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Chemical Safety in Chemistry Departments Laboratories at Iraqi Universities

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Abstract

Health and safety is a key concern in any chemistry laboratory because of the potential risks in handling hazardous materials. These risks can be eliminated or minimized by promoting good laboratory practices as well as providing proper safety equipments. Although, there are legislations to govern health and safety aspects in the workplace, which are applicable to universities, safety training for students is not always sufficient to promote good safety practices and the situation varies greatly from one university to another.

The aim of this paper is to examine the status of chemical safety in chemistry departments at Iraqi universities, which is also applicable to the situation of other developed countries. In order to carry out this study, a survey on health and safety was constructed and delivered to heads of chemistry departments of science colleges at public Iraqi universities. The survey queried the availability of safety procedures, documentation and provision of safety equipments in the chemistry departments.

Approximately third of heads did not respond, which shows lack of appreciation of health and safety issues. The situation is further complicated by a culture of cover-up and fear of being viewed negatively. As a result, approximately third of the heads of departments did not respond to the survey despite repeated requests.

Most of those responded to the survey indicated that their departments have safety manuals, safety committees/officers and that they provide health and safety training to staff and students. They also indicated that they provide safety courses as part of the chemistry curriculum. However, only half of the chemistry departments had incidents report and safety webpage.

The provision of safety equipments in the chemistry departments varied greatly from one department to another. Although, all heads responded to the survey agreed that their departments had basic safety equipments such as fire extinguishers and fume hoods, a fifth of those responded did not have gloves and a quarter did not have goggles and first aid kits. Only a quarter of

those responded had shower stations, a third had eyewash stations and only half had proper provisions for chemical waste.
This study showed that the situation of health and safety varied greatly between chemistry departments in Iraq. The situation is further complicated by governmental cuts in spending, which made heads of departments allocate funds for acquisition of chemicals, glassware and instruments rather than on training and purchasing health and safety equipments. It is beyond belief that some departments don't even provide gloves and goggles for their students, which highlights serious health and safety concerns.
The heads of chemistry departments have an obligation to convey the true health and safety state in their departments to the ministry of higher education. They should seek extra governmental funding to deal with some of the serious lapses of health and safety that are uncovered by this study.
Key Words: Chemistry, Chemical Safety, Hazardous Materials, Chemistry Laboratories, Iraq.

1. Introduction

There has been an increase in the use of chemicals in modern times due to new technological advances in all aspects of life. These advances have been led by discoveries, in most cases, in laboratories of universities around the world. While health and safety regulations have been introduced by governments and implemented in engineering workplaces. Attitude towards health and safety in universities is somewhat lacking behind. An example is the case of Patrick Harran, a chemistry professor at the university of California who narrowly avoided going to prison after an accident that caused the death of a research student, Sheri Sangji. On 29 December 2008, Sangji was conducting an experiment in Harran's organic chemistry laboratory without wearing appropriate PPE, when a chemical she was using burst into flames, severely burning over half of her body [1].
Therefore, accidents happen not because of lack of governmental regulations, "laboratory safety depends ultimately on the working habits of individual chemists and their sense of teamwork for protection of themselves, their colleagues and the wider community and environment" as stated by the National Research Council [2]. Therefore, it is the legal duty of academic institutions to promote safety culture among their employees and students [3]. Accidents cost outweigh the financial cost of safety equipments and materials [4].
Chemistry curriculum usually focuses on the main topics, such as organic and inorganic chemistry, physical chemistry, analytical chemistry, biochemistry etc. The topic of chemical safety is usually taught at the margins, mostly a appendix to laboratory experiments. It was not considered important enough to devote a whole course on the health and safety topic [4 - 6]. This resulted in chemistry graduates not having the appropriate attitude, skill, and knowledge in health and safety [3].
The situation was so dire that Langerman [7] concluded that most academic laboratories are unsafe venues for work or study. There was a worldwide consensus for the need of constructive approach to improve the situation by integrating safety education into the chemistry curriculum of universities [8].

However, awareness in chemical safety has recently improved significantly and there are now dedicated courses in chemical safety in good ranking universities [9 – 24].

It is quite common to find chemical laboratory safety webpage on the websites of these universities. These pages offer valuable source of information for staff and students. They have links to various forms and templates for risk assessments, contact details of safety officers, chemical safety committees and safety notes. They also report accidents and near misses in incident reports in order to eliminate or reduce risks in the laboratories.

The situation of chemical safety in Iraqi universities is not clear. It is therefore, the purpose of this paper to determine the state of health and safety in chemistry departments in Iraq and provide resources and experiences to promote health and safety.

2. Methodology

Iraq has thirty-three public universities, fifteen of which have one Science College. Baghdad and Babylon Universities on the other hand have two Science Colleges, one for girls and one mixed for boys and girls.

In order to get a view of the state of health and safety in these departments, a survey was constructed and sent via emails to all heads of departments. The survey consisted of sixteen phrases, to agree or disagree with, Appendix 1.

The phrases in the survey were divided into two groups. The first group of questions focused on the availability of safety documentation in the chemistry departments, such as safety manuals and forms, safety procedures, safety committees, training, incident reports and safety webpage. The second group of questions focused on availability of safety equipments and if they are in good working order. These equipments includes safety showers, eyewash station, goggles, gloves, broom and dustpan, first aid kit, fume cupboards, fire extinguishers and coloured and labelled containers for collecting waste chemicals.

3. Results and Discussion

It is regretful that approximately third of the heads of chemistry departments did not respond to the survey despite repeated requests and a few were reluctant to give true information. This shows lack of appreciation of matters related to health and safety and this in turn may result in putting the lives of staff and students at risk when carrying out practical work.

A summary of the responses of the heads of chemistry departments to the survey is shown ion Figure 1.

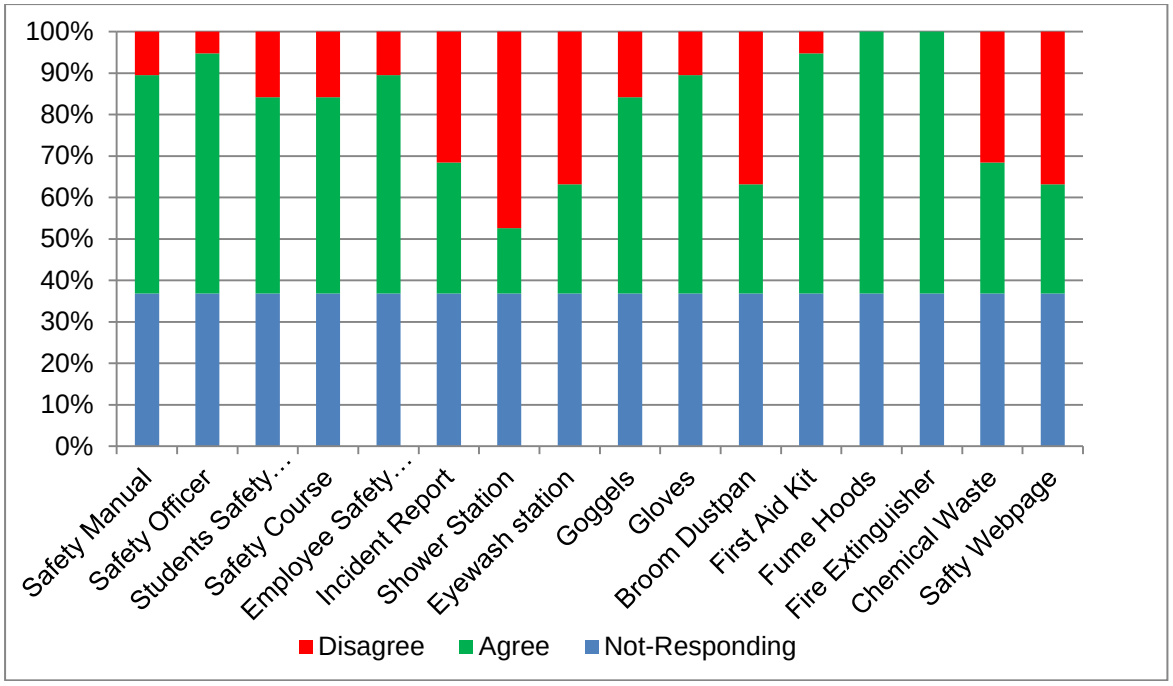

Figure 1: Summary of the responses of the heads of chemistry departments to the sixteen phrases in the survey. The x-axis represents the phrases asked to the heads of departments. The full phrases in the survey are listed in the appendix.

Most heads of the chemistry departments who responded to the survey agreed that their chemistry departments have chemical safety manuals. These manuals include information on safe laboratory practices that are aimed at minimizing risks. The manuals enlist the required personal protective equipments that should be worn in the laboratory, details of emergency procedures, and clearly present the safe methods of handling and storing chemicals and their waste.

Most respondents also reported that their departments have chemical safety committees or departmental safety officers who are properly trained and responsible for establishing and implementing appropriate chemical safety programmes. The chemical safety committee/officer is the reference point for all students, members of staff, and visitors who provide authoritative chemical safety answers and decisions on all chemical activities in the chemistry department.

Most heads of chemistry departments who responded to the survey agreed that their employees had proper safety training and they provide their students with proper chemical safety training as part of the chemistry curriculum. It is therefore encouraging that these departments provide their students with such knowledge and skills, which will be valued by their future employers. However, only half of the chemistry departments had incidents report and safety webpage. The incident report is used to identify previous incidents and take appropriate precautions to avoid their reoccurrence. The safety webpage is a valuable source of information for staff and students.

Although, all heads responded to the survey agreed that their departments had basic safety equipments such as fire extinguishers and fume hoods, a

fifth of those responded did not have gloves and a quarter did not have goggles and first aid kits. Only a quarter of those responded had shower stations, a third had eyewash stations and only half had proper provisions for chemical waste.

The impact of the American invasion in 2003 on the country and the subsequent civil war that followed have affected all governmental institutions, including the universities. Widespread institutional corruption and financial constraints following the collapse of oil prices forced the Iraqi government to cut spending. The financial constraints affected the allocation of funds within universities, which encouraged a culture of spending money on teaching core chemistry subjects rather than on promoting health and safety. The allocation of funds for purchasing chemicals, glassware and instruments certainly take precedence over safety concerns for most chemistry departments. Furthermore, the heads of chemistry departments are reluctant to reveal the true health and safety situation in their departments for fear of being singled out or viewed negatively.

All these factors make judging the health and safety situation in chemistry departments in Iraq a difficult task. However, the provision of safety equipments in the chemistry departments is a serious issue that varied from one department to another. The fact that some departments don't even provide basic personal safety equipments such as gloves and goggles is a serious health and safety concern.

The heads of chemistry departments have an obligation to convey the true health and safety state in their departments to the ministry of higher education. They should seek extra governmental funding to deal with some of the serious lapses of health and safety that are uncovered by this study.

The Iraqi chemistry departments could benefit from the safety websites of other chemistry departments for source of information that they could use in building up their own safety websites; examples are shown in [25 – 27]. The Royal Society of Chemistry in Britain also have useful website [28] that provides health and safety and regulatory guidance.

4. Conclusions

The status of chemical safety in chemistry departments in Iraqi universities was investigated in this paper. The situation is unclear and is further complicated by the political situation in the country. Most chemistry departments who have responded to the survey in this research provided safety documentation and safety training to their staff and students. However, most departments lacked in the provision of safety equipments and some don't even provide basic personal equipments such as gloves and goggles. This is probably caused by governmental cuts on spending and allocation of funds within chemistry departments that focused on acquisition of chemicals, glassware and instruments to carry out basic chemistry education rather than on purchasing safety equipments. Furthermore, the heads of chemistry departments are reluctant to reveal the true health and safety situation in their departments for fear of being viewed negatively. The heads of chemistry departments should be encouraged to convey the true health and safety state in their departments and seek extra governmental

funding to deal with some of the serious lapses of health and safety in their departments.

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Appendix 1: The Chemical Safety Survey Sent to Heads of Chemistry Departments.

No.	Phrase	Agreement	Dis-agreement
1	The department have a chemical safety manual, procedures, forms etc.		
2	The department have a chemical safety committee / officer responsible for the safety of all faculty, students, visitors and staff at your chemistry department. And this committee / officer have the right training to help them do their job properly.		
3	The department do provide all students with the proper chemical safety training courses prior and during their years of study.		
4	We teach students special course / subject within the chemistry curriculum for chemical safety in chemistry laboratories.		
5	All chemistry department laboratory's employees have had proper safety training and there are copies of individuals training records available upon request.		
6	We do have an incident report record at this department.		
7	All chemistry laboratories have a safety showers station and it is in good working order.		
8	All chemistry laboratories have an eyewash station and it is in good working order.		
9	All chemistry laboratories have goggles and they are all in good condition.		
10	All chemistry laboratories have different sizes and types of gloves and they are in good condition.		
11	All chemistry laboratories have broom and dust pan and they are all in good working order.		
12	All chemistry laboratories have first aid kit well equipped with necessary things.		
13	All chemistry laboratories have fume hoods and they are all in good working order.		
14	All chemistry laboratories have fire extinguishers and they are all in good working order.		
15	All chemistry laboratories have coloured and labelled containers for collecting waste chemicals.		
16	We do have a safety webpage on the department website.		
17	Do you have any comments or suggestions on how to improve the chemical safety at your department you want to add?		