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Identification and Assessment of Chemical Safety Measures for Hazardous Chemicals in Small Businesses

Ayilara S.I., Salami U.V., Okibe P.O.,AnyimP.B., Lakanse R.G., Christopher P.O., Abdul R.O., Ochigbo-Ejembi,M. O.,Enyi O.E.

National Research Institute for Chemical Technology, Basawa – Zaria, Kaduna state, Nigeria.

Abstract: *Occupational health and safety researchers have found that workers are exposed to different types of hazards including chemical hazards due to trade processes involved in their work. The study aimed to identify and assess the problem of non-adherence to chemical safety measures in handling hazardous chemicals in small businesses which results to health problems for the workers and environmental contamination. A purposive statistical study was conducted involving 125 respondents randomly from small-scale chemical businesses in about fifteen locations within Abuja (Nigeria) and its environs. A structured questionnaire was used to gather detailed information about their knowledge and dealings with hazardous chemical substances in their work environment. The data collected from the respondents were analyzed with SPSS and STATA statistical software using charts and tables as descriptive tools. Of the 125 respondents interviewed, 93.65% of them knew chemical safety measures; of these, 96.83% agreed to practice these procedures, which majorly involved the use of personal protective equipment (PPE) (44.20%), (mostly face masks and hand gloves) and safety posters (40.00%); 84.00% had undergone requisite training on chemical safety measures; however, only 56.91% of them had policies on chemical handling. Inspection and supervision were the highest (60.00%) means of monitoring worker's adherence to the chemical safety measures the enterprise put in place while suspension and query (21.8%) were the ways of enforcing compliance with safety procedures. For disposal of hazardous wastes, 36.67% disposed of theirs via waste management companies but 55.83% disposed of theirs incorrectly; in public waste bins, bushes, drainage canals, septic tanks, and by burial or burning. It was concluded that most organizations are aware of health hazards and are showing more adherence to preventive measures. The study recommends continuous sensitization and monitoring of these small-scale chemical businesses by government officials and regulatory bodies to enforce safety measures in chemical handling and waste disposal.*

Keywords: Environment, Health, Hazards, Chemicals, Industry

INTRODUCTION

The world over, chemicals play a vital role in the lives of people; they have become a significant part of human life, preventing and controlling diseases, sustaining activities, and increasing agricultural productivity (Bhusnure et al., 2018). Chemical hazards, which are produced by chemical synthesis, manufacturing, processing and transportation pose a detrimental effect on human and environmental conditions. Globally, the problem of rising health challenges associated with occupational exposure to hazardous chemicals is excessive. Research of this nature is sure to sensitize all key players about the ills associated with the misuse and abuse of hazardous chemicals which include: poisoning, dermatitis, headaches, irritation on the windpipe, ulcers, cancer, malfunctioning of internal organs (liver, kidney, lungs), nervous system disorder, impaired fertility, hampered fetal development, genetic mutations in offspring leading to birth defects and even death. Some basic safety measures include the proper labeling and storage of all chemicals before and after use; consultation of chemical hazard pocket guide for necessary information about each chemical before use; avoidance of eating, drinking, or smoking where chemicals are used; covering of skin with protective clothing; washing of eyes or skin with plenty of water after involvement in an accident; use of PPE such as hand gloves, face masks, eye goggles, boots and hair net by handlers of chemicals to mention but a few. The study included people involved in the sales of chemicals, production of the chemicals and conversion of chemicals into finished products. In addressing the issue of exposure to hazardous chemicals, it is vital to consider the context to which safety measures are taken by handlers of these chemicals.

METHODOLOGY

The study was conducted in Abuja and its environs. Abuja lies in the central part of Nigeria, in the Federal Capital Territory. The city is approximately 300 miles (480km) northeast of Lagos and lies in Lat $9^{0}4^{1}$ 20.1504^{11}Nand Long $7^{0}29^{1}28.6872^{11}$E. The study covered two major Local Government areas in Abuja (Abuja Municipal Area Council (AMAC) and Bwari) and two suburban towns. The study population comprised entrepreneurs involved in the production of chemical agents, sales of chemicals (people into sales of chemicals for paint making, cosmetics, cleaning agents, pesticides, herbicides, detergents) and those involved in the conversion of chemicals to finished products.

Data Collection

The data collection methodology involved desk research, qualitative and quantitative research methodologies including review of relevant documents, materials and questionnaires (with structured and unstructured questions). One hundred and forty (140) questionnaires were sent out, 125 were returned representing a response rate of 89.3%. The data were collated and analyzed. This was ensured by sample checks of entered data and physical verification of data that was entered. The entered data was thereafter analyzed using STATA (statistical software) and interpreted using descriptive tools-charts and tables.

Questionnaire Design

Designing of the questionnaire was in two (2) sections. Section A gave the biodata of the respondents while Section B gave multiple choice questions set to identify the different categories of hazardous chemicals, determine the awareness of the workers on hazards of the chemicals used and precautionary measures used to prevent and mitigate the effects of such hazardous chemicals on the well-being of the handlers.

Desk Research

This involved exploring data from existing documents of previous research. This work consulted with other materials beneficial to this research so as to give better understanding to the background information. The process was useful in the report writing process. Quantitative Approach Purposive sampling technique was adopted for this study. 85 respondents were purposely selected within the two local Governments (Bwari and AMAC) in Abuja while 40 other respondents were randomly selected from two areas (Nyanya and Mararaba) in Abuja environs. Thus, a total of 125 quantitative questionnaires were administered across the targeted areas. This involved a face-to-face process using a questionnaire. Questionnaire was the major instrument used for data collection. This consists of both closed and open-ended questions.

Data Management and Analysis.

Questionnaires were used to collect all the quantitative data. After the data collection, the questionnaires were coded using Statistical Package for the Social Sciences (SPSS) and the filled questionnaires were subsequently entered into the SPSS coded template. Quality approach to data processing was carried out so as to ensure that all variables met the quality required for analysis in terms of accuracy and reliability.

RESULTS AND DISCUSSION

Sex

A total of 125 respondents partook in the study. The findings of the survey showed the socio-demographic features of the respondents which showed that 64.3% were male (Table 1). This infers that the masculine gender leads the chemical industry in Nigeria. This result is in agreement with the findings by Chineke et al., 2016 and Okafoagu et al., 2017 who in their individual studies, discovered that there are more males in chemical-related industries.

Educational Level

The study findings indicated that most of the respondents were educated with majority, 50.8% having their Baccalaureate degree. (see Table 1); thus, their level of education should have enhanced their knowledge of hazards in the industry. This finding agrees with studies by Okafoagu et al, 2017 who found a significant association between levels of education and the mannerism of workers towards hazards at workplace in the Nigerian chemical industry.

Years of Work Experience and Age of Business

The survey revealed that 60.93% of the respondents had worked for less than five years in the establishment and about 43.44% of the companies were less than five years old (Table 1).

Number of Employees

The survey revealed 58.12% of the businesses had less than 10 employees (Table 1).

Table 1: Table summarizing key information from Biodata of Respondents

Parameter	Male (%)	Female (%)	B Sc (%)	≥ 5 years (%)	≥ 10 staff (%)
Sex	64.30	35.70	-	-	-
Education	-	-	50.80	-	-
Work Experience	-	-	-	60.63	-
Age of Business	-	-	-	43.44	-
No. of Employees	-	-	-	-	58.12

Awareness of the harmfulness of chemicals and chemical safety measures

Figure 1 showed that a very high percentage of these respondents, 93.65% were alert to chemical safety measures they could employ to avert harm from dangerous chemicals. Appraisal of the level of awareness shows that workers are often mindful of hazard safety precautions in the workplace. This finding is in agreement with the results of Okafoagu et al., 2017and Olayinka & Abdullahi, 2009 who in their independent research found that majority of the workers in related Nigerian chemical industries are cognizant of safety procedures in their work environments.

Availability of Precautionary Measures and Usage of Protective equipment

Figure 2 shows that most of the organizations, 96.83% had precautionary measures in place such as regular training of staff on chemical safety, safety manuals and posters, restricted areas, personal protective equipment, first aid kits and fire extinguishers (seeFigure 3). The findings indicated that the most common measures taken by these organizations were the use of PPE and safety manuals and posters. It was revealed that 84.00% of the respondents had undergone training on chemical safety (Figure 4). This opposes the finding by Awodele et al., 2014 who stated that about 30% of workers in a Nigerian paint factory received training on hazards and safety measures.

Scrupulous Care and Discipline in the use of PPE

The findings showed that organizational authorities enforced the use of PPEs by monitoring their staff via inspections, reminders at meetings, trainings and strict rules. Inspection was the major way of ensuring adherence to the use of PPEs (see Figure 5). The findings revealed that there were deliberate efforts by the managements of small-scale chemical businesses to enforce safety in their establishments. For staff who failed to comply with the use of PPEs, organizational authorities had to punish them so as to deter others and ensure the health and safety of everybody within the facility. The findings showed that suspension/sack and query were the major means of punishing offenders (see Figure 6).

Chemical waste disposal

Figure 7 shows the various means by which the respondents and their organizations disposed their chemical wastes. 36.67% sent their wastes to waste management companies while 16.67% disposed theirs in waste bins. Proper means of chemical waste disposal is an important safety measure to prevent harm to the community and to the environment. Some of the accepted ways of disposing chemical wastes are via waste management companies and returning waste to supplier. Most of the companies and suppliers are equipped with facilities to detoxify this waste before releasing them to the environment. The unacceptable ways of disposing chemical wastes include use of drainage canal or sewage tank and use of waste bins which is finally transferred to a public dump site.

Organizational Policy

The study indicated that 56.91% of the respondents representing their organizations claimed to have a policy for handling chemicals (Figure 8). This is very important.

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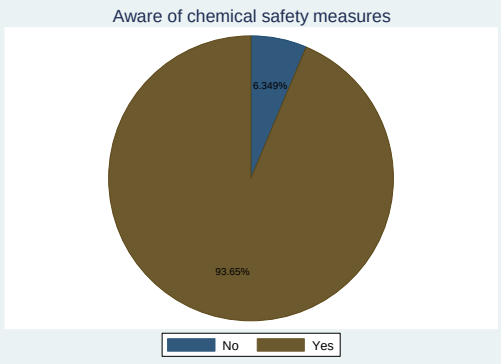

Figure 1: Pie-chart showing percentage awareness of chemical safety measures

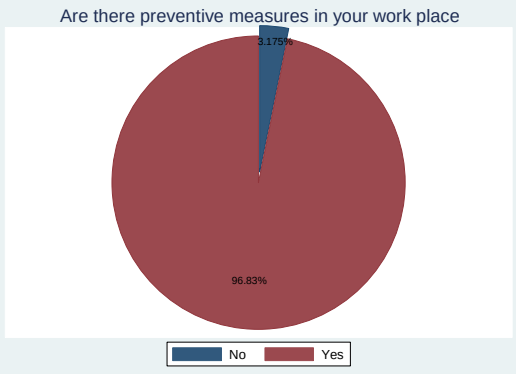

Figure 2: Pie-chart showing percentage preventive measures taken

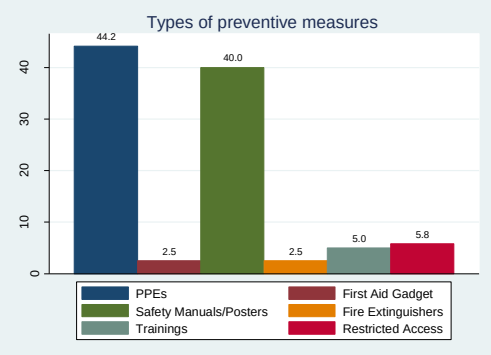

Figure 3: Bar-chart showing preventive measures taken measures

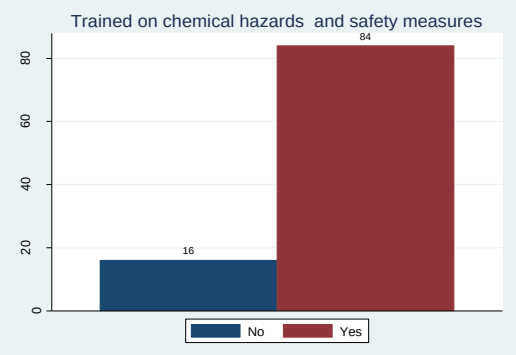

Figure 4: Bar-chart showing percentage of respondents trained on chemical safety

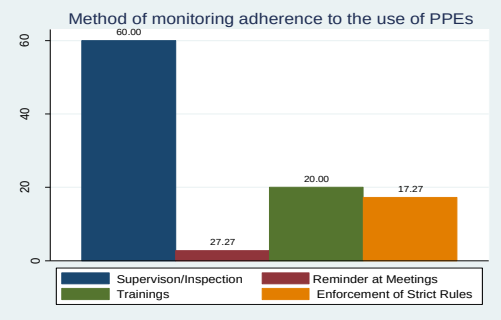

Figure 5: Bar-chart showing adherence monitoring on the use of PPE

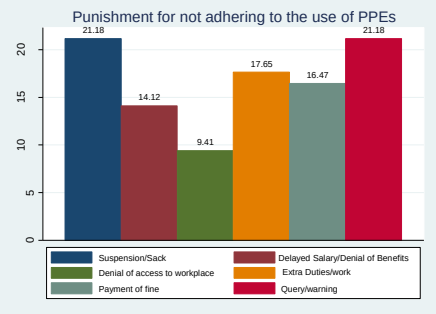

Figure 6: Bar-chart showing punishment types meted out for non-use of PPE

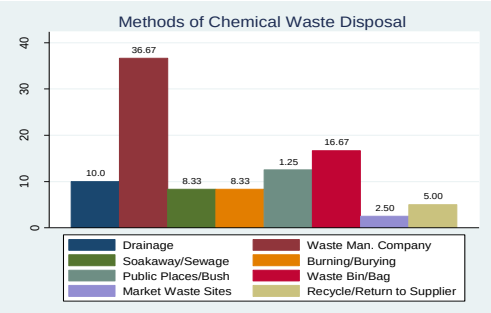

Figure 7: Bar-chart showing methods of chemical waste disposal

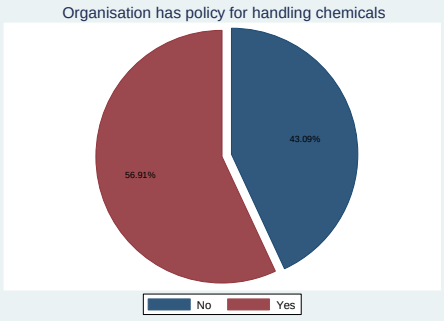

Figure 8: Pie-chart showing percentage documentation of organizational policy for handling chemicals

CONCLUSION

At the end of this survey, the investigators were able to identify small scale hazardous chemical businesses within Abuja and the precautionary and preventive measures they put in place for their staff. Therefore, it is pertinent to conclude that; in the Federal Capital Territory (FCT), Abuja, there are quite a number of business establishments that deal with chemicals at small and medium scale. A good number of those involved in the chemical businesses are aware of the dangers and risks involved in what they do and have different protective equipment with which they work as well as safety measures in place. They are also aware that accidents could take place and have preventive measures in place to avoid them. The level of compliance and adherence to safety measures was high as seen from the number of respondents that have had recurring accidents and the use of PPEs. A reasonable number of the organizations have policies for handling chemicals while a good number make available personal protective equipment for their employees. The several methods of monitoring adherence to the use of PPEs as well as the various forms of punishment for non-adherence to the use of PPEs is a clear indication of the level of commitment to chemical safety by the small-scale chemicals business owners in the FCT, Abuja.

RECOMMENDATION

Based on the presented findings and conclusions, the following are suggested for recommendations: 1) Stricter enforcement of existing hazardous chemical regulation and monitoring polices should be put into place. 2) The government should create more awareness on the dangers involved in improper handling of hazardous chemicals to the health of individuals and the environment.

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