

Appraisal of Occupational Safety in Manufacturing Industries in Kaduna and Niger States of Nigeria

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Abstract:- It has been observed that a lot of accidents occur because of lack of safety awareness. Men fall from ladders, operate their machines without guards, drop objects on their toes, or cut their hands because of misuse of tools. All these occur as a result of unsafe acts, or unsafe working conditions. This study therefore has been designed to appraise occupational safety and health practices in manufacturing industries in Kaduna and Niger states of Nigeria. Three research questions and 2 hypotheses guided the study. The study was carried out in 30 functional industries spread between Niger and Kaduna States. A descriptive survey research design was adopted for the study. The respondents for the study comprised of 50 Administrators, 70 Engineers/Technologist and 150 Technicians/Craftsmen. A structured questionnaire consisting of 48 items was used for data collection. Mean scores, Standard deviations and One Way Analysis (ANOVA) were used in the analysis of the data collected. Findings show that some safety equipment and facilities are provided, but management need to show more commitment in providing more facilities. Safety departments in many of the industries are not functional. Not much is done in terms of safety Education. It was recommended among others that, functional fire fighting vehicles and facilities should be improved upon. Posters, safety booklets, films, special classroom sessions, and interaction with safety specialist/supervisors should be used to educate and enlighten employees on safety issues, safety inspectors from government ministries should play supervisory role in ensuring strict compliance with government policies on safety and health practices in manufacturing industries in Nigeria.

Keywords:- Accidents, Occupational Safety, Industries, Safety Education, Technicians.

I. INTRODUCTION

The present day scenario particularly in the world of manufacturing is full of mechanization, automation and computerization, several of the equipment tools and facilities use in manufacturing have become sophisticated. The lives of the workers are threatened by the occupational hazards caused by accidents which sometimes may be fatal. Reference [1] maintained that carrying heavy weights, moving things around and doing dangerous tasks are essentially pushing a person beyond their natural limits, which could result in serious, permanent injuries or fatal accidents. In the last century, when life was not as fast as today, accidents use to take place as a matter of consequences. But as a result of the magnitude of these problems more lives were lost in industrial accidents. In fact according to [2] hundreds of Nigerians in various manufacturing industries lose their lives yearly; he further said some others are permanently incapacitated (disable) while others contract diseases to stay with them for life.

As a result of the high rate of industrial accidents resulting into high number of deaths recorded every year, the Federal Government of Nigeria took some very proactive steps, for example the establishment of the Federal Environmental Protection Agency (FEPA) through Decree No. 58 of 1988. In 1989, the Federal Government through FEPA formulated a National Policy on Environment with the overall aim of providing a safe general and working environment for all citizens. At another instance the Federal Government adopted the Safety and Health Provisions of the factories Act and Rules of 1948. The factories Act of 1948 is a law, regulating safety health and welfare in factories. The Act according to [3] applies to all factories. Factory under the Act as any premises wherein a manufacturing process is carried out with the aid of power and ten or more workers are working or were working on any one day in the preceding 12 months ([3]). Reference [4] observed that this factory Act deals with areas such as inspection and certifying factory premises, Licensing and Approval of plot of plant. Health and cleanliness, Dust and Fumes, Artificial Humidification, Lighting, Drinking water, safety of Machinery, Striking gears, Hoists and Lifts, Lifting Machines, Chains, Ropes and Lifting Tackles,

other areas are Revolving Machinery, Pressure Plants, Floor, Stairs, Industrial Poisoning and Noise, Fire/Explosive or Inflammable Dust, Gas etc.

Despite these pressure put in place by Government and according to [5] the emergency of vibrant and dynamic manufacturing sector that has accelerated economic growth and improvement in the quality of life in our society today the scourge of industrial accidents particularly from the manufacturing industries have claimed precious lives, turned many Men and Women into widowers and widows. While according to [6] several others have become permanently disable and unable to fend for themselves. Manufacturing industries deals with processing of raw material resources into finished products. Some of these processes result into emission of dangerous chemicals, waste products that are harmful to human health and even the environment. Reference [6] observed that modern industries must use infinite number of substances and compounds, some of which are injurious to the workers health. Chemical related accident records shows that more than 100 deaths occurred annually in the United States as a result of carbon monoxide poisoning. Reference [7] researched into effects of industrial chemical emission on the health of workers and discovered that as a result of insufficient safety measures; more than 250 technical workers of fertilizer blending company in Kaduna were all diagnosed to have body disorder, such as cancer of the lung, infertility, cardiovascular diseases and genetic mutation. Momoh further, observed that the bane of the industrial workers is that they are protected or taught by their employers. The work of [8] shows that several workers in the steel manufacturing industries that experienced radiation accidents, caused by radioactive materials suffer from nausea diarrhea, loss of weight, premature aging and leukemia. Accidents, dangerous situations and health problems have been assumed to be indicators of risk behaviours ([9]).

Records also abound as reported by [10] on how several workers of Peugeot automobile company in Kaduna were rendered partially blind as a result of constant exposure of their eyes to infra-blue rays of oxy-acetylene rays used in cutting tide metals. More disturbing and heart breaking is the report of 1st June, 1997, in the Sunday concord of how a stamping machine crushed the head of a factory worker with Primotex Nigeria Limited Lagos. He was merely cleaning machine when a colleague switched on the machine. The least of these sad events are endless. When one think of untimely deaths of vibrant, promising Nigerians via industrial accidents and how many of these untimely deaths have turned several children to orphans and women to widows it becomes pertinent to embark on a research of this nature. It is in the light of the above that this research is set to appraise occupation safety and health practice in Nigerian manufacturing industries.

A. Research Questions

The following research questions were formulated to guide the study:

1. What are the safety equipment and facilities provided in the manufacturing industries?
2. What is the extent of compliance with safety practices in manufacturing industries?
3. How committed are the managements of manufacturing industries to promotion of safety and safety Education?

B. Hypotheses

Ho₁ There is no significant difference in the mean responses of Administrators, Engineers/Technologists and Technicians/Craftsmen on the safety equipment and facilities provided by manufacturing industries. Ho₂ There is no significant difference in the mean responses of Administrators, Engineers/Technologists and Technicians/Craftsmen on the commitment of managements of manufacturing industries to promotion of safety and safety Education.

II. METHODOLOGY

The design for this study is a survey research because of the nature of the information needed for the research. The study was carried out in Kaduna and Niger States of Nigeria in functional manufacturing industries located in the two states. The population for this study consisted of Administrators (management staff), Engineers/Technologists and Technicians/Craftsmen (Technical personnel). The sample of the study is two hundred and seventy (270) subjects consisting of fifty (50) Administrators, seventy (70) engineers/technologists and one hundred and fifty (150) technicians/craftsmen. Cluster and simple random sampling technique was used in selecting the three categories of respondents. Table I shows sample of distribution of respondents used for the study.

Table I: Distribution of sample of Respondents from functional manufacturing industries in Kaduna and Niger States of Nigeria

S/No	State	Manufacturing Industries	Administrators	Engineers/ Technologist	Technicians/ Craftsmen	Grand Total
1	Niger	10	20	30	50	100
2	Kaduna	20	30	40	100	170
	Total	30	50	70	150	270

The instrument for data collection was a structured questionnaire, consisting of 48 items rated on 4-point scale of strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). They were subjected to both face and content validation by two experts in occupational safety. The reliability of the instrument was determined using Cronbach Alpha after pilot testing on 20 respondents comprising of industry administrators, Engineers/Technologists and Technicians/craftsmen. These respondents were not used in the main study. The reliability coefficient stands at 0.85 and the instrument was therefore adopted for the study. The researcher administered the questionnaire with the help of research assistants to all the two hundred and seventy respondents that were used for the study.

Data collected for the study was analysed using mean, standard deviation and One Way Analysis of Variance (ANOVA). Mean and standard deviation were used to answer the research questions, while ANOVA was used to test the two hypotheses. To determine the acceptance level, the resulting mean scores were interpreted relative to the concept of the real lower and upper limits of numbers 1-4 as used on the rating scale adopted for the study. The decision point is between the upper limit of 4 and lower limit of 3 being 2.49 and 2.50. This implies that items with mean values of 2.50 and above were considered as agreed, while items with mean values of 2.49 and below were considered as disagreed. The null hypotheses were accepted where the value of F ratio (calculated) were less than F ratio (critical table value) at 0.05 level of significant and will be rejected where the value of F-ratio calculated is greater than F-critical (which is 3.00 in this case).

III. RESULT AND DISCUSSION

A. Research Question 1

What are the safety equipment and facilities provided in the manufacturing industries?

Table II: Respondents Mean Scores and Standard Deviations on the Safety Equipment and Facilities Provided in the Manufacturing Industries

S/No	ITEMS	M_1	M_2	M_3	M_t	SD_t
1	Adequate number of fire extinguishers and fire fighting vehicles are available in the industry to fight fire outbreak.	2.62	2.90	3.33	2.95	0.71
2	Appropriate protective eye goggle and shields are provided in the workshops for all the personnel.	2.45	3.12	3.01	2.86	0.80
3	Protective footwear (boot) are available to all staff in the workshops	2.50	3.00	2.80	2.80	0.79
4	Appropriate aprons/overalls are available for all the workers	2.53	3.11	2.82	2.82	0.93
5	Nose mask/functional respirators are made available for workers and visitors to the factory	2.75	2.41	2.22	2.46	0.63
6	Functional head protection (helmet) are provided for the workers	2.32	3.04	2.70	2.69	0.76
7	Equipped first aid boxes are available in the industry	2.32	3.15	2.21	2.56	0.83
8	Danger signs are available for use at designated danger zones and on damaged equipment/machines	2.50	2.91	2.24	2.55	0.86
9	Hand gloves are provided for workers within the workshops	2.53	3.14	2.65	2.77	0.67
10	Fault alarms/indicators are mounted on strategic locations in the industry	2.31	2.94	2.25	2.50	0.64
11	Colours, warning signs, barriers, and safety inter locks and automatic trip off devices are provided at the appropriate locations.	2.84	2.92	2.80	2.85	0.62

12	Provisions are made for mobile overhead cranes, power trucks and forklifts to ease movement of heavy loads within the workshops	2.73	3.02	2.64	2.80	0.64
13	Good quality chains, hauling, rings, and swivels are available	2.97	2.40	2.53	2.63	0.97
14	There are both air and gas compressors	2.51	2.52	2.30	2.44	0.67
15	Hazardous, materials, substances and chemicals etc in containers are properly labelled	2.90	2.92	2.61	2.81	0.73
16	There are communication gadgets such as telephone, intercom, intra-com in cases of emergency.	2.91	2.54	2.41	2.62	0.75
17	Industries have ambulances and standard clinics or medical centres	2.83	2.94	2.72	2.83	0.73
18	Clean drinking water is provided for the workers in the industries	2.15	3.22	2.61	2.66	0.66
19	Gang ways and doors are kept clean and void of obstructions	2.82	2.66	2.36	2.61	0.69
20	All dangerous machine parts are adequately covered or guarded.	2.75	2.62	2.40	2.59	0.62

Key: M_1 = Mean of Administrators, M_2 = Mean of Engineers/Technologists
 M_3 = Mean of Technicians/Craftsmen, M_t = Average mean of Respondents
 SD_t = Standard Deviation of the three Respondents

B. Research question 2

What is the extent of compliance with safety practices in manufacturing industries?

Table III: Respondents Mean Scores and Standard Deviations on the Extent of Compliance with Safety Practices in Manufacturing Industries

S/No	ITEMS	M_1	M_2	M_3	M_t	SD_t
21	No person works on any machine unless he has been fully instructed/trained	2.74	2.91	2.72	2.79	0.74
22	Workers are complying with “no smoking” rules within the workshops.	2.82	2.53	2.63	2.66	0.55
23	Personal protective equipment such as safety glasses, respirators, safety boots etc are worn constantly	2.85	3.14	2.61	2.87	0.65
24	Employees keep their machines, benches or work areas clean at the end of every activity	2.80	3.17	2.73	2.90	1.05
25	Loose-fitting, finger rings, long hair, dangling neck ties are usually avoided in the workshops	2.56	2.94	2.52	2.67	0.76
26	Workers usually lift loads manually when trolleys and cranes are not available	2.71	3.05	2.64	2.80	0.80
27	Employees run machines at the normal or safe working speed of revolution	2.65	3.04	2.60	2.76	0.87
28	Chains, rings, hooks, shackles and swivels are inspected daily before use	2.63	2.94	3.02	2.86	0.79
29	Regular routine maintenance of tools and equipment are done to keep the equipment safe for use.	2.82	2.66	2.67	2.72	0.85
30	Workers use personal protective ear equipment such as ear plugs or muffs.	2.81	2.63	2.60	2.67	0.82

C. Research Question 3

How committed are the management of manufacturing industries to promoting safety and safety Education?

Table IV: Respondents Mean Scores and Standard Deviations on extents of Management’s Commitment to promoting safety and safety Education

<i>S/No</i>	<i>ITEMS</i>	<i>M₁</i>	<i>M₂</i>	<i>M₃</i>	<i>M_t</i>	<i>SD_t</i>
	Occupational Safety					
31	Management permits government safety inspectors to monitor the environment and workshops	2.82	2.61	2.64	2.69	0.79
32	Gang ways, compartments such as control, tool and finishing rooms are adequately lightened	2.93	2.96	2.52	2.80	1.02
33	Fire extinguishers are serviced or changed when they expire and are accessible to workers	2.95	3.08	2.60	2.88	0.70
34	Dressing rooms, toilets and washing rooms are maintained and kept clean	2.99	3.12	2.82	2.98	0.71
35	The industries are always shut down for the purpose of maintenance that promotes safety.	2.97	3.24	2.48	2.90	0.84
36	Supervisors enforce strict compliance with safety rules and regulation within the workshops	2.81	3.16	2.37	2.78	0.75
37	Workers are usually sent for routine medical check up	2.64	3.08	2.45	2.72	0.76
38	Fire fighting vehicles and ambulance are functional in case of emergencies	2.60	3.21	2.52	2.78	0.90
39	The safety officers usually move around the various departments for inspection.	2.54	3.26	2.42	2.74	0.69
	Safety Education					
40	In house training programme are organise for employees on safety and heath practices	2.63	2.94	2.55	2.71	0.78
41	Safety and health precaution symbols, posters and picture are pasted or hanged within and out of the premises	2.44	3.06	2.48	2.66	0.65
42	Employees are engaged on workshop and seminars on safety practices regularly	2.36	3.04	2.56	2.65	0.89
43	Special training are always given to employee when new machines are acquired	2.74	3.16	2.54	2.81	0.94
44	New employees are given safety orientation before being assigned to their primary task	2.65	3.20	2.62	2.82	0.82
45	Lecturers from the Universities are invited as resource person to deliver lectures on safety	2.46	2.95	2.74	2.72	0.70
46	Books, manuals, journals and video clips are provided for the employees regularly	2.63	2.82	2.74	2.73	0.67
47	Interactive multimedia, instruction through shop demonstration are contantly organized for workers	2.74	2.65	2.34	2.58	0.73
48	Public lectures are given specifically on the effects of harzardous substance on human health.	2.96	3.08	2.54	2.86	0.77

Analysis and the corresponding data presented in table II show that to certain level, safety equipment and facilities are provided except for nose mask/respirators/air and gas compressors. The items are rated high with mean responses ranging between 2.50 – 2.95. Standard deviations of the 20 items on the safety equipment and facilities in the manufacturing industries also ranged between 0.62 and 0.93 indicating minimal deviation from the mean.

Table III which addressed extent of compliance with safety practices in the manufacturing industries shows that manufacturing industries are complying with safety practices. The mean response is between 2.66-2.90. The standard deviations of 9 items in this category were less than 1 except item 24 that has standard deviation of 1.05.

Analysis on table IV revealed that the three groups of respondents agreed with the fact that the managements of these manufacturing industries are committed to promoting safety and safety Education. The mean response is between the ranges of 2.58-2.98. Item 32 have highest standard deviation of 1.02 all others are less than unity indicating minimal deviation from the mean.

D. Hypothesis one

There is no significant difference in the mean responses of Administrators, Engineers/Technologists and Technicians/Craftsmen on the safety equipment and facilities provided by manufacturing industries. Table V shows ANOVA of Administrators, Engineers/Technologists and Technicians/Craftsmen on the safety equipment and facilities provided by the manufacturing industries.

Table V: One-way ANOVA of Mean Scores of Respondents on the Safety Equipment and Facilities Provided by the Manufacturing Industries

<i>Sources of Variation</i>	<i>df</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F_{cal}</i>	<i>F_{cv}</i>
Between Groups	2	0.542	0.271	1.38	3.00
Within Groups	267	52.682	0.197		
Total	269	53.224			

Key: df = degree of freedom, F_{cal} = F-ratio calculated, F_{cv} = F-ratio critical value

E. Hypotheses Two

There is no significant difference in the mean responses of Administrators, Engineers/Technologists and Technicians/Craftsmen on the commitment of management of manufacturing industries to promotion of safety and safety Education. Table VI shows ANOVA of Administrators, Engineers/Technologists and Technicians/Craftsmen on the commitment of management of manufacturing industries to the promotion of safety and safety education

Table VI: One-way ANOVA of Mean Scores of Respondents on the Commitment of Management of Manufacturing Industries to the Promotion of Safety and Safety Education

<i>Sources of Variation</i>	<i>df</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F_{cal}</i>	<i>F_{cv}</i>
Between Groups	2	1.062	0.531	2.23	3.00
Within Groups	267	63.522	0.238		
Total	269	64.584			

Findings on Table V and VI revealed that the F-ratio calculated at 0.05 level of significance with 2 and 267 degrees of freedom were 1.38 and 2.23 respectively, while the critical value of F-ratio is 3.00. Since the calculated values of 1.38 and 2.23 were less than the critical value of 3.00, the null hypotheses were therefore accepted. It is concluded that there is no significant difference in the responses of Administrators, Engineers/Technologists and Technicians/Craftsmen on the safety equipment and facilities provided by the manufacturing industries and on the commitments of management of manufacturing industries to promotion of safety and safety education.

F. Discussion

The findings on table II indicated that most of the industries have safety equipment provided within the working environment. Safety equipment such as fire extinguishers, projective eye goggles, shields and respirators others include hand gloves, helmets fault alarms etc. this finding is not coming as a surprise because according to [11] manufacturing industries should for example have sufficient stocks of fire extinguishers of various grades and types that can be used to combat an eventual outbreak of fire. Though he further warned that the success of any fire prevention or extinguishing depend on several factors such as (1) the training and education given to the volunteer fire fighting team; (2) The success of the fire-prevention programme depends again much on good housekeeping, maintenance of fire-fighting equipment, the enforcement of rules like “No Smoking”, and the segregation and reduction of combustible materials. Reference [12] stressed that the protection of the eyes, ear and other delicate part of the body should be a priority. For example there is no reason why a manufacturing industry cannot provide face shields, eye goggles, ear plugs or acoustics in rooms where much noise and vibration takes place.

Further analysis shows that protective equipment such as nose mask/respirators are in short supply. This is in complete agreement with the findings of [7] who reported that several manufacturing companies do not make provision for workers protection against fumes, poisonous emissions and dusts discharged from the working environment. Further findings by [7] revealed that as a result of this non provision of protective equipments, two hundred and fifty (250) technical workers of fertilizer blending company and former Benue Cement Company Gboko were diagnosed to have several body disorders such as cancer of the lung, infertility, cardiovascular diseases and genetic mutation. The bane of these Industrial workers is that they are protected or taught by their employers.

Analysis of research question 2 shows that most of the manufacturing industries are complying with safety practices. Though there were few isolated cases of carelessness. It is in the light of above findings that [13] however maintained that the key to an effective safety process is the understanding that everyone has a role to play and that accidents could be reduced to the barest minimum if the workers develop positive safety attitudes. He said considerable proportions of all accidents are due to faulty attitudes. They found that faulty attitude was the single largest contributor (75%) to all accidents attributed to human causes. Reference [1] however maintained that if safety plans are carried out with a lot of deficiencies or variations, workers will start creating their own way of doing their work, and these fluctuations could lead to injuries or accidents.

In another parallel study carried out by National Safety Council recognizes in their analysis of accident causation three main divisions including unsafe Act, personal cause, and mechanical cause. The council maintained that the few isolated cases of where workers lose their lives or sustain injuries of various degrees can be attributed to improper attitude, lack of knowledge or skill, and bodily (physical or mental) defects. References [2] and [14] in their studies on industrial safety unanimously agreed that the few cases of workers at one Oil Company and Oshogbo Machine Tool Industries that were crushed by various machines were attributed to non compliance with basic safety rules and precautions.

Results on items that looked into promotion of safety and safety education in the industries by the management of manufacturing industries shows that several of the industries have basic safety equipment provided, but not much have been done in the area of safety education. This finding commensurate with the work of [15] who noted that many industries have tried in providing safety equipment such as fire extinguishers, washing basins, nose mask etc. They also noted that the major manufacturing industries have safety facilities such as dressing rooms, lightened furnishing rooms, gang ways, and toilets. Emphasizing on this point, [16] state that maintaining a safe workplace has been shown to enhance an organization's global competitiveness and enables the organization to meet desired objectives

However [1] observed that companies are often inaccessible to inspections by government health and safety enforcement agencies. In many instances, they operate as an "underground industry" or companies not even registered with the government for tax purposes. In the same vain [14] noted that several of the fires fighting vehicles are in bad states, external safety inspector hardly visit these industries to ensure compliance. Reference [17] observed with dismay that many of the industries do not have functional safety department neither is there any serious safety education going on. He said workers are only given general orientation upon resumption. It is important to note that safety education is one of the major ways by which industrial accidents could be reduced to bear minimum.

IV. CONCLUSION

It has been observed that a lot of accidents occur because of several factors such as unsafe acts, unsafe working condition and poor work attitude by employers. Finding from this research work have shown that several of the light or fatal accidents that have happened to many industrial workers is as a result of poor work practices, lack of judgment, in attentiveness and recklessness. On the other hand it has also been found that many operators' errors leading to accidents have being triggered by faulty design or machine construction errors or lack of standardization.

However research findings also show that authorities of many industries have not shown enough commitment in areas such as machine guarding, personal protective equipment, plant layout, manufacturing methods, lightening, heating, ventilation and removal of dust and fumes. It was discovered that many of the industries do not have functional fire fighting vehicles neither do they have a functional safety department, so neither external or internal safety inspectors go round to enforce compliance. Safety awareness that can be developed by having meetings, posters, safety booklet, films and special classroom sessions are completely absent. Yet it has been established that safety education have over the years eliminated safety ignorance and poor attitude to unsafe work practices.

V. RECOMMENDATIONS

Based on the findings and conclusion, the following recommendations are deemed necessary:

1. Functional fire fighting vehicles and facilities should be improved upon
2. Authorities of several industries should show more commitment in the provision of basic safety equipment and facilities
3. Safety department of all the industries should be revived as a matter of urgency to meet the current challenges.
4. Safety inspectors from government ministries should play a supervisory role in ensuring strict compliance with government policies on safety and health practices in manufacturing industries in Nigeria.

5. Industries should re-vive their safety education process, where posters, safety booklets, films, special classroom sessions and interaction with safety specialist/supervisors should be used to educate and enlighten employees on safety issues.

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