

Occupational Health Hazards in Small and Medium-scale Manufacturing Industries in Anambra State, South East, Nigeria

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Abstract Background: The World Health Organization (WHO) defined "occupational health" as dealing with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards. A hazard is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. Globally, there are 2.9 billion workers who are exposed to hazardous risk at their work places. Annually, there are two million deaths that are attributable to occupational diseases and injuries, while 4% of Gross Domestic Product (GDP) is lost due to occupational diseases and injuries. **Objectives:** To assess the occupational health hazards in small and medium-scale manufacturing industries in Anambra State. **Methodology:** This was a comparative descriptive cross-sectional study amongst registered medium and small-scale manufacturing industries in Anambra State. Data were collected using an interviewer administered semi-structured questionnaire and were analyzed using SPSS version 17. An inspection of the industries was done and the measurement of noise level, dust and psychosocial hazards within the factory floor was carried out. **Results:** A preponderance of male staff was found in the small scale (77.6%) and medium scale (75.0%) industries. The medical staffs constituted 7.4% in the medium scale industries and 2.1% in the small scale industries. The medical staff in both the small and medium scale industries constituted only 3.9% of the total work force. The average noise level was found to be higher in the medium scale industries (76.2) as compared to the small scaled industries (72.6). The average environmental dust concentration and psychosocial hazards were found to be higher in the small scale industries (2.3mg/m³ and 52.1%); as compared to the medium scale industries (1.1mg/m³ and 26.3%) respectively. Cuts and injuries constituted 41.2%; 35.4 and 25.9%; 30.0 of complaints by workers associated with hazards in the small and medium scale industries respectively. **Conclusion:** The average noise level was higher in the medium scale industries and generally lower than the threshold limits value (TLV) for noise of 85dB over an 8 hour working period. The average environmental dust concentration and psychosocial hazards were higher in the small scale industries. There was high potentials for accidents and injuries.

Keywords: occupational health, hazards, small, medium scale, manufacturing, industries

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1. Importance for Public Health

- There is paucity of published studies, if any on occupational health hazards that workers are exposed to in Anambra State which is one of the most industrialized states with high commercial and industrial activities in Nigeria.
- The study revealed that the average noise level was found to be higher in the medium scale industries as compared to the small scale industries and generally lower than the threshold limit value (TLV) for noise of 85dB over an 8 hour working period.
- Also revealed is that the average environmental dust

concentration and psychosocial hazards were higher in the small scale industries as compared to the medium scale industries.

- There was high potential for accidents and injuries in both the small and medium scale industries.
- Findings from this study will be sent to the State Ministry of Commerce and Industries and also the Manufacturers Association of Nigeria with appropriate recommendations.

2. Introduction

As defined by the World Health Organization (WHO) "occupational health deals with all aspects of health and

safety in the workplace and has a strong focus on primary prevention of hazards. [1] Health has been defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". [2] Occupational health is a multidisciplinary field of healthcare concerned with enabling an individual to undertake their occupation, in a way that causes least harm to their health. For example, with the promotion of health and safety at work which is concerned with preventing harm from any incidental hazards arising from the workplace. A hazard is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. Basically, a hazard can cause harm or adverse effects to individuals as health effects or to organizations as property or equipment losses. [3]

Globally, there are 2.9 billion workers who are exposed to hazardous risk at their work places. Annually, there are two million deaths that are attributable to occupational diseases and injuries, while 4% of Gross Domestic Product (GDP) is lost due to occupational diseases and injuries. However, the importance of OHSs is often overlooked. [4]

The attitude of the workforce to safety practices is not encouraging as one wonders whether safety principles exist in their minds while within the workspace environment. It is not necessary to hammer the fact that every day in public workspace like the factory floor shop of manufacturing industries, construction sites, road repair sites, and even mechanic workshops, we see artisans and workmen not safely dressed as it applies to their work and it is an indicator to the level of disregard that Nigerian workmen have for safety culture. Occupational health services are supposed to play an important part in the prevention and control of occupational diseases and injuries and in occupational rehabilitation. [5]

Occupational injuries constitute 1.5% global public health burden in terms of disability adjusted life years (DALY) and with estimated economic loss of 5-10% gross national product. [6,7] The International Labor Organization (ILO) conservatively estimated that about 2.3 million workers die each year from unintentional work related accidents and diseases. Work related morbidity is estimated to be more than 270 million cases annually. People belonging to all economic groups suffer fatal injuries, but death rates due to injuries tend to be higher in developing countries where there are unsafe working environments, less awareness, poorly trained workers and limited or no occupational health services available to care for the working population. [7,8,9]

The absence of reliable information about the incidences of occupational accidents and diseases is a major obstacle to curbing the appalling toll of work-related deaths and injuries. Despite enormous advances in technology, preventive medicine and the means to prevent accidents, the ILO and the WHO estimates that around 1.2 million work-related deaths, 250 million accidents and 160 million work-related diseases occur worldwide each year. Death, illness, and injury on such a scale impoverish individuals and their families, and they undermine attempts to improve working conditions. In addition to immeasurable human sufferings, they cause major economic losses for enterprises and

societies as a whole, such as lost productivity and reduced work capacity. [10]

Other than the home environment, the workplace is the setting in which many people spend the largest proportion of their time. Indeed, for most people, particularly in developing countries like Nigeria, the boundary between their home and workplace environment is blurred, since they undertake agricultural or cottage industry activities within the home. In favorable circumstances, work contributes to good health and economic achievements. However, the work environment exposes many workers to health hazards that contribute to injuries and systemic disorders; e.g., respiratory, cardiovascular, reproductive and central nervous system disorders. [11] Occupational morbidity, disability and mortality in most developing countries including Nigeria is becoming a serious public health problem which pose challenges to achieving the millennium development goals of poverty reduction and health for all. Evidence-based occupational health and safety services are indispensable in manufacturing industries in the developing world. [12]

The work environment exposes many workers to health hazards that contribute to injuries, respiratory diseases, cancer, musculoskeletal disorders, reproductive disorders, cardiovascular diseases, mental and neurological illnesses, eye damage and hearing loss, as well as to communicable diseases. [13] A study done in a Korean Tire manufacturing plant on work environments and exposure to hazardous substances reported that workers were exposed to rubber fumes that exceeded $0.6\text{mg}/\text{m}^3$, the maximum exposure limit in the UK. Forty-seven percent (47%) of workers were exposed to noise levels exceeding 85db. Workers in the production management process were exposed to temperatures up to 28.1°C even when the outdoor atmosphere was 2.7°C . [14]

A study in Australia on best estimates of the magnitude of mortality due to occupational exposure to hazardous substances reported that the number of deaths each year from occupational exposure to hazardous substances was 2290 and 78% of these were men. The rate of mortality attributable to occupational exposure to hazards substances was 3-4 times greater in male workers than in females. Male person-years of life lost (PYLL) were eight times higher than females PYLL. [15]

Several studies on occupational hazards and its prevention in manufacturing industries has been done in developing countries like this study in Ethiopia on the determinants of occupational injury in a textile factory reported that lack of training for the jobs, sleep disturbance, and job stress increased the risk of occupational injury. Also found was that men were 2.5 times at higher risk of occupational injury as compared to women, this is line with the study in Australia [15] that had higher male mortality. The study also revealed that workers that are less than thirty years of age are 1.9 times more likely to report injury than those older than thirty years of age. [16]

Cross-sectional studies in Nigeria on occupational health and safety among which is one in Oyo State, South West Nigeria, [17] another done in Kaduna Refinery and Petrochemical Company, Kaduna, North East, Nigeria, [4] both reported high incident rate of notifiable industrial

accidents, and that the rate was higher in the construction workers as compared to the manufacturing workers. These studies also found that the occupational health and safety system were ineffective. Also reported was that despite the knowledge and awareness of respondents to occupational hazards and formal training in occupational safety, compliance rate with occupational safety rules and regulations were poor. [17] There was similar findings in another study among stone quarry workers in Northern Nigeria. All the quarry sites had no preventive/safety measures for the work force. There was no recreational lavatory facilities. [18]

A cross-sectional study in Ilorin, Nigeria on industrial employees' exposure to noise in sundry processing and manufacturing industries reported that the average noise exposure level was found to be above recommended level of 60db by WHO as the healthy noise level. This is in line with a study in a Korean Tire manufacturing industry [19] where noise levels were consistently above 85db. It was also found that the workers in the industries were at high risk of developing noise induce hearing loss. [20] Several cross-sectional studies in Nigeria on awareness of occupational hazards and utilization of safety measures among workers have revealed high level of awareness of occupational hazards among workers with suboptimal utilization of protective measures against these hazards. These studies include a study among welders in Kaduna metropolis, [21] a study among healthcare workers in laboratories of two public health facilities in Nigeria, [22] and a study among mortuary workers in South-West Nigeria. [23]

A study in the US on noise exposure and hearing loss using Washington State workers' compensation records to identify up to 10 companies in each of eight industries. Each company was evaluated by a management interview, employee personal noise dosimetry and employee interviews reported that full-shift average exposures were greater than 85 db for 50% of monitored employees, using Occupational Safety and Health Administration (OSHA) parameters. Only 14% had noise exposures greater than 90 db. These findings are similar to the Korean [14] and Ilorin [20] study. In this study, most of the companies conducted noise measurements, but most kept no records, and consideration of noise controls was low. Hearing loss prevention programmes were commonly incomplete. Sixty two (62%) of interviewed employees reported always using hearing protection when exposed. The findings raise serious concerns about the adequacy of prevention, regulation, and enforcement strategies in the United States. The percentage of workers with excessive exposure was 1.5–3 times higher using a 3 db exchange rate instead of the OSHA specified 5 db exchange rate. Most companies gave limited or no attention to noise controls and relied primarily on hearing protection to prevent hearing loss; yet 38% of employees did not use protection routinely. Protector use was highest when hearing loss prevention programmes were most complete; indicating that under-use of protection was, in some substantial part, attributable to incomplete or inadequate company efforts. [24]

A study on occupational accidents in Russia and the Russian Arctic was carried out by review of the results of a search of the relevant peer-reviewed literature published in Russia and official statistics on Occupational accidents

and occupational safety between 1980–2010. The results showed that the occupational safety system in Russia has severely deteriorated in the last 2 decades, with legislators tending to promote the interests of industry and business, resulting in the neglect of occupational safety and violation of workers' rights. The majority of workers are employed in conditions that do not meet rules of safety and hygiene. More than 60% of occupational accidents can be attributed to management practices that violate safety regulations, poor organization of work, deficiency of certified occupational safety specialists and inadequate personnel training. Research aimed at improving occupational safety and health was underfunded. There is evidence of widespread under-reporting of Occupational accidents, including fatal accidents. Three federal agencies are responsible for Occupational accidents recording; their data differ from each other as they use different methodologies. The rate of fatal Occupational accidents in Russia was 3–6 times higher than in Scandinavian countries and about 2 times higher compared to United States and Canada in 2001. In some Russian Arctic regions Occupational accident levels were much higher. [25]

A study in Lagos, Nigeria amongst paint factory workers reported that a total of 400 randomly selected paint factory workers were involved in the study. A well-structured World Health Organization standard questionnaire was designed and distributed to the workers to elicit information on awareness to occupational hazards, use of personal protective devices, and commonly experienced adverse symptoms. Urine samples were obtained from 50 workers randomly selected from these 400 participants, and the concentrations of the heavy metals (lead, cadmium, arsenic, and chromium) were determined using atomic absorption spectroscopy. The results show that 72.5% of the respondents are aware of the hazards associated with their jobs; 30% have had formal training on hazards and safety measures; 40% do not use personal protective devices, and 90% of the respondents reported symptoms relating to hazard exposure. There was a statistically significant increase in the mean heavy metal concentrations in the urine samples obtained from paint factory workers as compared with non-factory workers. These findings are similar to the Russian study [25] where there was deterioration of occupational safety practices and violation of workers' rights in a developed country as compared to the Lagos study. [26]

3. Methods

The study was conducted in Anambra State, South-East Nigeria. The capital and seat of government is Awka while Onitsha and Nnewi are the biggest commercial and industrial towns respectively. The major indigenous ethnic group in Anambra State is the Igbo (which comprise 98% of the population). Anambra state has a land area of 4,844km² and a population of 4,055,048 according to the 2006 census. [27,28] The study areas included major towns like Nnewi, Onitsha and Awka where there is high concentration of industries.

This was a comparative cross-sectional study amongst registered medium and small-scale manufacturing industries in Anambra State. There were one hundred and seventy

nine (179) manufacturing industries registered with the Anambra State Ministry of Commerce and Industries. These industries were categorized according to labor size into large (employing more than 1000 workers), medium (employing between 51 and 1000 workers) and small scale industries (employing 50 or less number of workers). There was only one large scale manufacturing industry in Anambra State (and this large scale industry was excluded from this study); Eight (8) medium scale and one hundred and seventy (170) small-scale manufacturing industries registered in the state. [29] Although, the minimum calculated sample size was 31 industries in each category, a total population study of all registered small and medium scale manufacturing industries (the one hundred and seventy small scale and the eight medium scale industries) was considered more beneficial because there were only eight medium scale manufacturing industries registered with the Anambra State Ministry of Commerce and Industries.

The instrument used for data collection was a semi-structured questionnaire with closed and open ended questions that were interviewer administered to the company managers such as the personnel manager or the managing director or any other individual assigned to do so in the participating industries. Information got included the labor strength, medical services available to workers, environmental conditions, sanitary, social and welfare facilities, operational legislative measures and safety measures.

An inspection of the industries was done and the measurement of noise level, dust and psychosocial hazards within the factory floor was carried out. A general health questionnaire with focus on psychosocial risk in the work place was used to assess the psychosocial hazards in the workers work environments. The estimates of noise level were determined using a precision grade “Extech” digital sound level meter model 407730 version 1.3 June 2014. Measurement band width 300 Hz to 8 kHz and measuring level range of 40 to 130 db. The instrument was calibrated internally by the internal sound level calibrator before making measurements. The desired response of the sound level meter was set to “A-weighting” and “Slow”. When measurements were made, the microphone was located in such a way as not to be in acoustic shadow of any obstacle in appreciation field of reflected waves. Noise levels were measured at the level of the employee’s heads while they kept their work postures. The standard level above which a worker should not be exposed is 85 decibel.

The dust measuring device DT-9880 was used in this study. It is a universal measuring instrument for measuring the concentration of particles in the air. It measures the exact amount of dust particles in the air. This particle counter measures particle sizes from 0.3 to 10 microns. A general health questionnaire was applied to either the leader or a member of a workers union in each

of the industries studied with focus on psychosocial risk in the work place such as, questions on work hours, work pressure, monotonous work, worker-worker relationship, worker-employer relationship and ergonomic work environment were asked using a five point likert scale. Responses range from “strongly agree” with 4 points, “agree” with 3 points, “not certain” with 2 points, “disagree” with 1 point and “disagree strongly” with 0 points. Six (6) questions were asked with a maximum aggregate of 24 points that is equivalent to 100% i.e. high psychosocial hazards; and a minimum of 0 points which is 0% psychosocial hazards. For the purpose of this study, a score of less than 50% was regarded as low psychosocial hazards, while, a score of between 50 – 69% was regarded as moderate psychosocial hazards, and a score of 70% and above was regarded as high psychosocial hazards.

Data collected were analyzed using the computer software package SPSS version 17. A descriptive analysis of data was done using frequency tables. Chi square statistics was done for the comparison of proportions between medium and small scale industries. T test statistics was done for the comparison of means. The level of statistical significance was set at 5%.

Ethical clearance for this study was obtained from the Research and Ethics Committee of the Nnamdi Azikiwe University Teaching Hospital, Nnewi. Permission to carry out the study was obtained from the Anambra State Ministry of Commerce and Industry. Participating industries were informed of the scope, demand and benefits of the study. They were also assured of confidentiality with the information they provided. To further ensure confidentiality, codes were used instead of names on the questionnaire. Written informed consent was obtained from each participating industry. Participating industries had the right to withdraw from the study at any time in the course of the study if they choose to do so. The study was conducted over a six (6) month period from 1st of March to 31st of August 2014.

4. Results

A total of 8 medium scale manufacturing industries, which represent 100% of the registered medium scale manufacturing industries and 160 small scale manufacturing industries, which represent 94% of the 170 registered small scale industries in Anambra State, were studied. Ten (10) out of the 170 small scale industries did not respond for various reasons such as company policies, fear of prosecution following what is considered “bad report” by researcher and outright aggression and refusal without reason. It was observed that occupational exposure to hazard, work practices and the health services provided in the non-respondent small scale industries were essentially the same as those that responded.

Table 1. Categories of industries (small and medium scale) with the total staff complement and sex distribution

	Categories of industries			Test/p-value
	Small scale, n (%)	Medium scale, n (%)	Total, n (%)	
Sex				
Male	4090 (77.6)	2050 (75.0)	6140 (76.7)	$\chi^2 = 6.67$ df = 1 p < 0.05
Female	1182 (22.4)	683 (25.0)	1865 (23.3)	
Total	5272 (100.0)	2733 (100.0)	8005 (100.0)	

Table 2. Distribution of personnel in the different departments of the two categories of the studied industries

	Categories of industries			Test/ p-value
	Small scale	Medium scale	Total	
Distribution of personnel				
Production staff n (%)	3957 (75.1)	1551 (56.8)	5508 (68.8)	
Maintenance staff n (%)	599 (11.4)	586 (21.4)	1185 (14.8)	$\chi^2=240.7$ df = 4 P < 0.05
Administrative staff n (%)	401 (7.6)	277 (10.1)	678 (8.5)	
Medical staff n (%)	112 (2.1)	202 (7.4)	314 (3.9)	
Other staff n (%)	203 (3.9)	117 (4.3)	320 (4.0)	
Total n (%)	5272 (100.0)	2733 (100.0)	8005 (100.0)	

Table 3. Average values of measured occupational health hazards in the two categories of the studied industries

Category of industry	Occupational hazards		
	Sound level Db (A)	Dust concentration mg/m ³	Psychosocial %
Small scale (n = 160)	72.6	2.3	52.1
Medium scale (n = 8)	76.2	1.1	26.3

Table 4. The prevalence of health symptoms associated with the hazards in the two categories of industries studied

Category of industry	Health symptom						
	Cuts (%)	Falls (%)	Other injuries (%)	Backache (%)	Chest pain (%)	Waist pain (%)	Skin problem (%)
Small scale (n = 160)	41.2	33.5	35.4	25.2	16.2	12.5	27.1
Medium scale (n = 8)	25.9	22.6	30.0	22.8	15.7	10.9	21.4
Mean	33.6	28.1	32.7	24.0	16.0	11.7	24.3

A preponderance of male staff was found in the small scale (77.6%) and medium scale (75.0%) industries. The male/female ratio in the small scale industries was 3.5:1 and 3:1 in the medium scale industries. There was a statistically significant difference in the number of male staffs as compared to the number of female staffs in the studied industries $p < 0.05$). (Table 1)

Most of the workers were in production unit/department. For the small scale 3957 (75.1%) were in the production units, while in the medium scale industries 1551 (56.8%) were in the production units. The administrative staffs constituted 7.6% in the small scale industries and 10.1% in the medium scale industries. The medical staffs constituted 7.4% in the medium scale industries and 2.1% in the small scale industries. The medical staff in both the small and medium scale industries constituted only 3.9% of the total work force. There was a statistically significant difference in the distribution of personnel in the different departments of the studied industries with the production department having the highest numbers of workers. ($p < 0.05$). (Table 2)

The table shows average values (Sum of total readings divided by the total number of industries studied in each category of industries) of readings from the small and medium scale industries of sound level, environmental dust concentration and the average percentage of psychological risk workers are exposed to in these industries. The average noise level was found to be higher in the medium scale industries (76.2) as compared to the small scaled industries (72.6). The average environmental dust concentration and psychosocial hazards were found

to be higher in the small scale industries (2.3mg/m³ and 52.1%); as compared to the medium scale industries (1.1mg/m³ and 26.3%) respectively. (Table 3)

The most frequent prevalent health symptoms associated with the hazards as gotten from interview of health personnel, safety officers or labour union leaders (the sum of "Yes" answer per health symptom in each category of industries was divided by the total number of studied industries in that category multiplied by 100). The results were as follows in Table 4.

Among the small (41.2%) and medium scale (25.9%) industries were cuts, followed by other injuries, 35.4% in the small scale and 30.0% in the medium scale industry. Generally, the small scale industries had a higher percentage of health symptoms as shown in Table 4.

5. Discussion

The responding medium scale industries constituted 100% of the medium scale industries registered with the Anambra State Ministry of Commerce and Industries, while the small scale industries constituted 94% of the total number of registered small scale manufacturing industries in the State. This is a slightly higher response rate as compared with a study in Edo and Delta State of Nigeria that reported an average response rate in the small, medium and large scale industries of 91.1% [30] and a far higher response rate as compared with the study in Jordan [31] that reported a response rate of 21.9% amongst the small scale industries and 58.6% amongst the medium scale industries. This can

be explained by the fact that the Ministry of Commerce and Industry gave the researcher a letter of introduction to facilitate co-operation by factory owners and managers. In this study, the medium scale industries were quite receptive and willing to discuss the various issues raised in the study. However, the small scale industries were less receptive. This may be due to the fact the small scale industries may have poorer health and social welfare services and other things that they may want to hide from investigators especially with respect to hazards in their workers work environments and fear of indictment by the law.

A preponderance of male staff was found in the small scale (77.6%) and medium scale (75.0%) industries with a male/female ratio in the small scale industries of 3.5:1 and 3:1 in the medium scale industries. There was a statistically significant difference in the number of male staffs as compared to the number of female staffs in the studied industries ($p < 0.05$). The male/female ratio also compared with the Edo and Delta State study that reported a male/female ratio of 3:1. [30] The male preponderance is in keeping with the prevailing gender labour force. Females were found to be mainly engaged in secretariat, cleaning and packaging jobs which are less strenuous in terms of physical strength. The males were found to be involved with the more strenuous and risky jobs in these industries. This is in tandem with the study in Australia [15] that reported that 78% of the men were involved in risky and hazardous jobs and also the study in Ethiopia [16] that reported that men were 2.5 times at higher risk of occupational injury as compared to women due to the kind of jobs they undertake.

Most of the workers were in production unit/department. For the small scale industries 75.1%, and the medium scale industries 56.8% were in the production units. This may be due to the fact that the study was on manufacturing industries that are mainly involved in production of products. As observed, the percentage of workers in the production units was higher in the small scale industries as compared with the medium scale industries. This may probably be due to the fact that processes become more automated as one move towards the larger scale industry types. The administrative staffs constituted 7.6% in the small scale industries and 10.1% in the medium scale industries. The medical staffs constituted 7.4% in the medium scale industries and 2.1% in the small scale industries, with an average from both the small and medium scale industries of 4.8% of medical staffs. The percentage of administrative and medical staffs is observed to be higher in the medium scale industries as compared to the small scale industries. This is higher as compared to the Edo and Delta State study [30] that reported that the medical staffs constituted 2.5% of the total staff of the manufacturing industries. This higher rate therefore, implies that there is better awareness now on the need for more medical staffs to be employed to meet the workers health needs as compared with the situation then when the Edo and Delta State study [30] was carried out.

One occupational hazard was measured in three out of the five broad groups of occupational hazards: physical, biological, mechanical/ergonomical, chemical and psychosocial hazards. The measured hazards were: noise or sound level (physical hazard); dust concentration (chemical hazard); and psychosocial hazards. The average noise level was

found to be higher in the medium scale industries (76.2 db) as compared to the small scaled industries (72.6 db). This may probably be due to the fact that processes in the medium scale industries are more automated with the use of machines that are noisier than the manual activities being carried out in small scale industries that use less noisy machinery. These findings were similar to what was reported in the study in Illorin [20] with noise levels that was consistently above 60 db which is the WHO recommended healthy noise level and lower than that of the study in Korea [14] and the study in the US⁵¹ which reported that workers were being exposed to sound levels that was above 85 db. The average environmental dust concentration and psychosocial hazards were found to be higher in the small scale industries (2.3mg/m³ and 52.1%); as compared to the medium scale industries (1.1mg/m³ and 26.3%) respectively. This may probably be due to the fact the medium scale industries' manufacturing processes are more automated with less noise, unlike most of the small scale industries that operate most of the time with noisier and old fashioned machineries in open spaces outdoors with more dust exposure.

6. Conclusion

The study revealed that the average noise level was found to be higher in the medium scale industries as compared to the small scale industries and generally lower than the threshold limit value (TLV) for noise of 85dB over an 8 hour working period. Also revealed is that the average environmental dust concentration and psychosocial hazards were higher in the small scale industries as compared to the medium scale industries. The study revealed that there was high potential for accidents and injuries in both the small and medium scale industries.

References

- [1] World Health Organization. Western Pacific Region. Occupational Health. Accessed at http://www.wpro.who.int/topic/occupatioal_health/en/ on 01/12/2014.
- [2] World Health Organization. International Health Conference, New York, 1946. Accessed at <http://www.who.int/about/definition/en/print.html> on 01/12/2014.
- [3] Canadian Centre for Occupational Health and Safety. Hazard and Risk. Accessed at http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.htm on 01/12/2014.
- [4] Aliyu AA, Saidu S. Pattern of occupational hazards and provision of occupational health services and safety among workers of Kaduna Refinery and Petrochemical Company, Kaduna, Nigeria. *Continental Journal of Tropical Med.*, 2011; 5(1): 1-5.
- [5] World Health Organization. Global strategy on occupational health for all. Recommendation of the 2nd meeting of the WHO collaborating centers in occupational health. Beijing, China 11-14 October 1994. Geneva: WHO, 1995. Accessed at <http://www.who.int/.../oehdeclaration94e.pdf> on 25/11/12.
- [6] Nyguyen T, Luongo M. Occupational injuries and prevention activities in Vietnam. *Asia Pac. J Public health*, 2009; 15(1): 7-10.
- [7] International Labor Organization. Decent work-safe work. Geneva, Switzerland 2005. Accessed at http://www.ilo.org/.../wcms_183659.pdf on 04/12/12.
- [8] ILO. System for collection and analysis of occupational accident data. *African Newsletter on occupational health and safety*, 2009; 19(1): 4-5.

- [9] Rongo LMB. Are workers in small scale industries in Dares Salam aware of occupational ergonomics principles? African newsletter on occupational health and safety, 2005; 15(1): 14-16.
- [10] Okojie O. System for reporting occupational diseases in Nigeria. African newsletter on occupational health and safety, 2010; 20: 51-53.
- [11] World Health Organization (WHO). Health and environment in sustainable development. Geneva, 1997. Accessed at <http://www.who.int/.../corvalan.pdf> on 12/01/2013.
- [12] Yitagesu H. Assessment of magnitude and factors of occupational injury among workers in large scale metal manufacturing industries in Adis Ababa, 2009. Accessed at <http://www.scribd.com/research/health&medicine> on 15/01/2013.
- [13] Ontario Ministry of Labour. Occupational health hazards and illness. Accessed at <http://www.labour.gov.on.ca/ontarioministryoflabour> on 17/01/2013.
- [14] Lee N, Lee BK, Jeong S, Yong Yi G, Shin J. Work environments and exposure to hazardous substances in Korean Tire manufacturing. *Saf. Health Work*, 2012; 3: 130-139.
- [15] Morrell S, Kerr C, Driscoll T, Taylor R, Salkeld G, Corbett S. Best estimates of the magnitude of mortality due to occupational exposure to hazardous substances. *Occup. Environ. Med.*, 1998; 55(9): 634-641.
- [16] Aderaw Z, Engdaw D, Tadesse T. Determination of occupational injury: A case control study among textile factory workers in Amhara regional state, Ethiopia. *J Trop. Med.* 2011; 2011: accessed at <http://www.hindawi.com/journals/jtm/2011/657275/> on 01/10/2014.
- [17] Jinadu MK. Occupational health and safety in a newly industrializing country. *The Journal of the Royal Society for the Promotion of Health*, 1987; 107(1): 8-10.
- [18] Aliyu AA, Shehu AU. Occupational hazards and safety measures among stone quarry workers in Northern Nigeria. *Nigeria Medical Practitioner*, 2006; 50(2): 42-47.
- [19] International Labor Organization (ILO) Asia-Pacific. Promoting occupational health service for workers in the informal economy through primary care units. September 2009. Accessed at http://www.ilo.org/.../wems_114237.pdf on 15/01/2013.
- [20] Olayinka OS, Abdullahi SA. Industrial employees' exposure to noise in sundry processing and manufacturing industries in Ilorin metropolis, Nigeria. *Industrial Health*, 2009; 47: 123-133.
- [21] Sabitu K, Iliyasu Z, Dauda MM. Awareness of occupational hazards and utilization of safety measures among welders in Kaduna metropolis, Northern Nigeria. *Ann. Afr. Med.*, 2009; 8(1): 46-51.
- [22] Fadeyi A, Fowotade A, Abiodun MO, Jimoh AK, Nwabuisi C, Dasalu OO. Awareness and practice of safety precautions among healthcare workers in the laboratories of two public health facilities in Nigeria. *Niger. Postgrad. Med. J.*, 2011; 18(2):141-146.
- [23] Ogunnowo BE, Anunobi CC, Onajole AT, Odeyemi KA. Awareness of occupational health hazards and the practice of universal safety precautions among mortuary workers in South-West Nigeria. *Nig. QJ Hosp. Med.*, 2010; 20(4): 192-196.
- [24] Daniell WE, Swan SS, McDaniel MM, Camp JE, Cohen MA, Stebbins JG. Noise exposure and hearing loss prevention programmes after 20 years of regulations in the United States. *Occup Environ Med.*, 2006; 63 (5): 343-351.
- [25] Dudarev AA, Karnachev IP, Odland JQ. Occupational accidents in Russia and the Russian Arctic. *Int J Circumpolar Health*, 2003; 72: 10-14.
- [26] Awodele O, Popoola TD, Ogbudu BS, Akinyede A, Coker HAB, Akintola A. Occupational hazard and safety measures amongst paint factory workers in Lagos, Nigeria. *Saf Health Work*, 2014; 5 (2): 106-111.
- [27] Mazi O. Anambra State history. *Igbo Focus UK*. Accessed at http://www.igbofocus.co.uk/htm/anambra_state.html on 13/02/2013.
- [28] Anambra State Government Nigeria Official Home Page. Accessed at <http://www.anambra.gov.ng> on 23/01/2013.
- [29] M.A.N Sectoral groups and sub-sectors. Anambra State Ministry of Commerce and Industries, Directorate of Industry, State Secretariat Complex, 4th Floor, Awka.
- [30] Isah EC, Asuzu MC, Okojie OH. Occupational health services in manufacturing industries in Nigeria. *Occup. Med.*, 1996; 46(5): 333-336.
- [31] Khrais S, Al-Araidah O, Aweisi AM, Elias F, Al-Ayyoub E. Safety practices in Jordanian manufacturing enterprises within industrial estates. *International Journal of Injury Control and Safety Promotion*, 2013; 20(3): 227-238.