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Original

# Knowledge and Practice of Battery Technicians about Lead Poisoning in the Workplace

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## Abstract

**Background:** Utilization of self-protective equipment at the workplace of battery technicians could consequently protect the health of the artisans 'and prevent lead-related occupational hazards. This study assessed the knowledge of lead poisoning hazards and the rate of utilization of personal protective equipment (PPE) among battery technicians in Lagos, Nigeria. **Methods:** This study was a quantitative, cross-sectional survey design. Multistage and systematic sampling technique was used to select N=384 adult battery technicians aged 18 years old and higher. The questionnaire was validated and the reliability established through pilot study. Data were collected and analyzed with chi-square and multiple logistic regressions statistical model using SPSS version 24.No missing N value and hypotheses were tested at $p < 0.05$ and 95% confidence interval. **Results:** Few participants, 9.9% had good knowledge of lead poisoning hazards, and it indicates a poor level. The rate of utilization of PPE at the workplaces was 18 % which is low. Chi-square analysis of the knowledge of lead poisoning hazard and PPE utilization for battery technicians in the organized and roadside settings were X2=0.1481, p=0.7003, and $X^2$=3.2607, p=0.0709, respectively which isnot statistically significant. **Conclusion:** Knowledge of lead poisoning hazard influenced the rate of utilization of PPE at the workplace of battery technicians. So, an effort to improve the use of PPE could be done through implementation of occupational safety policy, training and dissemination of information on the threat of lead poisoning for battery technicians to achieve positive behavioral change.

**Keyword:** Knowledge; Lead poisoning hazard; Battery technicians; PPE utilization; Nigeria

## Introduction

Lead poisoning is considered as one of the occupational diseases recognized in the earliest time in the manual workers, but, barely considered by physicians in the pre-industrial era.[1, 2]Battery technicians are among the occupational groups exposed to lead poisoning hazards because battery cells are made of lead.[3, 4]According to World Health Organization (WHO) and Center of Disease Prevention and Control (CDC), the global burden of diseases caused by lead poisoning is high, and it is estimated as 9 out of the 106 categories of diseases.[5, 6] Once lead absorbed into the human body through ingestion, inhalation and dermal absorption, it would get into the bloodstream, binds with the erythrocytes and causes toxic effects.[7] Lead may be stored in the bone and teeth for a long period before it could be released into the bloodstream.[8] Lead which is in the bone accounts for more than 95% of the lead burden in adults and is a major contributor for workers in lead-related occupations.[9] Virtually, lead toxin affects every organ in the human body, and crosses blood-brain barrier to access the central nervous system.[10, 11]As a

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result, it inflicts brain damage, causes nervous system disorder, deteriorate cell functions and become a host of neurological disorder.[12, 13]

The annual work-related diseases caused by exposure to lead are major significant public health problems throughout the world, particularly in developing countries like Nigeria.[14-16] The lack of knowledge of lead poisoning hazards and the symptoms of acute lead intoxication compounded the problem of battery technicians as most cases are not recognized or reported, and the individuals do not seek medical treatment.[17] Therefore, supporting battery technicians to know and recognize lead poisoning hazards could encourage utilization of self-protective apparatus at workplaces.[18] The Dejoy's model was applied in this study.[19]The significant application of this model is that it focuses on the interaction of an individual with environmental condition combined with the behavioral, psychosocial factors, and expectations that influence the reaction to various hazardous threats at the workplace.[19] Hence, the knowledge, perception of risk, characteristic of the individuals and values placed on life may determine the predisposing concepts that will provide motivation for utilizing self-protective equipment at workplaces.

Studies on the knowledge of the lead poisoning hazards, importance of utilizing PPE at the workplace of battery technicians to protect them from lead threat and to improve the rate of utilization of self-protective apparatus has dearth in literature. Hence, this study was conducted to fill the gap in the knowledge on lead poisoning hazards among battery technicians. The objectives of this study include: to assess battery technicians' knowledge of lead poisoning hazards and the awareness of the importance of utilization of PPE, to know the rate of utilization of PPE and the availability of the self-protective apparatus at workplaces. Furthermore, the rate of utilization of PPE was compared among battery technicians in the organized and roadside settings. The justification for this study is that a cognitive appreciation and understanding of the lead hazards and the importance of self-protective behavioral practices could lead to compliance with the use of PPE at the workplaces. The significance of this study is to achieve positive behavioral change among battery technicians and improve the rate of utilization of self-protective equipment at the workplaces and reduce lead poisoning threat.

## Methods

### Research design

This study was a quantitative, cross-sectional survey design and the participants studied aged 18 years old or higher. The study was conducted in the year 2018, and 384 male and female adults battery technicians participated in this study who had their workshops located in the organized and roadside settings of the two selected Local Government Councils Areas (LGAs: Alimosho and Mushin) of Lagos, Nigeria. Data were collected by a self-developed close-ended questionnaire. The validity and reliability of the tool were established prior to the study and the value of the Cronbach's Alpha was 0.85.

### Sample size and study population

The sample size for this study was determined using LaMorte[20] formula N= p (1- p) (Z/E) 2. This formula was adapted to calculate the study population because the responses in the questionnaire were in binary variables (YES/NO).The calculated number of subjects was N=384and the study statistical power was 0.90, which is high and appropriate due to the large sample size studied.[21] The sampling procedure used was a multistage sampling method and a systematic technique to select the final participants. The sample intervals were calculated to be 4.020, 17.020, 30.020, 43.020 and 56.020 using the formula K=N/n.[21] It implies choosing subsequent Kth subject after the first sample subject, until the total number of the required sample was collected. The rationale for choosing the sampling method was to ensure true representation of the target population.

### Data collection, variable measurement and analysis

Questionnaires were distributed among technicians and data were collected within a month, Monday to Friday each week. Questions were categorized into demographic and occupational characteristics of the participants, knowledge of lead poisoning hazards, knowledge of the importance of utilization of self-protective equipment against lead poisoning hazards and the rate of utilization of the PPE in the workplaces. Codebook was prepared and data were imported into the computer for analysis, and no missing N value. Data were analyzed with SPSS software version. The descriptive analysis was done to examine the distribution of each variable. The method of scoring adopted for the level of knowledge of the participants was that those who scored < 3 points (<50%) out of the 6 questions on knowledge section were rated to have poor knowledge of lead poisoning hazards,

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and the participants who scored 5 points or above (≥ 70%) were rated to have good knowledge of lead poisoning hazards. The section on rate of utilization of PPE (Primary Outcome Variable) was defined as those who wore protective clothing, hand gloves, respirators, goggles, nose masks, and protective shoes. All variables were coded "0" or "1" for [No] and [Yes] answer, respectively. Chi-square test was used to establish the association that exists between the categorical variables, while multiple logistic regressions examined the independent variables that were related to the outcome variable at $p< 0.05$ and 95%CI.

Ethical procedures and protection of participants' rights

The procedures performed when conducting this study followed the standard stipulation in the studies involving human participants. The study was approved by the IRB of Walden University, and the approval number is 12-05-16-0462777. The consent form was given to the participants to read, understand and filled freely without any interference before participation in the study. Participants were assured that the survey would not bring any harm, but could improve the rate of utilization of PPE at workplaces. Personal identifiers were not collected and confidentiality was maintained throughout the study.

## Results

The mean age of the N=384 participants was 43.6 + 10.5 and 40.5+ 7.6 years for the organized and roadside groups, respectively. There were 194(50.5%) battery technicians from the organized setting, while 190(49.5%) were from the roadside setting. Thirteen females (3.4%), and 371(96.6%) males were surveyed as shown in Table 1.

In Table 2, 47(12.3%) battery technicians reported that they had the PPE that could protect them from lead poisoning hazards. Majority of the battery technicians 318(82.8%) reported the lack of PPE at workplaces due to low monthly income.

Table 3 illustrated the results of the knowledge of protection against the lead poisoning hazards that were significantly associated with the utilization of PPE at the workplace.

Model adjusted for covariate variables (age, education, year of experience, monthly income, availability of safety equipment and workshop setting). Table 4 illustrated the output that accounts for the independent variables; it gives information on the knowledge of lead poisoning hazards and compared the rate of the utilization of PPE by battery technicians in the organized and roadside settings.

**Table 1.** Descriptive analysis results of the battery technicians' demographic and occupational characteristics

| Variable | Subgroup | Battery technicians workshop | | Total | *P*-value |
|---|---|---|---|---|---|
| | | Organized n=194 (%) | Roadside n=190 (%) | N=384 (%) | |
| Age (years) | ≤ 19 | 08(4.1) | 09(4.7) | 17(4.5) | p<0.000 |
| | 20-29 | 30(15.5) | 35(18.4) | 65(16.9) | |
| | 30-39 | 56(28.9) | 52(27.4) | 108(28.1) | |
| | 40-49 | 68(35.1) | 65(34.2) | 133(34.6) | |
| | ≥50 | 32(16.4) | 29(15.3) | 61(15.9) | |
| Gender (sex) | Male | 186(95.9) | 185(97.4) | 371(96.6) | p=0.418 |
| | Female | 08(4.1) | 05(2.6) | 13(3.4) | |
| Education level | No formal education | 13(6.7) | 17(8.9) | 30(7.8) | p<0.000 |
| | Elementary school | 43(22.2) | 50(26.3) | 93(24.3) | |
| | Some high school | 26(13.4) | 30(15.8) | 56(14.6) | |
| | High school graduate | 90(46.4) | 75(39.5) | 165(42.9) | |
| | University/college grad | 22(11.3) | 18(9.5) | 40(10.4) | |
| Monthly income (Naira) | ≤ 20,000 | 27(13.9) | 32(16.8) | 59(15.4) | p=0.042 |
| | 21,000-40,000 | 104(53.6) | 106(55.8) | 210(54.7) | |
| | 41,000-60,000 | 44(22.7) | 33(17.4) | 77(20.1) | |
| | 61,000-80,000 | 11(5.7) | 10(5.3) | 21(5.5) | |
| | ≥ 81,000 | 08(4.1) | 09(4.7) | 17(4.3) | |
| Years of experience | ≤ 5 | 22(11.3) | 18(9.5) | 40(10.4) | p=0.923 |
| | 5-9 | 24(12.4) | 26(13.7) | 50(13.1) | |
| | 10-14 | 63(32.5) | 65(34.1) | 128(33.3) | |
| | 15-19 | 47(24.2) | 44(23.2) | 91(23.7) | |
| | ≥ 20 | 38(19.6) | 37(19.5) | 75(19.5) | |

$X_2$=Chi-square Test, *P*<0.05 significant at 95% CI = Confidence Interval, Freq= frequency, % = percentage.

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**Table 2.**Availability, training and usage of personal protective equipment at workplaces of battery technicians

| Variable | YES | NO |
|---|---|---|
| N=384 | Freq. (%) | Freq. (%) |
| Have personal protective equipment | 47(12.3) | 337(87.7) |
| PPE is not available due to lack of money to procure | 318(82.8) | 66(17.2) |
| Have training about the importance of utilizing PPE | 47(12.3) | 337(87.7) |
| PPE is available at the workplace of auto technicians | | |
| Protective clothing (overall) | 333(86.7) | 51(13.3) |
| Protective hand gloves | 53(13.8) | 331(86.2) |
| Respirators for breathing | 47(12.3) | 337(87.7) |
| Protective eye goggles | 70(18.2) | 314(81.8) |
| Protective nose masks | 54(14.1) | 330(85.9) |
| Protective shoes/boots | 51(13.3) | 333(86.7) |

N=384, YES= positive responses, NO= negative response, Freq= frequency, % =percentage

**Table 3.**Chi-square analysis results of battery technicians' knowledge of lead poisoning hazards and the utilization of PPE

| Variable | Subgroup | Utilization of PPE (N=384) | | *P*-value |
|---|---|---|---|---|
| | | YES (%) | NO (%) | |
| Respirator is important for protection against lead poisoning hazard | YES | 101(26.30) | 87(22.66) | $X_2$=10.860 |
| | NO | 77(20.05) | 119(30.99) | p<0.000 |
| Ventilator provides protection against lead poisoning hazard | YES | 80(20.84) | 113(29.43) | $X_2$=33.990 |
| | NO | 37(09.63) | 154(40.10) | p<0.000 |
| Knowledge of PPE provides protection against lead poisoning hazard | YES | 94(24.48) | 98(25.52) | $X_2$= 7.752 |
| | NO | 71(18.49) | 121(31.51) | p=0.005 |
| Knowledge of common lead poisoning symptoms | YES | 99(25.78) | 88(22.92) | $X_2$= 7.367 |
| | NO | 81(21.09) | 116(30.21) | p=0.006 |
| Knowledge of diseases associated with lead poisoning hazard | YES | 36(09.38) | 79(20.57) | $X_2$= 5.381 |
| | NO | 98(25.52) | 171(44.53) | *p*=0.020 |

*P*< 0.05 was considered as significant at 95% CI= confidence interval, **YES = positive, ***NO = negative,

**Table 4.**Comparison analysis results of battery technicians' knowledge of lead poisoning hazards and the utilization of PPE in the organized and roadside settings

| Variable | Subgroup | Rate of utilization of PPE | | $X^2$ | df | *P*-value |
|---|---|---|---|---|---|---|
| N=384 | | Good practice (Utilize PPE) (≥ 70%) | Poor practice (Did not utilize PPE)(<50%) | | | |
| Organized setting | Good knowledge of lead poisoning (≥ 70%) | 34 | 102 | 0.1481 | 1 | p=0.700 |
| | Poor knowledge of lead poisoning (<50%) | 13 | 45 | | | |
| | Total (n=194) | 47 | 147 | | | |
| Roadside setting | Good knowledge of lead poisoning (≥ 70%) | 22 | 127 | 3.2607 | 1 | p=0.070 |
| | Poor knowledge of lead poisoning (<50%) | 11 | 30 | | | |
| | Total (n=190) | 33 | 157 | | | |

Note. Table was derived from 2ndclassification output that accounts for the independent variable's and give information for the percentage gained, *P*-value is significant at *P*< 0,05 and 95% CI

## Discussion

The population based cross-sectional survey was conducted to address the multilevel factors that influence the utilization of self-protective apparatus at the workplace of battery technicians in Lagos Nigeria. 87.7% of the participants showed lack of knowledge about lead poisoning hazards. This outcome showed that battery technicians did not understand the danger and the health problems associated with the accumulation of lead toxin in the body system. The implication of this finding is that there was a knowledge deficit of the threat of lead poisoning among battery technicians. The rate of the utilization of PPE at the workplace of battery technicians is currently 18.0% which is low. Lack of information on the safety apparatus and its usage could have negative influence on the compliance with the utilization of self-protective equipment at the workplaces.[22]The commonly used PPE among battery technicians is the protective overall clothing. The finding of

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this study is consistent with the study conducted in Ghana among 100 workers exposed to lead poisoning.[23]

The study revealed that vehicle repairer artisans had a lower rate of utilization of PPE, and just 27% of the participants complied with the use of PPE at the workplace.[23] This study also revealed lack of money to purchase PPE among battery technicians. The finding is consistent with the cross-sectional survey conducted in Nnewi, South EasternNigeria.[24]The participants' rate of utilization of PPE was low (12.4%) and the common reasons for not using PPE was lack of money to purchase PPE.[24] The implication of this finding is that there is a need to communicate the threat of lead toxicity, the associated health problems to battery technicians to encourage them to acquire the PPE from their low income.[25-27]The classification of the knowledge of lead poisoning hazards and utilization of PPE at workplaces of battery technicians was not significant for the participants either in the roadside or organized setting.[28]Therefore, poor knowledge of lead poisoning hazards could have affected their perception about the risks associated with lead poisoning and consequently results in low utilization of the PPE in the study settings.[29] The implication of this finding is that occupational experts could use the rate of the utilization of PPE at workplaces to know the safety practices status attainment on lead poisoning among battery technicians.[29]

The limitation of this study included the source of data, which were primarily self-report. The self-report is prone to recall bias, as it may be difficult for battery technicians to remember their PPE utilization history correctly. This kind of situation could result in either underestimation or overestimation of the events. Furthermore, the responses used for measuring PPE utilization and knowledge of lead poisoning hazards were scored. The responses were scaled from 0-1 using Guttman scale of response. The responses were coded in which "1" meant the correct answer, while "0" meant the wrong answers. The standard for determination of code "0" and "1" could be high to exclude a few weak probable positive responses and this is also a limitation of this study. All these factors could limit the generalization of the study findings to the entire population of battery technicians in Nigeria.

Implementation of occupational safety policy is recommended along with the monitoring and enforcement by the occupational inspectors. Adequate dissemination of information on lead poisoning hazards to battery technicians is necessary to improve the rate of the utilization of PPE. An intervention study is recommended to determine the level of compliance of battery technicians' with the utilization of PPE at workplaces.

## Conclusion

The findings of this study show that knowledge of lead toxicity predicts utilization of the PPE at the workplaces of battery technicians. The outcome also shows that there is no significant difference between battery technicians in the organized and roadside settings considering knowledge and the rate of utilization of the PPE at the workplaces. The positive social change implications of this study is that it could stimulate knowledge of lead poisoning hazards, which is presently low, and increase the rate of utilization of the self-protective equipment among battery technicians.

## Conflict of Interests

Author declared that there is no conflict of interests associated with this study

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## References

1. Rogers ML, Lucht JA, Sylvaria AJ, Cigna J, Vanderslice R, Vivier PM. Primary prevention of lead poisoning: protecting children from unsafe housing. American journal of public health. 2014;104(8):e119-24.
2. Riva MA, Lafranconi A, D'orso MI, Cesana G. Lead poisoning: historical aspects of a paradigmatic "occupational and environmental disease". Safety and health at work. 2012;3(1):11-6.
3. Van der Kuijp TJ, Huang L, Cherry CR. Health hazards of China's lead-acid battery industry: A review of its market drivers, production processes, and health impacts. Environmental health. 2013;12(1):61.
4. Saliu A, Adebayo O, Kofoworola O, Babatunde O, Ismail A. Comparative assessment of blood lead levels of automobile technicians in organized and roadside garages in Lagos, Nigeria. Environmental and public health. 2015;2015:1-9.
5. Gottesfeld P, Pokhrel AK. Lead exposure in battery manufacturing and recycling in developing countries and among children in nearby communities. Occupational and environmental hygiene. 2011; 8(9):520-32.
6. WHO. Lead poisoning and health. US: WHO; 2014: 1-4.
7. CDC. Case Definitions: Nationally Notifiable Conditions. Atlanta, GA: Centers for Disease Control and Prevention. US: CDC; 2016: 5-11.

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[ DOI: 10.18502/aoh.v3i4.1550 ]

8. Rentschler G, Broberg K, Lundh T, Skerfving S. Long-Term lead elimination from plasma and whole blood after poisoning. International archives of occupational and environmental health. 2012;85(3):311-6.
9. Shaik AP, Sultana SA, Alsaeed AH. Lead exposure: a summary of global studies and the need for new studies from Saudi Arabia. Hindawi publishing cooperation disease marker. 2014;2014:1-7.
10. Mason LH, Harp JP, Han DY. Pb neurotoxicity: neuropsychological effects of lead toxicity. Biomed research internatl. 2014;2014: 1-8.
11. Liao LM, Friesen MC, Xiang YB, Cai H, Koh DH, Ji BT, et al. Occupational lead exposure and associations with selected cancers: the Shanghai men's and women's health study cohorts. Environ health perspective. 2016;124(1): 97-103.
12. Patil AJ, Bhagwat VR, Patil JA, Dongre NN, Ambekar JG, Das KK. Biochemical aspects of Lead Exposure and Toxicity in Spray painters of western Maharashtra (India).Environmental health research. 2013;6(2):101-10
13. Pottier G, Viau M, Ricoul M, Shim G, Bellamy M, Cuceu C, el al. Lead Exposure Induces Telomere Instability in Human Cells. PLoS one. 2013;8(6):e67501.
14. Huang W, Lin JL, Lin-tan DT, Hsu CW, Chen KH, Yen TH. Environmental lead exposure accelerates progressive Diabetic Nephropathy In Type II Diabetic patients. Biomed research internatnal. 2013;2013:1-9.
15. Dongre NN, Suryakar AN, Patil AJ, Ambekar JG, Rathi DB.Biochemial effects of lead exposure on systolic & diastolic blood pressure, heme biosynthesis and hematological parameter in automobile workers of North Karnataka (India). India journal of clinical biochem. 2011;26(4):400-6.
16. Kalahasthi R, Tapu Barman RH, Bagepally BS, Beerappa R. Effectiveness of interventions on biological monitoring among workers exposed to Pb from lead-acid Storage battery plant. International medical science and public health. 2016;5(09):1770.
17. Singh Z, Chadha P, Sharma S. Evaluation of oxidative stress and genotoxicity in battery manufacturing workers occupationally exposed to lead. Toxicology International. 2013; 20(1):95-100.
18. CDC: Center for Disease Control and Prevention. Health problem caused by exposure to lead. US: CDC; 2014: 3-5.
19. Dejoy DM. Theoretical models of health behavior and workplace self-protective behavior. Safety research. 1996;27(2):61-72.
20. LaMorte WW. Power and sample size determination: Sample size for one sample, dichotomous outcome. Boston: Boston University School of Public Health; 2016
21. Ji JS, Power MC, Spamors D, Spiro III A, Hu H, Louis ED, et al. Lead exposure and tremor among older men; the VA normative aging Study. Environmental Health Perspective. 2015;123(5):445-50.
22. Alberta Queen's Printer. Occupational Health and Safety Code Explanation Guide. Canada:Alberta;2018. P:112-117.
23. Monney I, Bismark DA, Isaac OM, Kuffour RA. Occupational health and safety practices among vehicle repair artisans in an urban area in Ghana. Environmental and Occupational Science. 2014;3(3):1-8.
24. Ibeh N, Aneke J, Okocha C, Okeke C, Nwachukwuma J. The influence of occupational lead exposure on haematological indices among petrol station attendants and automobile mechanics in Nnewi, Southeast, Nigeria. Environmental and Occupational Science. 2016;5(1):1-6.
25. Adebola JO. Knowledge, attitude and compliance with occupational health and safety practices among pipeline products and marketing company (PPMC) staff in Lagos. Merit research journal of medicine and medical sciences. 2014;2(8):158-73.
26. Kalahasthi R, Barman T, Rao HR. Assessment of the relationship between blood lead levels and hematological parameters among lead acid –storage battery plant workers. Environmental and occupational science. 2012;1(1): 1-5.
27. Pogacean OA, Gurzau ES.Workers exposure and individual behavior in a car battery plant.Environment. 2014; 3(11): 73-75.
28.Hess CA, Cooper MJ, Smith MJ, Trueman CN, Schutkowski Holger. Lead exposure in adult males in urban Transvaal province, South Africa, during the apartheid era. PLoS one. 2013; 8(3): e58146.
29. Tuakuila J, Lison D, Mbuyi F, Haufroid V, Hoet P. Elevated blood lead levels and sources of exposure in the population of Kinshasa, the capital of the Democratic Republic of Congo. Exposure science and environ epidemiology. 2013;23(1):81-7.

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