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Assessment of Occupational Health and Safety Standards in the Manufacturing Sector of Selected Nigerian States

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ABSTRACT
This study examined the occupational health and safety (OHS) standards in the manufacturing sector of four Nigerian states: Lagos, Ogun, Kwara, and Oyo. The knowledge, training, and enforcement of OHS practices in these regions are the focus of this work, which acknowledges the critical role of OHS in ensuring workplace productivity and protecting employees. The responses of industry professionals in the target states were collected through the use of a structured questionnaire that was administered through Google Forms. Data analysis was conducted using ANOVA and Chi-square tests to identify significant relationships among variables. Charts were used to visualize key findings and emphasize trends in awareness and practice.
The results indicate that respondents from Lagos, Ogun, and Kwara states generally exhibit a high level of cognizance of OHS policies, whereas those from Oyo report a moderate level of familiarity. Statistical analysis reveals that the perceptions of workers across states are substantially influenced by OHS policy knowledge. Age influences adherence to occupational health and safety (OHS) protocols; however, the efficacy of OHS training programs appears to be minimally affected by factors such as educational background and qualifications. Workers' assessments of the frequency and enforcement of occupational health and safety training are not substantially influenced by their occupation or sector of employment.
These findings underscore the fact that, despite the relatively high level of awareness of OHS policies in the surveyed states, there is a significant difference in the effective implementation and delivery of OHS training programs. The study emphasizes the necessity of targeted interventions to improve the practical implementation of OHS protocols in the manufacturing sector. Future research should concentrate on the development of industry-specific OHS frameworks and the study of the long-term effects of improved OHS training on worker safety and productivity in Nigerian manufacturing sectors.
Keywords*: OHS Protocols, OHS Policies, Occupational Health, OHS Practices, Safety, ANOVA,*

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I. INTRODUCTION

The manufacturing sector is one of the most significant contributors to Nigeria's economy, providing employment opportunities and supporting economic growth. However, manufacturing activities often expose workers to various occupational hazards, including machinery-related injuries, chemical exposure, and poor ergonomic conditions. Occupational health and safety (OHS) standards aim to minimize these risks, but the implementation of these standards varies significantly across different states in Nigeria. The construction sector is infamous for its high-risk characteristics, with workers facing numerous occupational dangers, including falls, heavy machinery incidents, and exposure to hazardous substances (Chiaburu et al., 2018. Sangotayo et al. 2022). In light of these concerns, health and safety training programs have become essential elements of construction companies' operations (Jones and Johnson, 2018). OHS programs seek to provide workers with the knowledge, skills, and attitudes essential for identifying, assessing, and mitigating workplace hazards, to promote a safer work environment (Clarke et al., 2017).

The efficacy of health and safety training techniques in construction enterprises continues to be a topic of persistent examination and discussion (Robinson and Davis, 2017). Although regulatory agencies establish

criteria and requirements for safety training, the conversion of these mandates into measurable enhancements in safety performance is not invariably uncomplicated (Occupational Safety and Health Administration, 2020). The construction industry's dynamic nature, marked by advancing technology, processes, and workforce demographics, requires ongoing adaptation and innovation in training approaches (European Commission, 2017). OHS aimed to fulfill two distinct aims; the first step was to implement appropriate metrics to evaluate the efficacy, primarily focusing on identifying a reliable metric for assessing the impact of health and safety training programs in construction companies (Hinze and Teizer, 2015). The second aspect is the assessment of employee responses to the design and implementation of health and safety training programs, which are vital to their efficacy (Hallowell et al., 2018). Historically, indicators like incident rates and injury frequency have been employed to assess safety performance (Hallowell et al., 2018). Nonetheless, these measurements may fail to encompass the many dimensions of training efficacy, including employee views and behavioral modifications (Clarke & Ward, 2016). OHS seeks to enhance the understanding of the efficacy of health and safety training procedures by examining various measurements and approaches (Kines et al., 2018). Employee engagement, understanding, and retention are affected by elements like training material, presentation techniques, and instructor proficiency (Leigh et al., 2012). Understanding the employee responses to these critical components is vital for enhancing training programs to more effectively address the requirements and preferences of the workforce (Muiruiri and Mulinge, 2014). The expansion of infrastructure and the creation of jobs are indispensable to the economic development of nations, which is facilitated by the building and construction sectors (Bello et al. 2022). The capital city of Nigeria, Abuja, has become a central hub for a variety of construction projects due to the rapid urbanization and economic development that has resulted in a surge in construction activities (Jaafar, et al. 2018). Nevertheless, this expansion has not only resulted in economic advantages but has also exposed the general public and construction workers to substantial health and safety hazards (Garba et al. 2022).

Construction sites are inherently filled with a variety of hazards and risks, which leads to a high frequency of accidents and injuries. The construction industry is confronted with obstacles associated with health and safety management practices as in numerous other regions worldwide (Wang et al. 2021). These challenges include a lack of safety protocols, inadequate safety instruction, negligent enforcement of safety regulations, and a general lack of awareness of health and safety standards and issues within the industry (Zehro, 2020). As a consequence, these obstacles have resulted in an alarming number of accidents and injuries, which have had a significant impact on the health and welfare of employees, as well as the progress of building initiatives and construction projects. This has resulted in substantial financial losses (Mauro et al 2018)

Safety and health at construction sites are of the utmost importance to prevent accidents that could result in project delays, increased costs, decreased productivity, and a damaged reputation (Mauro et al., 2018). Emphasize the importance of safety training, the establishment of safe working environments, and the utilization of safe instruments as critical factors that influence the safety performance of construction projects. Mudashiru et al. (2021) conducted an assessment of hazard and safety performance within the construction industry. The study employed both qualitative and quantitative methodologies and discovered that, although owners and personnel recognize job-related health and security issues, they are not substantially exposed to these hazards. The research indicated that enhanced well-being and engagement of all people could result in better employee attitudes and increased site throughput.

The most effective method of preventing accidents, according to Heinrich's theory, is to interrupt the sequence of events by addressing and managing hazardous actions or conditions. The findings indicated that 88% of accidents are the result of perilous behaviors, 10% are caused by hazardous conditions, and 2% are the result of factors beyond one's control. Furthermore, it reveals that for every grievous injury, there were 29 minor injuries and 300 incidents that were narrowly avoided. Heinrich's pyramid is the term that is frequently used to describe this concept (Mauro et al., 2018) A previous study on the occupational health and safety risk levels in the building construction trades in Nigeria revealed that the rates of risk occurrence and severity varied among different trades. It emphasized the necessity of reinforcing existing labor laws in Nigeria and recommended a multi-risk management approach for construction managers (Okoye, 2018).

Additionally, research conducted by Nnaji, & Karakhan (2020) revealed that, despite a modest increase in the adoption of technology for safety and health management in construction as a result of its capacity to enhance safety conditions, the industry continues to face significant resistance to its continuous implementation. It also offered information on the barriers to technology adoption and the limitations of technology implementation, as well as strategies for surmounting these obstacles. Çınar (2020) assessed the safety measures used by contractors for their site workers and examined matters related to the post-accident care of these personnel. The findings revealed that construction workers must self-protect while on duty and have significant responsibility for any mishaps that occur. The safety measures used by contractors for their site workers were investigated and recommendations were proposed for potential solutions, advocating for stringent

measures to be implemented against violators by the designated site inspectors. The manufacturing sector, due to its use of heavy machinery, chemicals, and physical labor, presents unique OHS challenges. Effective OHS policies reduce work-related injuries, enhance productivity, and foster a culture of safety. Yet, gaps in policy enforcement, under-resourced safety agencies, and inadequate training are prevalent in Nigeria's manufacturing industry, resulting in high incidences of work-related injuries. Therefore this study examined the level of Occupational Health and Safety (OHS) knowledge, training, and enforcement in the Nigerian states of Kwara, Ogun, Lagos, and Oyo.

II. MATERIALS AND METHODS

This study employs a mixed-methods approach, combining quantitative surveys, qualitative interviews, and on-site assessments in examining the level of Occupational Health and Safety (OHS) knowledge, training, and enforcement in the Nigerian states of Kwara, Ogun, Lagos, and Oyo. The chosen states have a high concentration of manufacturing activities, making the states ideal for a comprehensive assessment of OHS standards.

Study design

This research was carried out with the primary focus being on the perceptions of respondents to the level of Occupational Health and Safety (OHS) knowledge, training, and enforcement in the Nigerian states. The information from the respondents was acquired through the use of well-structured questionnaires. These were given to respondents online in the form of a Google form so that the questionnaires were self-administered as part of the research. The questionnaire has a few questions that were adapted from Thaddaeus et al. (2013) to inquire about the respondents' perspectives on the level of Occupational Health and Safety (OHS) knowledge, training, and enforcement in the Nigerian states of Kwara, Ogun, Lagos, and Oyo.

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Sampling technique

A basic random sample was adopted to accurately represent the entire information population. This involved picking members of the population at random and without taking into account any other factors. The questionnaires used to collect data for the study were designed to be self-administered by respondents using an online Google form. Respondents were instructed to fill out the forms and submit them using the Internet.

Data collection

This study made substantial use of questionnaires that were constructed to collect data, and the instruments that were used to create the questionnaires were created with background material acquired from sources that were evaluated in the literature. The students at both the postgraduate and undergraduate levels participated in this study and were asked to fill out the closed-ended questionnaire. The participants were assured that the data would only be used for research purposes throughout the study. Respondents were given the options: strongly agree, agree, disagree, or strongly disagree with the statement.

Data analysis

The information is presented in the form of charts and data were analyzed using Analysis of variance and chi-square tests.

Formulation of Hypotheses

The Null Hypothesis (H0) of Hypothesis 1 asserts that participant familiarity with occupational health and safety (OHS) policies has no significant effect on state preferences, while the alternate Hypothesis (H1) posits that participant familiarity with OHS policies has a significant effect on state preferences. The Null Hypothesis (H0) in Hypothesis 2 posits that the participant's adoption of occupational health and safety policies and procedures in the workplace has no significant effect on age group preferences. The Alternative Hypothesis (H1) posits that the participant's adoption of occupational health and safety policies and procedures in the workplace has a significant effect on age group preferences. The Null Hypothesis (H0) in Hypothesis 3 posits that the educational qualifications do not significantly influence the efficacy of the occupational health and safety training obtained, while the Alternative Hypothesis (H1) posits that the educational qualifications do significantly influence the efficacy of the occupational health and safety training obtained. The Null Hypothesis (H0) is the foundation of Hypothesis 4. H0 posits that the industry sector does not have a significant impact on the participants' opinions regarding the frequency of OHS training, while H1 posits that the industry sector does have a significant impact on the participants' opinions regarding the frequency of OHS training. The Null Hypothesis (H0) in Hypothesis 5 posits that the position does not significantly influence the participants'

opinions regarding evaluations of the enforcement of OHS policies in the workplace, while H1 asserts that the position does significantly influence the participants' opinions regarding evaluations of the enforcement of OHS policies in the workplace. The Null Hypothesis (H0) in Hypothesis 6 posits that the distribution of the participant's official occupational health and safety training acquired has no significant effect on years of experience preferences. The Alternative Hypothesis (H1) posits that the distribution of the participant's official occupational health and safety training acquired has a significant effect on years of experience preferences. The hypotheses were tested using the Analysis of Variance (ANOVA) and chi-test at a confidence level of 95% to confirm the findings.

Chi-Square Probability Distribution

The chi-square distribution is a sequence of distributions whose specific form varies according to the degrees of freedom. The chi-square test assesses whether two variables are dependent by eliminating the possibility of independence and correlated variables moving in the same or opposite direction. The null hypothesis argues that there is no relationship between the two variables, while the research hypothesis asserts that there is a relationship. The test statistic has a chi-square distribution, and the conclusion depends on whether the collected statistic is greater than the critical statistic at the given significant level. The chi-square (X^2) statistic is computed using the formula (1)

$$X^2 = \frac{\sum(fo - fe)^2}{fe} \quad . \qquad (1)$$

Where f_o is the observed value and f_e is the expected value

Overview of Analysis of Variance (ANOVA) test

One-way analysis of variance (ANOVA) and two-way analysis of variance are the two subcategories of ANOVA used to determine whether there are statistically significant differences between the means of three or more independent groups and it is useful when evaluating at least three variables. ANOVA classifies differences by comparing the means of each group and involves distributing variance across multiple sources. Statistical Analysis Software (SAS) was used to compute the statistical measures of variation aid in making better decisions, such as ANOVA, skewness, kurtosis, and coefficient variation. Skewness assesses horizontal pulls of data on either side of the mean (either positive or negative) based on the presence of extreme values (lower or extreme).

Kurtosis is a data-based distribution's vertical upward or downward pull near the mean and its relative standard deviation. It suggests variations due to the flatter and heavier tails on either side. Coefficient variation measures the percentage (%) variation when comparing two characteristics with different units and it aids in improved clarity. The standard deviation is employed as a metric for quantifying variability and the standard deviation quantifies the degree of variability across individuals about its shared mean. The deviations refer to the distances between individual data values and the mean.

Overview of Analysis of Variance (ANOVA) test

One-way analysis of variance (ANOVA) and two-way analysis of variance are the two subcategories of analysis of variance (ANOVA). The One-Way ANOVA evaluates whether or not the three groups differ on a dependent variable and includes one factor. The one-way ANOVA results listed in Tables 1 and 2 present a Two-Way Analysis of Variance

Table 1. One–way ANOVA Distribution

Source of variation	A sum of Squares (SS)	Degree of freedom (df.)	Mean Square (MS)	F-ratio
Between Samples	SSC	v_1=(k-1)	$MSE = \frac{SSE}{(n-k)}$	$\frac{MSbetween}{MSwithin}$
Within Samples	SSE	v_2= (n-k)	$MSE = \frac{SSC}{(n-1)}$	
Total	SST	(n -1)		

Where SST is the sum of squares of variances, SSC is the sum of squares for column samples, SSE is the sum of squares for row samples in rows, MSC is the mean sum of squares between samples, and MSE is the mean sum

of squares within samples. The two-way ANOVA test is employed for the data classified into two categories, The analysis of variance for a two-way ANOVA is shown in Table 2, SST is the total sum of squares, SSC is the sum of squares for columns, SSR is the of squares for rows and SSE is the sum of squares due to error as written in eqn(2)

$$SSE = SST - (SSC + SSR) \quad (2)$$

Furthermore, the number of degrees of freedom between columns equals (c-1), the number of degrees of freedom between rows equals (r-1), and the number of degrees of freedom for residual equals (c-1)(r-1), where "c" refers to the number of columns and "r" refers to the number of rows. Table 2 presents a Two-Way Analysis of Variance. The residual or erroneous sum of squares is the total sum of squares minus the sum of squares between columns minus the sum of squares between rows.

Table 2. Two-Way Analysis of Variance

Source of Variation	Sum of Squares	Degree of freedom	Mean sum of Squares	Ratio of F
Between Samples	SSC	(c-1)	$MSE = \frac{SSC}{(C-1)}$	$\frac{MSC}{MSE}$
Between Rows	SSR	(r-1)	$MSR = \frac{SSR}{(r-1)}$	$\frac{MSR}{MSE}$
Residual or Error	SSE	(c-1)(r-1)	$MSE = \frac{SSE}{(r-1)(c-1)}$	
Total	SST	(n-1)		

III. RESULTS AND DISCUSSIONS

Table 3 illustrates the socio-economic profiles of the respondents. It illustrates the distribution of responses according to sex, state, age group, educational qualification, industry sector, organizational position/role, and years of experience.

The data indicates that the majority of participants were male (88.7%, n=47), while female respondents were a minority (11.3%, n=6). The majority of respondents, 54.7% (n=29), were aged 36 to 45, followed by 22.6% (n=12) aged 46 to 55, while both the 18 to 25 and 26 to 35 age groups comprised 11.3% (n=6) each.

Lagos emerged as the predominant state among respondents, accounting for 24.7% (n=13), followed by Kwara at 22.6% (n=12). Both Ogun and Oyo represented 13.3% (n=7), while other states comprised 26.4% (n=14). The predominant educational attainment among respondents was a bachelor's degree, held by 43.4% (n=23), followed by a master's degree at 33.96% (n=18), while both HND and PhD degrees were obtained by 11.3% (n=6). The predominant industry sector among respondents is construction, with 45.3% (n=24), followed by services at 22.6% (n=12), oil and gas at 22.6% (n=12), and agriculture at 9.4% (n=5). The respondent's predominant role inside the organization is supervisor, comprising 56.6% (n=30), followed by manager at 33.96% (n=18), and workers at 9.43% (n=5).

The majority of respondents, 43.4% (n=23), had 11 to 20 years of experience, followed by 33.96% (n=18) with 6 to 10 years, while both 1 to 5 years and less than 1 year accounted for 11.3% (n=6) each. Table 4 presents the descriptive statistics on the respondents' sex, state, age group, educational qualification, industry sector, organizational position/role, and years of experience distributions. .

Table 3: Demographic Data: sex, state, age group, educational qualification, industry sector, position/role in the organization and year of experience distributions of the respondents

Sex	**Freq.**	**Percent**
Male	47	88.68
Female	6	11.32
Total	53	

States	**Freq.**	**Percent**
Kwara	12	22.64

Lagos	13	24.53
Ogun	7	13.21
Oyo	7	13.21
Others	14	26.42
Total	53	

Age Group		**Percent**
18-25	6	11.32
26 - 35	6	11.32
36 - 45	29	54.72
46 - 55	12	22.64
Total	53	

Educ. Qual.	**Freq.**	**Percent**
Diploma	6	11.32
BSc	23	43.40
MSC	18	33.96
PhD	6	11.32
Total	53	

Industry Sector	**Freq.**	**Percent**
Agriculture	5	9.43
Construction	24	45.28
Oil & Gas	12	22.64
Services	12	22.64
Total	53	

Position in the Organ.	**Freq.**	**Percent**
Manager	18	33.96
Supervisor	30	56.60
Workers	5	9.43
Total	53	

Years of Exp.	**Freq.**	**Percent**
Less than 1 year	6	11.32
1 - 5 years	6	11.32
6 - 10 years	18	33.96
11 - 20 years	23	43.40
Total	53	

Descriptive statistics were used to investigate the distribution pattern of the collected data and measure asymmetry by calculating skewness and kurtosis. According to George and Mallery (2010), to generate a normal univariate distribution, asymmetry and kurtosis values ranging from -2 to +2 are generally considered appropriate. Hair et al. (2010) and Bryne (2010) proposed that data can be defined as normal when the skewness ranges from -2 to +2, and the kurtosis ranges from -7 to +7. As shown in Table 4, the skewness of a normal distribution is exactly zero, and any dataset with symmetry is predicted to have a skewness value near zero. The skewness values of 0, 1.63, 0.28, 0.92, and 0.28 for the variables of sex, age group, educational qualification,

industry sector, and year of experience distributions of the respondents indicate a right-skewed distribution, whereas state and position/role in the organization skewness values of -012, and -0.41 indicate a left-skewed distribution The distribution of the data is uniform and asymmetric. The respondents' mean values of sex, state, age group, educational qualification, industry sector, position/role in the organization, and year of experience distributions are 26.5, 10.6, 13.25, 13.25, 17.67, and 13.25, respectively. The mean is a metric that measures the central tendency of a probability distribution along with its median and mode.

The results indicated that all participants (100%) affirmed that corrective measures were implemented after accidents or occurrences. All responders affirmed that remedial measures were implemented after accidents or occurrences. The poll reveals that all participating firms implement proactive strategies to mitigate safety concerns and avert future occurrences, demonstrating a robust commitment to safety and risk management throughout the organizations. Accidents and mishaps are utilized as chances for development and enhancement. Organizations emphasize accountability and responsibility in addressing safety issues. This indicates the presence of a robust safety culture in all surveyed firms. Continuous enhancement and risk mitigation are prioritized. Regulatory mandates for incident reporting and subsequent actions are likely satisfied or beyond, and industry best practices are being adhered to.

Table 4. Descriptive statistics of sex, state, age group, educational qualification, industry sector, organizational position/role, and years of experience distributions of the respondents

	Sex	States	Age Group	Educ. Qual.	Industry Sector	Position in Industry	Year of Exp.
Mean	26.50	10.60	13.25	13.25	13.25	17.67	13.25
Standard Error	20.50	1.50	5.44	4.31	3.94	7.22	4.31
Median	26.50	12.00	9.00	12.00	12.00	18.00	12.00
Mode	#N/A	7.00	6.00	6.00	12.00	#N/A	6.00
Standard Deviation	28.99	3.36	10.87	8.62	7.89	12.50	8.62
Sample Variance	840.50	11.30	118.25	74.25	62.25	156.33	74.25
Kurtosis	#DIV/0!	-3.04	2.49	-4.39	1.98	#DIV/0!	-4.39
Skewness	#DIV/0!	-0.41	1.63	0.28	0.92	-0.12	0.28
Range	41.00	7.00	23.00	17.00	19.00	25.00	17.00
Minimum	6.00	7.00	6.00	6.00	5.00	5.00	6.00
Maximum	47.00	14.00	29.00	23.00	24.00	30.00	23.00
Sum	53.00	53.00	53.00	53.00	53.00	53.00	53.00
Count	2.00	5.00	4.00	4.00	4.00	3.00	4.00
Largest(1)	47.00	14.00	29.00	23.00	24.00	30.00	23.00
Smallest(1)	6.00	7.00	6.00	6.00	5.00	5.00	6.00
Confidence Level(95.0%)	260.48	4.17	17.30	13.71	12.55	31.06	13.71

Figure 1 illustrates the geographical distribution of respondents and their level of familiarity with occupational health and safety (OHS) policies. A significant proportion of respondents from Kwara (92%), Ogun (92%), Lagos (88%), and others (88%) exhibit a high level of awareness regarding occupational health and safety (OHS) policies, whilst all respondents from Oyo (100%) demonstrate a moderate familiarity with OHS policies.

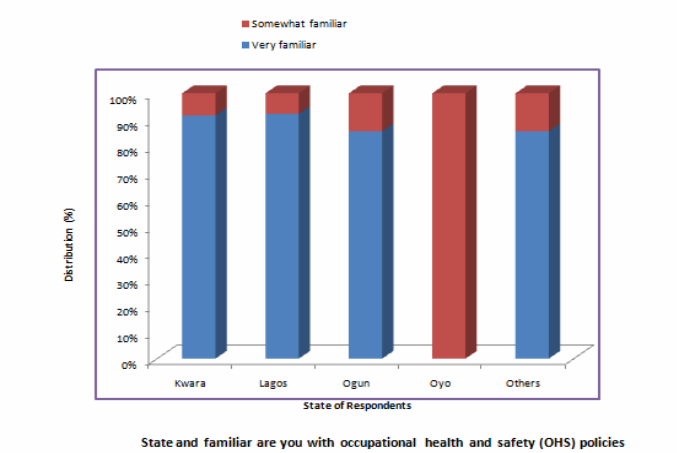

Fig.1: Distribution of respondents' states and their level of familiarity with occupational health and safety (OHS) policies.

A Chi-Square test distribution was employed to further analyze Figure 1 at a significance level of 5%. A significance level of 5% was used to ascertain the distribution of the participant's familiarity with occupational health and safety (OHS) policies about their preferences for the state of the workplace using the Chi-square test.

Testing of research hypotheses - Hypothesis 1

H0 states that participant familiarity with occupational health and safety (OHS) policies has no significant effect on state preferences, and H1 states that participant familiarity with occupational health and safety (OHS) policies has a significant effect on state preferences. Table 5 displays the Chi-Square Test Distribution for Hypothesis 1 at the Significance level of 5 %.

Table 5: Chi-square test for the distribution of the participant's familiarity with occupational health and safety (OHS) policies about their preferences for the state of the workplace,

S/N	Observed freq (fo)	Expected freq (fe)	fo-fe	Sqr(fo-fe)	Sqr(fo-fe)/fe
1	11	9.2830	1.7170	2.9480	0.3176
2	12	10.0566	1.9434	3.7768	0.3756
3	6	5.4151	0.5849	0.3421	0.0632
4	0	5.4151	-5.4151	29.3232	5.4151
5	12	10.8302	1.1698	1.3685	0.1264
6	1	2.7170	-1.7170	2.9480	1.0850
7	1	2.9434	-1.9434	3.7768	1.2831
8	1	1.5849	-0.5849	0.3421	0.2159
9	7	1.5849	5.4151	29.3232	18.5016
10	2	3.1698	-1.1698	1.3685	0.4317
	Total	53.0000			**27.8151**

The decision rule (Table 5) stipulates that if the computed X^2 surpasses the tabulated X^2 value, the null hypothesis (Ho) is rejected, and the alternative hypothesis (Hi) is affirmed. Given that the calculated X^2 (27.8151) surpasses the critical X^2 (0.711) at a 95% confidence level with 4 degrees of freedom, the null hypothesis (Ho) is rejected. The hypotheses contend that participant familiarity with occupational health and safety (OHS) policies does not substantially affect state preferences, whereas H1 asserts that this familiarity does significantly impact state preferences.

Figure 2 depicts the distribution of respondents categorized by age group with the implementation of occupational health and safety policies and procedures in the workplace. The research reveals that a substantial percentage of respondents aged 18-25 (98%), 36-45 (88%), and 46-55 (50%) acknowledge the presence of established Occupational Health and Safety (OHS) policies and procedures in their workplaces. In contrast,

respondents aged 26-35 (100%) and 46-55 (50%) claim that such occupational health and safety rules and procedures are absent in their employment.

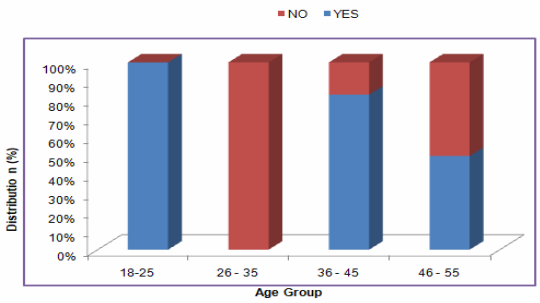

Figure 2: The distribution of respondents by age group and the adoption of occupational health and safety policies and procedures in the workplace

A Chi-Square test distribution was employed to further analyze Figure 2 at a significance level of 5%. The Chi-square test was employed to ascertain the distribution of the participant's adoption of occupational health and safety policies and procedures in the workplace about their preferences for the age group, with a significance level of 5%.

Testing of research hypotheses - Hypothesis 2

H0 states that the adoption of occupational health and safety policies and procedures in the workplace has no significant effect on age group preferences, whereas H1 states that the adoption of occupational health and safety policies and procedures in the workplace has a significant effect on age group preferences. Table 6 shows the Chi-Square Test Distribution for Hypothesis 2 with a significance threshold of 5%.
The decision rule (Table 6) specifies that if the calculated X^2 exceeds the tabulated X^2 value, the null hypothesis (Ho) is rejected, and the alternative hypothesis (Hi) is accepted. The computed X^2 (20.2378) exceeds the crucial X^2 (0.352) at a 95% confidence level with 3 degrees of freedom, resulting in the rejection of the null hypothesis (Ho). The hypotheses propose that the execution of occupational health and safety laws by participants does not significantly influence age group preferences, while H1 posits that such execution does have a substantial effect on age group preferences.

Table 6: Chi-square test for the distribution of the participant's adoption of occupational health and safety policies and procedures about the age group preferences

S/N	Observed freq (fo)	Expected freq (fe)	fo-fe	Sqr(fo-fe)	Sqr(fo-fe)/fe
1	6.00	4.0755	1.9245	3.7038	0.9088
2	0.00	4.0755	-4.0755	16.6095	4.0755
3	24.00	19.6981	4.3019	18.5062	0.9395
4	6.00	8.1509	-2.1509	4.6266	0.5676
5	0.00	1.9245	-1.9245	3.7038	1.9245
6	6.00	1.9245	4.0755	16.6095	8.6304
7	5.00	9.3019	-4.3019	18.5062	1.9895
8	6.00	3.8491	2.1509	4.6266	1.2020
	Total	53.0000			20.2378

Figure 3 illustrates the distribution of respondents based on their educational degrees and the effectiveness of the Occupational Health and Safety training received by the participants. The study indicates that a significant proportion of respondents—100% of diploma/certificate holders, 80% of bachelor's degree holders, and 30% of master's degree holders—claim that the OHS training provided to participants is exceptionally effective. Conversely, individuals with a doctoral degree (100%) and those with a master's degree (30%) perceive the OHS training received by participants as fairly effective.

The data in Figure 3 illustrates the distribution of respondents based on their educational qualifications and the effectiveness of the Occupational Health and Safety training that the participants received. The potential interactions between the educational qualifications and the efficacy of the Occupational Health and Safety training attained by the participants were investigated using ANOVA analysis in the study. The ANOVA Analysis distribution is illustrated in Table 7, which serves as documentation of the educational qualifications and the efficacy of the occupational health and safety training that was acquired.

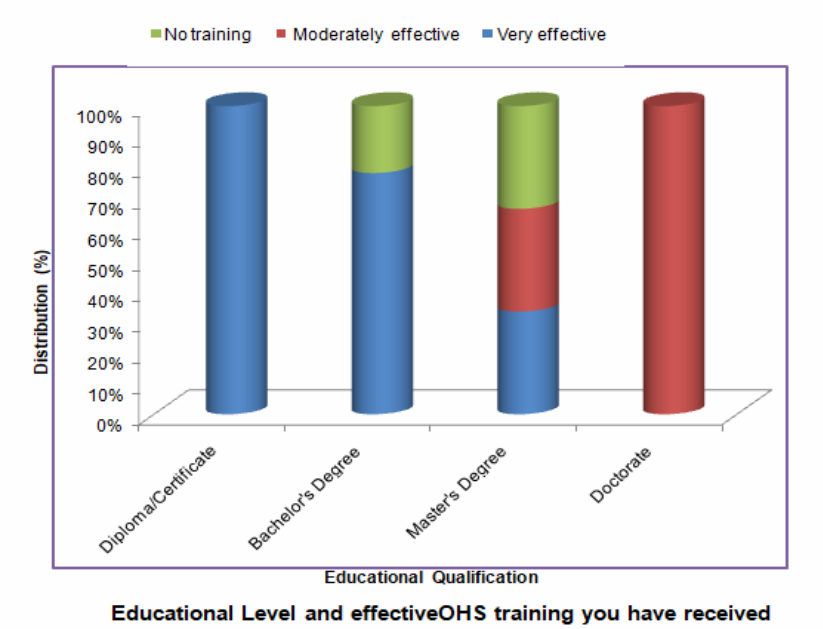

Figure 3: Educational qualifications and the efficacy of the Occupational Health and Safety training obtained by the participants

Testing of research hypotheses - Hypothesis 3

H0 asserts that the educational qualifications do not significantly influence the efficacy of the occupational health and safety training obtained, while H1 asserts that the educational qualifications do significantly influence the efficacy of the occupational health and safety training obtained. ANOVA analysis is demonstrated in Table 7 to investigate the potential interactions between educational qualifications and the efficacy of occupational health and safety training.

Table 7: ANOVA - Educational Level and the efficacy of the Occupational Health and Safety training received

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	74.250	3	24.750	0.908	0.491	4.757
Columns	57.167	2	28.583	1.049	0.407	5.143
Error	163.500	6	27.250			
Total	294.9167	11				

The decision rule (Table 7) indicates that if the calculated F value is smaller than the tabulated F value, H0 is approved and H1 is refused. Since the calculated F (0.908) is less than the tabulated F (4.757), the null hypothesis (H0) is accepted, indicating that the efficacy of Occupational Health and Safety training is not significantly influenced by educational qualifications, while the alternative hypothesis (H1) is rejected, suggesting that educational qualifications do not significantly affect the efficacy of the training.

Figure 4 depicts the distribution of respondents by industry sector and their perspectives on the frequency of OHS training provided. The data reveals that all respondents in the construction sector received monthly OHS training, whereas all respondents in the gas and oil sector received annual OHS training. Furthermore, 70% of participants in the agriculture sector underwent quarterly Occupational Health and Safety (OHS) training, whereas 70% in the construction industry received OHS training sporadically.

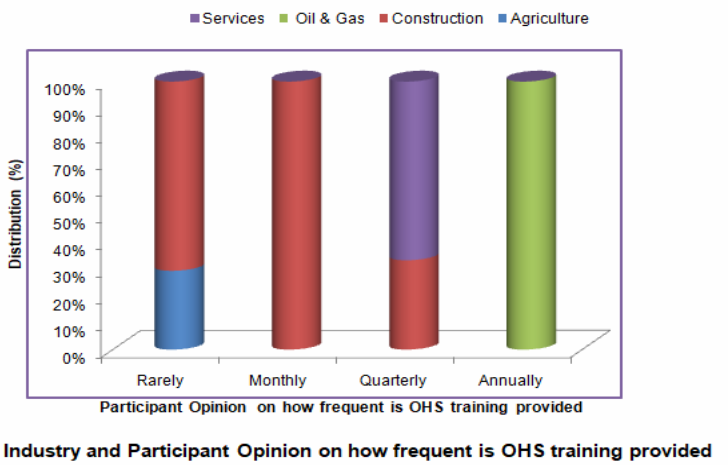

Figure 4: Industry sector and their opinions regarding the frequency of OHS training

Figure 4 depicts the distribution of respondents by industry sector and their perceptions on the frequency of OHS training received. The study utilized ANOVA to investigate the potential connections between the industry sector and participants' perceptions of the frequency of OHS training received. Table 8 presents the ANOVA analysis distribution, demonstrating the relationship between the industry sector and participants' perceptions of the frequency of OHS training received.

Testing of research hypotheses - Hypothesis 4

H0 asserts that the industry sector does not significantly influence the participants' opinions regarding the frequency of OHS training, while H1 asserts that the industry sector does significantly influence the participants' opinions regarding the frequency of OHS training. Table 8 illustrates the ANOVA analysis conducted to investigate potential interactions between the opinions of the participants regarding the frequency of OHS training received and the industry sector.

Table 8: ANOVA - Industry and Participant Opinion on how frequent OHS training is provided

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	46.6875	3	15.563	0.493	0.696	3.863
Columns	22.6875	3	7.563	0.240	0.867	3.863
Error	284.0625	9	31.563			
Total	353.4375	15				

The decision rule (Table 8) indicates that if the calculated F is less than the tabulated F, H0 is accepted and H1 is refused. Since the calculated F value (0.493) is less than the tabulated F value (3.863), the null hypothesis (H0) is accepted. This hypothesis posits that the industry sector does not significantly influence participants' opinions on the frequency of OHS training, while the alternative hypothesis (H1), which asserts that the industry sector does significantly influence these opinions, is rejected.

Figure 5 illustrates the distribution of respondents according to their positions and their assessments of the implementation of OHS policies in the workplace. The data indicates that 92% of supervisors evaluate the implementation of OHS policies in the workplace as exceptional, whereas 70% consider it good. Conversely, 90% of managers perceive the enforcement as equitable, while 50% regard it as inadequate, and 45% of employees also assess it as inadequate.

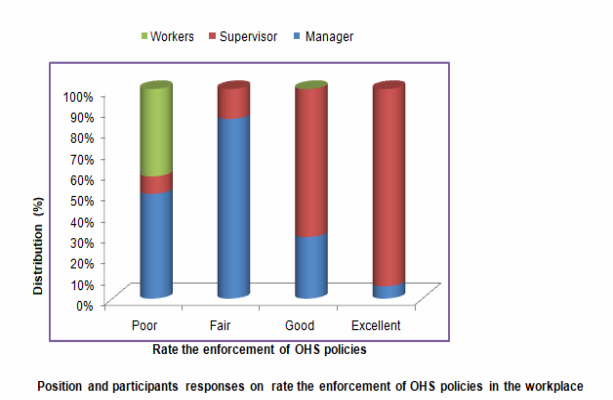

Figure 5: The distribution of respondents by position and their evaluations of the enforcement of OHS policies in the workplace

Figure 5 depicts the distribution of respondents by position and their evaluations of the enforcement of OHS policies in the workplace. The study utilized ANOVA to investigate the potential connections between respondents by position and their evaluations of the enforcement of OHS policies in the workplace. Table 9 presents the ANOVA analysis distribution, demonstrating the relationship between respondents by position and their evaluations of the enforcement of OHS policies in the workplace.

Testing of research hypotheses - Hypothesis 5

H0 asserts that the position does not significantly influence the participants' opinions regarding evaluations of the enforcement of OHS policies in the workplace, while H1 asserts that the position does significantly influence the participants' opinions regarding evaluations of the enforcement of OHS policies in the workplace. Table 9 illustrates the ANOVA analysis conducted to investigate potential interactions between the participants' opinions regarding evaluations of the enforcement of OHS policies in the workplace and the position.

Table 9: ANOVA - Position and rate the enforcement of OHS policies in your workplace

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	78.1667	2.0	39.0833	1.2353	0.3554	5.1433
Columns	22.9167	3.0	7.6389	0.2414	0.8646	4.7571
Error	189.8333	6.0	31.6389			
Total	290.9167	11				

The decision rule (Table 9) stipulates that if the computed F is inferior to the tabular F, H0 is accepted and H1 is rejected. As the computed F value (1.2353) is inferior to the critical F value (5.1433), the null hypothesis (H0) is accepted. This hypothesis asserts that the position does not substantially impact participants' views on the implementation of OHS laws in the workplace, whereas the alternative hypothesis (H1), which contends that the position does considerably affect these views, is dismissed.

Figure 6 depicts the distribution of respondents based on their years of experience and the official Occupational Health and Safety training obtained in the prior year. The data reveals that 88% of those with less than one year of experience and 95% of those with 5 to 10 years of experience report having received official OHS training in the preceding year. In contrast, 84% of those with 1-5 years of experience and 50% of those with 11-20 years report that they did not receive formal OHS training in the last year.

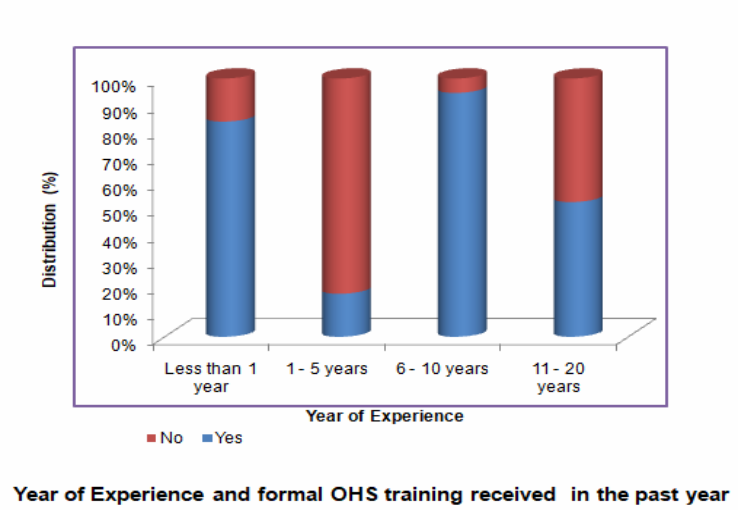

Figure 6: Years of Experience and the official Occupational Health and Safety training acquired

A Chi-Square test distribution was employed to further analyze Figure 6 at a significance level of 5%. The Chi-square test was employed to ascertain the distribution of the participant's official occupational health and safety training about their preferences for the years of experience, with a significance level of 5%.

Testing of research hypotheses - Hypothesis 6

H0 states that the distribution of the participant's official occupational health and safety training has no significant effect on years of experience preferences, whereas H1 states that it has a significant effect. Table 10 shows the Chi-Square test distribution for Hypothesis 6 with a significance threshold of 5%.

The decision rule (Table 10) specifies that if the calculated X^2 is greater than the tabulated X^2 value, the null hypothesis (Ho) is rejected and the alternative hypothesis (Hi) is accepted. The estimated X^2 (15.7685) exceeds the critical X^2 (0.352) at a 95% confidence level with three degrees of freedom, implying that the null hypothesis (Ho) is rejected. The hypotheses claim that the distribution of participants' official occupational health and safety training has no substantial impact on their preferences for years of experience, but H1 suggests that it does.

Table 10: The chi-square test for the distribution of the participant's official occupational health and safety training acquired has no significant effect on years of experience preferences

S/N	Observed freq (fo)	Expected freq (fe)	fo-fe	Sqr(fo-fe)	Sqr(fo-fe)/fe
1	5.00	3.9623	1.0377	1.0769	0.2718
2	1.00	3.9623	-2.9623	8.7750	2.2146
3	17.00	11.8868	5.1132	26.1449	2.1995
4	12.00	15.1887	-3.1887	10.1677	0.6694
5	1.00	2.0377	-1.0377	1.0769	0.5285
6	5.00	2.0377	2.9623	8.7750	4.3063
7	1.00	6.1132	-5.1132	26.1449	4.2768
8	11.00	7.8113	3.1887	10.1677	1.3017
9	Total	53.0000			15.7685

IV. CONCLUSIONS

This investigation offered valuable insights into the current state of occupational health and safety (OHS) in specific states of Nigeria, demonstrating substantial disparities in OHS awareness, training, and enforcement. The following conclusions were drawn; respondents from Lagos, Ogun, and Kwara exhibit a high level of familiarity with OHS policies, whereas those from Oyo exhibit moderate awareness. The analysis emphasizes that state-specific preferences are substantially influenced by familiarity with OHS policies, which implies that regional factors may affect the perception and implementation of OHS. In addition, the

effectiveness of OHS training is not substantially influenced by other demographic factors, such as educational background, whereas the implementation of OHS procedures is found to be more influential on age group preferences. The research also demonstrates that the enforcement of safety regulations and the frequency of OHS training are not significantly influenced by job position or industry sector.

The findings suggest a disparity in the practical enforcement of OHS policies and the effectiveness of training programs, despite the high levels of awareness. The findings emphasize the necessity of enhanced policy enforcement and more customized occupational health and safety training in various sectors. To guarantee safer work environments throughout Nigeria, future research should concentrate on the development of strategies to enhance OHS compliance, particularly in regions and industries with lower levels of awareness and enforcement.

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