entering the premises can understand risk levels immediately. Also it is duty of concerned in charge person to make sure that these standard practices are been followed sincerely by all individuals working in laboratory.



Fig.2 :Guidelines for standard laboratory practices

2.3 First aid:

It is the one of the most crucial aspect to reduce injuries caused due to accidents. It is immediate and temporary treatment done to prolong growth of risk due to injuries. This requires special training to working person to use particular first aid for certain type of injury. It includes certain medicines may needed at the accident place and some physical treatment to make the person out of danger.

When compared to the realistic approach safety measures are often overshadowed in educational institute as compared to industrial laboratories. Also almost 30% laboratories in educational institute do not receive any training regarding safety and security issue is major cause of worry which results in low level safety awareness among staff itself. To emphasize more on this study made by American Chemical Society reveals that in the last decade there were more than 120 laboratory accidents resulted in deaths, human injuries of students staff. It is observed that cause of accidents is mostly lack of common sense, ignorance about instructions thus it is equal responsibility of both users and staff to take efforts to minimize accidental activities. The American Chemical Society (2010) reports that a crucial role for achieving safety in the laboratory is of science teacher which can be possible by means of motivational programs regarding awareness for paying attention to safety precautions in the laboratory.

III. TYPES OF POSSIBLE INJURIES AND REMEDIES:

Following can be possible type of injuries and remedies observed during working in science laboratories.

3.1 Electrical Shock

When it is been seen a person got hit with electric shock a person nearby must ensure to turn off the electric supply safely. After that infected person must brought to open space to ensure abundant fresh air supply. If the breathing or heart working is found inactive, it is must to give CPR (Cardio Pulmonary Resuscitation) by a trained person. After observing severity of health of the person decision to be taken regarding immediate hospitalization.

3.2 Ingestion of Poisons

In such cases it is necessary to find out exactly what infected person has ingested. vomiting is not advisable till instructed by physician. If experienced staff has understanding about the situation primary treatment can be applied till the person get hospitalized.

3.3 Cut Wounds

Based on depth of cut, length of injury and portion of body injured relevant action is needed. Usually first action to be taken is to minimize blood spilling out of body part by applying proper medicine and bandage. At the time of treatment Injections are necessary to avoid infections further.

3.4 Thermal burns

It is one of the most common kind of injury in all types of laboratories. Common practice is to separate heat affected areas from fire or hot surfaces then to immerse affected part in cold water, then if seriousness of burn is not high then applying ointment to make body part cool is preferred.

3.5 Personal Medical Issues

Incharge person must be aware of medical issues of certain students while operating mostly like different allergies some kind of phobias.

3.6 Fire hazards

This kind of accident is very spontaneous and can make massive destruction in very less time. Following can be possible ways by which spontaneous fire may take place

- i. During inattentive working exposure of body parts or clothes to fire sources like burner, furnes may take place.
- ii. In Laboratories places there may be some combustible liquids present which may expand fire exposed area.
- iii. Flammable gases such as hydrogen, methane and nitrogen can lead to extremely dangerous fire.
- iv. Poor electrical connections is also serous reason for unsafe working which lead to fire hazard.

When fire is taking place at the moment three major actions need to take as

- i. All the students need to shift to safe place as soon as possible.
- ii. Analysis is needed to know whether fire is small and contained if so efforts need to make to extinguish the fire preferably using fire extinguisher and if the fire is out of control all people must be evacuated first then fire must be avoided to expand by closing doors, disconnecting power supply alerting everyone for help by ringing fire alarm. Most important thing is not to chase fire if you are not trained to do in such cases it is said that "Flight is better than fight."
- iii. In case of Fire victim people fire must be extinguished by spraying water and call for medical help on urgent basis.

IV. GENERAL SAFETY ATTENTIONS

4.1 Safety equipment

Following things are necessary under the view of maintaining safe working environment

1. First Aid Box:

It must contain all needed medicines which can be used in case of all types of injuries. It must be accessible to everyone and should be checked periodically. In case of any kind lab accident it is always necessary to give primary treatment to reduce risk of failure. So based on nature of laboratory first aid kit need to be designed and maintained periodically. In general following are contents of first aid kit.



Fig.3 :First-aid kit

- i. Plasters in a variety of different sizes and shapes
- ii. Rolled bandages
- iii. Safety pins
- iv. Disposable sterile gloves
- v. Scissors
- vi. Sticky tape
- vii. Thermometer (preferably digital)
- viii. Skin rash cream
- ix. Cream or spray to relieve insect bites and stings
- x. Antiseptic cream
- xi. Painkillers such as paracetamol
- xii. Cough medicine
- xiii. Distilled water for cleaning wounds
- xiv. Eye wash and eye bath



Fig.4 :General Safety facilities needed in science laboratory

2. Fire extinguisher –

Based on type and population of building different sizes of extinguishers can be used also based on application area A,B,C,D type of Fire extinguisher is used.

Class A:

This type of fire extinguisher is useful for fire raised from material from clothes, dry wood, paper material can be extinguished by mostly water. So this type of fire extinguisher contain pressurized water solution. It is most preferred in open places and areas free from electric circuits.

Class B:

This type of fire extinguisher uses pressurized carbon dioxide to extinguish fires due to flammable liquids like oil, grease, various solvents.

Class C: This type of fire extinguisher is useful for fire resulting due to electric equipment. For such situations water or liquid contained fire extinguishers are not compatible.

Class D: This fire extinguisher contains dry powder and liquid solution it is useful for immediate stoppage of fire from area but can not be used in place where delicate and costly equipment are used since it will damage it permanently.




<p>A Trash Wood Paper</p>  <ul style="list-style-type: none"> • wood • paper • cloth • etc. 	<p>B Liquids Grease</p>  <ul style="list-style-type: none"> • gasoline • oil • grease • other solvents
<p>C Electrical Equipment</p>  <ul style="list-style-type: none"> • computers • fax machine • other energized electrical equip. 	<p>COMBUSTIBLE</p>  <p>METALS</p> <ul style="list-style-type: none"> • magnesium • sodium • potassium • titanium • other flammable metals

Fig.5 : Types of fire extinguisher

3. **Safety shower** – In case of chemical spillage such kind of showers are necessary to remove chemicals over body parts
4. **Fire Sprinklers system** – It is mandatory for large laboratories handling flammable materials so that at the time of fire takes place minimum damage could happen.
5. **Fume hood** – To handle explosive or flammable material or substance contain poisonous fumes safety container structure is needed.
6. **Fire alarm**- In case of building catches fire to make all people in the building alert about it fire alarm must be activated which will evacuate the building and direct them towards the safer place.
7. **Face shield and mask** – It is necessary for demonstrating experiment which may prone to make injuries to facial parts.

V. CONCLUSION

The present study focuses on major aspects of laboratory safety measures. It is necessary to enhance safe laboratory practices with knowledge of handling first aid skills. Attention need to give for standard operating procedure. Different campaign need to be conducted to highlight importance of laboratory safety. Increasing sense of awareness among the students and faculty while doing their work in laboratories for which dedicated training programs fire drills need to be conducted. To make students and faculties completely aware about "Safety is first and safety is must". At last being a human it is responsibility of each of us to be obligated for safe working condition for which social media and promotion is also needed. These safe working guidelines are much needed to make accident free and learning promotive environment in laboratory.

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