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# ASSESSMENT OF ACCIDENT AND SAFETY PRACTICES OBSERVED DURING CHEMISTRY PRACTICAL CLASSES IN SECONDARY SCHOOLS IN AWKA SOUTH LOCAL GOVERNMENT AREA

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## Abstract

This study examined assessment of accident and safety practices observed during chemistry practical classes in secondary schools in Awka South Local Government Area of Anambra state. The study adopted a descriptive survey research design. The population consisted of 2,096 SS2 chemistry students from nineteen public secondary schools in Awka South Local Government Area. Five research questions guided the study. The sample size of the study consisted of one hundred (100) chemistry students drawn from five public secondary school chemistry laboratories in Awka south local government area. The sample was drawn from the population using simple random sampling technique (balloting with replacement). The instrument used for data collection was named Chemistry Practical Class Accident and Safety Questionnaire (CPCASQ) adapted from Sugut (2020) Laboratory Hazard Questionnaire (LHQ). The instrument has five sections A, B, C, D and E in line with purpose of study and was validated by three experts with reliability values of 0.96, 0.98, 0.91, 0.95, 0.98 for the five sections of CPCASQ. Mean ratings was used to answer the research questions one, two, three and five while percentages was used in answering research question four using a modified Likert type four-point rating scale with numerical values of 4,3,2,1. The decision rule was that values from 2.50 indicated agreement while values below 2.50 indicated disagreement while percentages from 50% and above indicated agreement while below 50% indicated disagreement. The results revealed among others that students were fully aware of the laboratory safety practices observed during chemistry practical classes and there are areas that are being neglected which are important to safety of students and others in the laboratory. From the findings, recommendations and conclusion were made.

**Keywords:** Chemistry, Accident and Safety Practices, Chemistry Practicals

## Introduction

Chemistry is one of the core science subjects that occupy a central position in science and technology development at the secondary school level of education. Chemistry is a natural science that deals with the study of matter. Gongden. et.al. (2020) averred that chemistry is the study of the composition, properties, structures and uses of matter. Chemistry is a subject that deals with the study of matter and its behavior when exposed to varying temperatures and pressure conditions. Operationally, chemistry is the science concerned with the study of composition, structure and properties of matter and the way they react with other matters.

Okorie (2018) noted that chemistry is pivotal to the transformation and development of nations because it has continued to play an increasingly important role in the production of many technologies, from life-saving pharmaceuticals to computers and other information technologies. The author observed that because of the central role it plays in the successful study of science-based courses such as medicine, pharmacy, biochemistry, engineering, agriculture and several others, chemistry is regarded as a 'central science' and this underlines the importance and need to study it. Anugwo and Asogwa (2015) argue that chemistry has contributed greatly towards providing our basic needs and improving the quality of life. Thus, chemistry is divided into two aspects which are the theoretical aspect and practical aspect (Okorie, 2018). The practical aspect of chemistry involves practical works or laboratory works. Practical works in teaching and learning of chemistry is carried out in the Laboratories.

Anza .et. al. (2017) opined that laboratories are described as secure environments with adequate experimental material where open-ended activities can be carried out; the rules to be followed are clearly defined; designed properly for both individual and cooperative studies of students. More so, Doofan et. al (2022) defined laboratory asa space that is furnished with various tools, apparatus, and chemicals for carrying out experimentation, research, and diagnostic operations. The authors further stated that different types of laboratories exist across various research centers, industries, colleges, polytechnics and universities. Science and technology laboratories (STLs) include biological, agricultural, medical, physics, electronics, chemistry, geology, mining, engineering, forensic, and research laboratories. Limboo et. al. (2021) opined that the laboratory work is considered very important to promote students' learning of science and scientific inquiry. The teaching of chemistry through laboratory work can help increase students' interest in chemistry.

Akani (2015) posited that Practical chemistry constitutes a major part in chemistry education, when students are taught chemistry theoretically without the practical aspect done in laboratory, the students will learn poorly. The importance of practical work in the chemistry cannot be overstated; therefore, practical works cannot be eliminated from the chemistry curriculum. This is in line withOkorie and Ugwuanyi (2019) chemistry is an experimental science and therefore needs a high level of practical activities for its development and application. Teaching practical

chemistry often involves creating situations where students can experience things at first hand, whether this is an object, an event or a thought process Needham (2014).

Limbo et. al. (2021) observed that despite all these importance of the laboratory works in teaching of chemistry, however there are many hazardous chemicals and equipment in the chemistry laboratories in schools. Walters et. al. (2017) posited that Chemistry is one of these subject areas in which often hazardous chemicals are used extensively during laboratory session.

Limbo et. al.(2021) maintained that these chemicals and equipment possess a significant risk of accidents, which is a threat to human health, and the natural environment. These chemicals might be organic or inorganic and may be encountered in solid, liquid or gaseous form. Moreover, these chemicals may be corrosive, explosive, irritant, flammable, harmful, oxidizing, toxic, environmentally harmful or radioactive. Those who work in laboratories must, therefore, be aware of the hazards and risks associated with chemicals.

Doofanet. al.(2022) posted that academics laboratories across the globe there have been a number of high- profile incident of accident over the past ten years that has resulted in injuries and fatalities. Meanwhile, there had been an accident reported in a secondary school in Penang. Thirteen school students had been shown to experience symptoms such as difficulty breathing and coughing after inhaling iodine gas that was reckoned to happen during a science experiment. Further investigation concluded that this accident occurred due to poor ventilation and level of awareness of students in laboratory safety in the school's as reported by Liew and Sekaran (2019).

Anza et. al. (2017) opined that the students are aware of safety measures and that they get information about safety measure practices from chemistry manuals and university course etc. Meanwhile, Kumar et. al. (2022) observed that majority of the participants (69.8%) had good knowledge of the occupational hazards and safety measures while Fagihi (2018) discovered that the level of safety measures awareness in school laboratory among the pre-service science teachers at using Heinrich's Domino Model Theory (HDMT) of accident causation is low because the school authority neglected the important areas of laboratory safety of students in the institution.

Abbas et.al. (2016) discovered that despite the availability of Personal Protective Equipment's(PPE), wearing of these Personal Protective Equipment's Najran University (PPEs) was found to be lacking among the laboratory technicians and students because most school management neglected the importance of these devices in the laboratory for chemistry safety. More so, Nkengasong (2010) and Zaip et. al. (2021) maintained that laboratory systems and services are often neglected in resource-poor settings which could endanger the lives of laboratory users not minding that most laboratory devices are available in most secondary schools chemistry lab.

Nwele (2013) discovered that the extent of availability of safety equipment in science laboratory in secondary schools were very low. Zaip et. al. (2021) reported that personal protective equipment (PPE) had the low mean score this was because most of the workers feel that PPE will not be needed but Anza et. al. (2017) asserted that Familiarity of Students with Laboratory Attire (FSLA) and Personal Protective Equipment's (PPE), when the respondents were asked about their familiarity with laboratory attire and personal protective equipment's, majority (80.55%) of the respondents claimed that they are not familiar with laboratory attires and personal protective equipment's. During the observation made to collect the information for the study, it was observed that majority of students conducting their tenure without laboratory attires and personal protective equipment's, which is an indication for their low familiarity of laboratory attire and personal protective equipment's (PPE). Similarly, Nwele (2013) and Pareek (2019) individually asserted that the available of laboratory safety materials and equipment are on the low side. Contrary, Emendu (2012) and Bello (2012) in their respective study found out that there are available safety materials in science laboratories but the extent at which safety practices is being utilized during chemistry practical classes may be low.

Sugut (2020) reported for effective learning and teaching process, the effort of the science teacher and laboratory attendant ensuring that the during practical classes that safety practices should be adhered to, thereby making experimental learning safe for both the students, laboratory personnel and teachers should really understand the importance of safety during practical classes. Sugut further reported that safety is a top priority in chemical laboratories. Even if every attempt has been made to minimize hazards in a laboratory, anything can become dangerous when it is used improperly or carelessly.

It is often said that everything that happen have a cause, nothing just happens in the universe because it wants to happen there is always a factor that leads to its occurrence. Problems like mislabeling of chemicals, mismanagement of chemical, lack of safety practices and awareness and inappropriate laboratory behaviors like eating and drinking can result to laboratory accident. Exposure to this could endanger the lives of the students and teachers. Thus the high rate of accidents in laboratories has attracted a lot of concern from science educators, researchers and other stakeholders just as both empirical and theory study reviewed are pointing to the same direction. Thus researchers in science education and secondary school authorities has continued to seek better ways to prevent accidents and promote the use of safety practices during practical classes.This is what led to the present study which assessed the accidents and safety practices observed in chemistry practical classes in Awka South Local Government Area of Anambra State, Nigeria.

**Purpose of the study.**

The main purpose of this study was to assess the accident and safety practices observed in chemistry practical classes in secondary schools in Awka South Local Government Area. Specifically, the study sought to;

1. Ascertain the level of awareness of the students on laboratory accidents in chemistry practical classes in Awka South Local Government Area
2. Ascertain the level of awareness of the students on laboratory safety practices in chemistry practical classes in Awka South Local Government Area
3. To determine the areas of neglect in the chemistry laboratory that is important to safety of students and others.
4. Determine the availability of laboratory safety wears and equipment in chemistry laboratories of secondary schools in Awka South Local Government Area.
5. Evaluate the extent at which laboratory safety practices are being utilized in chemistry laboratories in secondary schools in Awka South Local Government Area.

**Research Questions**

This study sought to assess the accident and safety practices observed in chemistry practical classes using the following research questions:

1. What are the levels of the student's awareness of laboratory accident in Awka South Local Government Area
2. What are the levels of the student's awareness of laboratory safety practices in Awka South Local Government Area
3. What are the areas of neglect that are important to the safety of students and others?
4. What are the available laboratory safety wears and equipment in chemistry laboratory of secondary schools in Awka South Local Government Area?
5. What are the extents at which safety practices are utilized during chemistry practical classes in secondary schools in Awka South Local Government Area?

## Method

Descriptive survey was adopted in this study because the study accurately depicts and describe the characteristics or behaviours of a specific population or group by collecting data through questionnaires. The area of study was Awka south local government area, which is one of the local government areas in Awka education zone of Anambra state. The population consisted of (2,096) two thousand and ninety-six SS2 chemistry students from nineteen public secondary schools in Awka south local government area. The sample size consisted of one hundred (100) chemistry students selected from five chemistry school laboratories in the local government area used for the study in Awka south local government area. The sample was drawn from the population using simple random sampling technique (balloting with replacement). The instrument used for data collection was named Chemistry Practical Class Accident and Safety Questionnaire (CPCASQ) adapted from Sugut (2020) Laboratory Hazard Questionnaire (LHQ). The instrument has five sections A, B, C, D and E in line with the purpose of study. CPCASQ was validated by three experts; one from chemistry Department Nnamdi Azikiwe University Awka, another from the Department of Science Education Nnamdi Azikiwe University, Awka and the third is a senior secondary school chemistry teacher with ten years of experience. To ascertain the reliability of CPCASQ, the instrument was pilot tested at secondary schools in Onitsha North Local Government Areas which is outside the area of study and reliability coefficients of 0.96, 0.98, 0.91, 0.95, 0.98 were got for the five sections of the questionnaire (A, B, C, D and E) using Cronbach alpha indicating that the instrument is reliable. Mean ratings was used to answer the research questions one, two, three and five while percentage was used in answering research question four using a modified Likert type four-point rating scale with numerical values of 4,3,2,1. The decision rule was that values from 2.50 and above indicates agreement while values below 2.50 indicates disagreement while percentage from 50% and above indicated agreement while below 50% indicated disagreement

## Results.

### Research Question 1

What are the levels of the student's awareness of laboratory accident?

| S/N | ITEMS | $\bar{X}$ | REMARKS |
|---|---|---|---|
| 1. | I am aware that accidental spills and leaks of chemicals is a laboratory accident | 3.38 | AGREE |
| **2.** | I am aware that fires caused by electrical equipment, liquids and reactive chemicals is a laboratory accident. | 3.33 | AGREE |

| | | | |
|---|---|---|---|
| 3. | I am aware that explosions in laboratories is a laboratory accident | 3.11 | AGREE |
| 4. | I am aware that electric shock caused by faulty electrical equipment is a laboratory accident | 3.12 | AGREE |
| 5. | I am aware that cut by broken apparatus is a laboratory accident | 3.48 | AGREE |
| 6. | I am aware that falling as a result of wet floor is a laboratory accident | 3.30 | AGREE |
| 7. | I am aware that chemicals in the mouth, eye and skin is a laboratory accident | 3.15 | AGREE |
| 8. | I am aware that fainting as a result of insufficient oxygen or inhaling toxic fumes is also a laboratory accident | 3.19 | AGREE |

**Table 1: Mean (X) student's response on the level of awareness of the student on laboratory accident during chemistry practical classes.**

**Number of respondent: 100 students with cluster mean of 3.26**

Table 1 showed data on the level of awareness of the students on laboratory accident in the secondary school chemistry laboratories with reference to laboratory accident. In the table, items 1-8 had mean ratings of 3.38, 3.33, 3.11, 3.12, 3.48, 3.30, 3.15, and 3.19, respectively. The cluster mean rating of 3.26 which is above the mean cut off point of 2.50 indicates that the students are aware of laboratory accident that occur during chemistry practical classes in the secondary school chemistry laboratories.

**Research question 2**

What are the levels of the student's awareness of laboratory safety practices?

**Table 2: Mean ($\bar{X}$) student's response on the level of awareness of the student on laboratory safety practices during chemistry practical classes.**

| S/N | ITEMS | $\bar{X}$ | REMARK |
|---|---|---|---|
| 9. | I am aware that the use of personal protective equipment (PPE) in the laboratory at all times (e.g. gloves, safety goggles, lab coats, face shields, and respirators) are laboratory safety practices | 3.81 | AGREE |
| 10. | I am aware that proper storage and labelling of chemical with safety sign is a laboratory safety practice | 3.69 | AGREE |

| | | | |
|---|---|---|---|
| 11. | I am aware that students should not eat, drink and play in the laboratory is one the laboratory safety practice | 3.66 | AGREE |
| 12. | I am aware that regular check and maintenance of laboratory equipment is a laboratory safety practice | 3.42 | AGREE |
| 13. | I am aware that regular evacuation drill and safety awareness is a laboratory safety practice | 3.31 | AGREE |
| 14. | I am aware that students should always have supervisors during practical classes is a laboratory safety practice. | 3.78 | AGREE |
| 15. | I am aware that students ability to wash their hands after experiments, especially those involve the use of chemicals, living organisms and harmful substances is a laboratory safety practice | 3.69 | AGREE |
| 16. | I am aware that during demonstrations, safety screens used to separate students from apparatus when hot liquids or chemicals are likely to splash is a laboratory safety practice | 3.74 | AGREE |
| 17. | I am aware that keeping record of student's medical history is a laboratory safety practice. | 3.07 | AGREE |
| 18. | I am aware that long hair, loose ties or other loose clothing items been properly secured is a laboratory safety practice. | 2.93 | AGREE |

Table 2 showed data on the level of awareness of the students on laboratory safety practices in the secondary school chemistry laboratories with reference to laboratory accident. In the table, items 9-18 had mean ratings of 3.81, 3.69, 3.66, 3.42, 3.31, 3.78, 3.69, 3.74, 3.07 and 2.93 respectively. The cluster mean rating of 3.51 which is above the mean cut off point of 2.50 indicates that the students are aware of laboratory safety practices that should be observed during chemistry practical classes in the secondary school chemistry laboratories.

**Research question 3**

What are the areas of neglect that are important to the safety of students and others in the secondary school chemistry laboratories?

**Table 3: The mean (X) of student's response on the areas of neglect that is important to the safety of students and others during chemistry practical classes.**

| S/N | ITEMS | $\overline{X}$ | REMARKS |
|---|---|---|---|
| **19.** | Student in the laboratory without supervision are been neglected | 3.28 | AGREE |
| 20. | Proper disposal of waste are neglected in our school laboratory | 3.24 | AGREE |
| 21. | Complete first aid kit are fully available | 2.01 | DISAGREE |
| 22. | Seminar and workshop for safety practices are neglected | 2.92 | AGREE |
| 23. | Use of personal protective equipment(PPE) during practical classes are neglected | 1.9 | DISAGREE |
| 24. | Overlooking of students or teachers eating during practical classes | 2.30 | AGREE |
| 25. | Conducting of regular evacuation drill is been neglected | 3.06 | AGREE |

**Number of respondent: 100 students with cluster mean 2.68**

Table 3 showed data on the areas of neglect that are important to the safety of students and others in the secondary school chemistry laboratories. In the table, items 1-8 had mean ratings of 3.28, 3.24, 2.01, 2.92, 1.94, 2.30 and 3.06 respectively. The cluster mean rating of 2.68 which is above the mean cut off point of 2.50 indicates that there are areas that have been neglected that are important to safety of the student and others during chemistry practical classes in the secondary school chemistry laboratories.

**Research question 4**

What are the available laboratory safety wears and equipment in chemistry laboratory of secondary schools in Awka South Local Government Area?

**Table 4: Percentage (%) of available laboratory equipment and safety wears in chemistry laboratory.**

| SAFETY WEARS AND EQUIPMENT | A(%) | NA(%) | REMARKS |
|---|---|---|---|
| 26. PPE (Hand gloves, safety lenses, nose mask, gas mask and laboratory coat) | 75 | 25 | AGREE |
| 27. Combustion bench | 35 | 65 | AGREE |
| 28. Fume cupboard/chamber | 20 | 80 | AGREE |
| 29. Balanced demonstration bench | 78 | 22 | AGREE |
| 30. Gas and water services | 20 | 80 | AGREE |
| 31. Cross ventilated windows | 71 | 29 | AGREE |
| 32. Hospital emergency telephone number | 37 | 63 | AGREE |
| 33. Fire blanket | 34 | 66 | AGREE |
| 34. Fire extinguishers | 80 | 20 | AGREE |
| 35. Store for chemicals | 45 | 55 | AGREE |
| 36. First aid box | 54 | 46 | AGREE |
| 37. Separate stores for electrical apparatus | 26 | 74 | AGREE |
| 38. Safety handbook and chart | 27 | 73 | AGREE |
| 39. Emergency showers | 41 | 53 | AGREE |
| Mean percentage | 45.93 | 53.64 | |

No of Respondent: 100 students

Summary of Table 4

| POINT SCALE | MEAN PERCENTAGE |
|---|---|
| Available | 45.93% |
| Not available | 53.64% |

From table 4, the researcher found out that the mean percentage of available is 45.93% and the mean percentage of not available is 53.64%. The mean percentages 53.64% which is for not available is above 50% which indicates that 53.64% of safety material and equipment in the chemistry laboratory of secondary schools in Awka South Local Government Area are not available only about 45.93% are available. In order words the safety materials and equipment are not available.

**Research question 5**

What is the extent of which safety practices are utilized during chemistry practical classes?

**Table 5: Mean ($\overline{X}$) of student's response on the safety practices been utilized during chemistry practical classes.**

| S/N | ITEMS | $\overline{X}$ | REMARK |
|---|---|---|---|

| | | |
|---|---|---|
| 40. Personal protective equipment (PPE) (e.g. gloves, safety goggles, lab coats, face shields, and respirators), are used been in the laboratory at all times | 3.02 | AGREE |
| 41. Chemicals are stored and labeled properly with safety sign | 2.79 | AGREE |
| 42. Eating, drinking and playing in the laboratory, is highly prohibited. | 3.22 | AGREE |
| 43. Check and maintenance of laboratory equipment are done regularly. | 3.43 | AGREE |
| 44. Conduct appropriate safety and evacuation drills on a regular basis | 2.88 | AGREE |
| 45. Students are always with supervisor during practical classes. | 3.46 | AGREE |
| 46. Hands are been washed after experiments, especially those involving the use of chemicals, living organisms and harmful substances | 3.34 | AGREE |
| 47. Students' medical histories are been recorded and kept. | 2.41 | DISAGREE |
| 48.During demonstrations safety screens are used to separate students from apparatus when hot liquids or chemicals likely to splash. | 2.92 | AGREE |
| 49. Long hair, loose ties or other loose clothing items properly secured are a laboratory safety practice. | 2.70 | AGREE |

**Number of respondent: 100 students with cluster mean of 3.02**

Table 5 showed data on the extent of which safety practices are utilized during chemistry practical classes in secondary school laboratory in Awka South Local Government Area. In the table, items 40-49 had mean ratings of 3.02, 2.79, 3.22, 3.22, 3.43, 2.88, 3.46, 3.34, 2.41, 2.92 and 2.70 respectively. The cluster mean rating of 3.02 which is above the mean 2.50 which indicates that the safety practices are being utilized during chemistry practical classes in secondary school laboratory in Awka South Local Government Area.

**Discussion of Findings**

**Level of awareness of the students on laboratory accident that can occur during chemistry practical classes**.

The finding of this study showed that the students are fully aware of laboratory accident that can occur during chemistry practical classes. This could be as a result of workshops on laboratory accident organized by the school authorities to ensure that the students are aware of the accident that could occur during practical classes, thereby making the students to be very cautious while working in the laboratory to ensure an effective and safe learning, or it's the effort of the teachers inculcating it into their teaching thereby letting the students aware of these laboratory accident and it's causes.

The findings of this study is in line with Akani (2015) who asserted that the students are aware of laboratory accident that could occur during practical classes in the secondary school laboratory, the finding was also supported by Anza et. al. (2017), who found out that the majority of their respondents (61.11%) replied that they are aware of budding hazards of laboratory chemicals on them and their environment.

**Level of awareness of students on laboratory safety practices observed during chemistry practical classes.**

The finding of this study showed that the students are fully aware of laboratory safety practices observed during chemistry practical Classes. This could be as a result of workshops on safety practices organized by the school authorities, teachers and technicians to ensure that the students are aware of the safety practices, making practical classes effective and safe, or it is the effort of the teachers inculcating it into their teaching, thereby letting the students aware of these laboratory safety practices.

This finding is in-line with Anza et. al. (2017).who investigated the level of awareness of safety measures practiced in school laboratories. The researchers found out that the students are aware of safety measures and that they get information safety measure practices through manuals and university course etc. **T**he findings are in consonance with Kumar et. al. (2022). The authors found out that majority of the participants (69.8%) had good knowledge of the occupational hazards and safety measures. These findings are contrary to the findings of Fagihi (2018), who discovered that the level of safety measures awareness in school laboratory among the pre-service Science teachers at Najran University is low.

**Area of neglect that is important to safety of students and others in the laboratory.**

The result of the study shows that there are areas that are being neglected which are important to safety of students and others in the laboratory. These findings maybe as a result of the nonchalant attitude of teachers, laboratory personnel and students towards ensuring that the laboratory is safe for practical activities or there is no supervision from the school management checkmating what goes on during chemistry practical classes. It could be that they are not aware of these areas in regards to safety. This is in line with Abbas et. al. (2016) discovered that despite the availability

PPE, wearing of these PPEs was found to be lacking among the laboratory technicians and students. This could be because PPEs are not enforced and encouraged by the heads of departments.

More so it could be neglect of certain areas that ensure safety while working in the chemistry laboratory only increases the rate of accident which is likely to occur; therefore, it is of importance that every area that aid or ensure the safety of its users should be given highest priority during and after chemistry practical classes. This finding is in accordance with Nkengasong (2010) who stated that Laboratory systems and services are often neglected in resource-poor settings which could endanger the lives of its users.

**Availability of safety materials and equipment in the chemistry laboratory**

The finding of the study showed that the required safety materials and equipment for chemistry laboratories are not available in secondary schools in Awka South Local Government Area. This is in consonance with Nwele (2013) who discovered that the extent of availability of safety equipment in science laboratory in secondary schools were very low. This also corroborated with the findings of Zaip et. al. (2021) which reported that personal protective equipment (PPE) had the low mean score this was because most of the workers feel that PPE will not be needed. It is also in line with Anza et. al. (2017), Familiarity of Students with Laboratory Attire and Personal Protective Equipment's (PPE), when the respondents were asked about their familiarity with laboratory attire and personal protective equipment's, majority (80.55%) of the respondents claimed that they are not familiar with laboratory attires and personal protective equipment's. During the observation made to collect the information for the present study, it was observed that majority of students conducting their tenure without laboratory attires and personal protective equipment's, which is an indication for their low familiarity of laboratory attire and personal protective equipment's (PPE). This could be as a result of the government not checkmating the school laboratories thereby not promoting the study of science subjects in secondary schools or because the school made no effort in sourcing for fund to equip their laboratories, with necessary facilities especially the safety materials, or because the safety materials and equipment were not properly managed when made available. The mean percentage of the availability of a number of safety materials and equipment from the finding is 45.93% which is below the bench mark of 50 percent whereby the mean percentage of not available safety materials and equipment is 53.6%. Safety equipment should be present in well-marked, highly visible, and easily accessible locations in or near all laboratories that use hazardous chemicals.

These findings also reviewed that most chemistry laboratory are not well equipped with the necessary safety materials and equipment thereby making the laboratory unsafe for usage. This finding is in collaboration with Nwele (2013), Pareek (2019) who in their individual studies stated the available of laboratory safety materials and equipment are on the low side. But it's in

disagreement with Emendu (2012) and Bello (2012) who in their respective study found out that there are available safety materials in science laboratories

**Extent at which safety practices is being utilized during chemistry practical classes.**

The finding of the study showed that safety practices are being used during chemistry practical in Awka South Local Government Area. This finding maybe as a result of the school authorities interest in creating a safe environment for effective learning and teaching process, the effort of the science teacher and laboratory attendant ensuring that the during practical classes that safety practices should be adhered to, thereby making experimental learning safe for both the students, laboratory personnel and teachers should really understand the importance of safety during practical classes. Safety is a top priority in chemical laboratories. Even if every attempt has been made to minimize hazards in a laboratory, anything can become dangerous when it is used improperly or carelessly. These findings are in agreement with Sugut (2020) principal adopting safety measures in school laboratory.

**Recommendations**

Based on the findings of this study, the following recommendations were made:

1. Government, stake holders of education, professional associations like STAN should provide safety materials and equipment for secondary school chemistry laboratories.

2. Constant supervision should be organized to checkmate the safe handling and use of materials and equipment in chemistry laboratory.

3. Institutions, colleges of education and universities and secondary schools should continue to ensure that the students and teachers adequately with knowledge for on safety practices in laboratories.

4. Teachers should ensure that all areas which are important to the safety of the students and others are not neglected.

5. Teachers should be encouraged through inducements and allowances to ensure that they get more serious with their duty especially in carrying out practical.

**Conclusion**

Based on the findings of the study it is valid to conclude that the students are aware of laboratory accident occurs and laboratory safety practices observed in chemistry practical classes observed in Awka South Local Government Area. Also, the laboratory safety practices were observed duly by the students during practical classes. There is no availability of adequate safety

materials and equipment in the chemistry laboratory. There are areas of neglect which are important to safety that are not observed. For example, students been left in the chemistry laboratory without supervision.

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