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Perceived Effect of Improper Industrial Waste Management among Factory Workers in Aba, Abia State: Implications to Health Promotion and Health Education

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Abstract
The study investigated the perceived effect of improper industrial waste management among factory workers in Aba metropolis in Abia State: Implications to health Promotion and health education. The objectives of the study were to investigate the perceived effect of improper industrial waste management among the factory workers in Aba and to determine senior and junior factory workers differences in the perceived effect of improper industrial waste management. Two research questions and one hypothesis were formulated for the study. The target population of the study was 1691 factory workers in the two local government areas in Aba Metropolis. A sample of 169 (76 senior and 93 junior) factory workers were selected using proportional sampling techniques. A-13 items researchers' structured instrument titled Industrial Waste Management Questionnaire *(IWMQ) was used for data collection which was validated by three research experts. The Cronbach alpha statistic was used to determine the internal consistency which yielded a coefficient index of 0.83. Data analysis was done using frequency and percentage to answer the research questions while Chi-square statistic was used to test the cadre difference in the hypothesis of the study. The finding of the study showed that; the perceived effect of improper industrial waste management is high among factory workers in Aba and there is a significant difference in the perceived effect of improper industrial waste management between senior and junior factory workers in Aba. Based on these findings, the study concluded that; the perceived effect of improper industrial waste management is high among factory workers in Aba and there is significance cadre difference in the perceived effect of improper industrial waste management among senior and junior factory workers in Aba. The study recommended that industrial waste treatment centres should be constructed and located in every local government area for the sustainability of the industries.*
Keywords: Industrial Waste, Waste Management, Pollution, Factory Worker, Health Promotion

Introduction

Waste generation and management could be said to be a common phenomenon with industrialization. Urbanization is specifically connected to economic development and the technological development that flow from them (Odunola, Jelili, Adejumobi, & Asani, 2015). Most industrial towns in Nigeria tend to produce many varieties of wastes which litter all through the environment, some are known to be hazardous while there are still others whose effects on human health and environment are not yet to be known. Maczulak (2010) stated that before the state and federal regulation began in the late 1970s, most industrial wastes was disposed of in landfills stored in surface impoundments of such as lagoons or pits discharged into surface water with little or treatment, or burnt. Management of waste has resulted in polluted groundwater, streams, lakes and rivers as well as damage to wild vegetation (Dangbin, 2018). Disposal of industrial waste to the environment has poor monitoring supervision as well as mismanagement.

Waste could be materials that are not prime products (that is, products produced for the market) for which the generator has no further use in terms of his purposes of production, transformation or consumption and of which disposes of. Waste could be solid, liquid or gas. Waste is garbage, rubbish or trash. Some wastes take a longer time before they decompose while some do not decompose at all, they could be recycled for use to get rid of the environment of its polluting effect. Meis (2011) reported that forty per cent of wastes found at dumps are products of different industries. Proper management of industrial waste has been a major problem facing most developing cities like Aba.

The desire to excel among the industrialists has greatly increased the amount of wastes among the industries. Industrial wastes are wastes produced in form of solids, liquids, gases and airborne particulate matter, which emitted into the environment (Maczulak, 2010). Awuchi and Igwe (2014) defined industrial waste to be the waste produced by industrial activity which includes any material that is rendered useless during a manufacturing

process. Healthy waste management modes which are incineration, sanitary landfill, composting, source reducing, reusing and recycling should be provided for proper management of the industrial waste (Conserve Energy Future [CEF], 2017). Meis (2011) reported that poor management of industrial waste has great effects on the health of the industrial workers and people living or trading close to the industries. Health-related problems associated with working in industries are high blood pressure as a result of noise from heavy machines, psychological trauma, water and sanitation-related diseases like dysentery, cholera, diarrhoea for effluents are poured into water, smoke from burnt wastes and malaria, hence mosquitoes breed in the stagnant water (Odunola et al., 2011). Even the vibration of the heavy machines is not friendly to the health of the machine operators and other factory workers.

Industrial waste management is referred to be the process of collecting and treating industrial waste. Industrial waste management is defined as the discipline associated with control of generation, storage, collection, transport or transfer, processing and disposal of industrial waste in a way that best addresses the range of public health, conservation, economics, aesthetic, engineering and other environmental considerations (LeBlanc, 2017). LeBlanc described six components of industrial waste management: Waste generation: Onside handling, storage, processing: Waste collection: Waste transfer or transport: Waste processing and recovery: and Waste disposal. Oil, smoke, sawdust, papers, rags, leathers, iron particles, food particles and wastewater are all the by-products or wastes from industries (Meis, 2011). For adequate proper management of the industrial waste, there should be the provision of the following healthy modes of industrial waste management; incineration, sanitary landfill, composting, source reducing, reusing and recycling should be provided for proper management of the industrial waste (Conserve Energy Future [CEF], 2017). Poor management of industrial waste has great effects on the health of the industrial workers and people living or trading close to the industries (Meis, 2011). Industrial waste management is to reduce and eliminate the adverse effects of waste material on human health and the environment to support economic development and superior quality of life.

There are machine operators and other people who work and earn their livings from industries. Factory workers are referred to those workers that are found in industrial settings where they may operate machines, assemble products, maintain, clean equipment or engage in cleaning up the environment or surrounding of production (Pearson, 2020). Job (2020) described factory workers as those workers that are responsible for a range of functions including processing, sorting, and parking the products as well as operating the machines and monitoring the output to compliance standards, and other factory workers also have to clean up the machines, materials for productions and surroundings or environment of production. The factory workers have to control and manage the industrial waste for final disposal.

Aba in Abia State is considered appropriate for this study because it is a commercial city where many big industries exist. Polema palm kernel crushing, Nkwubuego sawmill produces timber for the building of houses, schools and other institutions, Nicol shoe designers, Rosie garment/Textile mills, Starline Pharmaceuticals, Rosa Bakeries and Nigerian Breweries. Abia State is much dependant on Aba as a commercial city hence it is known as "Japan" of Africa. However, it has been recorded that in most developing countries, industrial waste littered all over the environment implies improper industrial waste management among the private and government-owned industries. These attitudes of the industrialists have caused a lot of health problems to the workers and other people living within the places of the industries. Most factory workers and people living or trading close to the industries still do not believe that their ill health would be as a result of poor environmental sanitation. Delay in taking appropriate measures to correct the damage already done, and to prevent further damage to the quality of the environment in other to promote and maintain healthful living of the people there will be serious repercussions for the future health and economic wellbeing of the people.

Notwithstanding the potential effects of improper management of industrial waste, the perceived effects of improper industrial waste among factory workers in Aba, Abia State is yet to be investigated. Iriruaga (2012) opined that the discharge of industrial waste into the environment results in aesthetic insult and releasing of bad odour to the environment, as well as making the environment hazardous for the inhabitants. Adekoya (2011) stated that industrial waste inflicts a lot of nuisance to people and most of the houses located at 500m radius to the selected industries. Some of the nuisances identify are; a lot of vibration and loud noise to the extent that it causes inconveniences, partial deafness, dust particles, waste, smoke when burning waste product which causes irritation and other health problems to the residents. Other small industries like woodwork, textile, petrol stations, vehicle repair among others produce a significant amount of hazardous waste in Aba. However, within the city are some commercial operators such as iron benders, mechanic workshops, vulcanizes, banks, retail shops and warehouses which work as service agents to the industries. Noise pollution is another type of problem facing Aba as a commercial city. Heavy plants which are used by the industries make much noise in the area. Noise is referred to as unwanted sound which affects the eardrums. However, many studies had been carried out on industrial waste

and its disposal but none has been on the impact of improper industrial waste management. Therefore the health of factory workers and people working around the industries remains under investigation. Hence, this present study would take a step further to examine the effect of improper industrial waste management among the factory workers in Aba. This study is considered significant because it will draw the individuals, private and government bodies' attention to the importance of providing a good industrial waste system to industries in Aba since it would help to protect the environment against infections and diseases and thereby promoting and maintaining healthful living among factory workers and the people.

The objectives of this study were to investigate: the modes of industrial waste management used among factory workers in Aba; perceived effects of industrial waste on factory workers in Aba; and to determine the perceived effects of improper industrial waste disposal among factory workers in Aba based on the cadre of workers.

Research Questions

The following research questions have been formulated to guide the study.

1. What are the modes of waste disposal used by factory workers in Aba?
2. What are the perceived effects of industrial waste on the health of factory workers?
3. What are the perceived effects of industrial waste on the health of factory workers based on cadre?

Hypothesis

This null hypothesis was postulated and tested at .0 level of significance:

1. Factory workers do not significantly differ on the perceived effects of industrial waste on the health of factory workers based on the cadre of workers.

Methods and Materials

Area of the study

The study was carried out in Aba metropolis of Abia State. Aba is one of the major commercial nerves of South-east of Nigeria and the main trading centre of Abia State. It is located on Aba River, with a population density of 7400/km^2. The inhabitants are predominantly Christian Igbo speaking people. It lies between Port-Harcourt, Owerri, Umuahia and Ikot-Ekpene road. Aba metropolis is made up of two local government areas; Aba South and Aba North local government areas. The interest of the researchers about the area is that it is dominated by many factories, traders and craft men, and the factory workers are exposed to different types of industrial waste. The different factories make use of different modes to dispose of their waste as best known to them but they efficiencies of their modes of waste disposal are far below expectation.

Design of the study

The survey research design used to investigate the perceived effect of improper industrial waste management among factory workers in Aba. Survey design according to Adamu, Bitrus and Ladu (2019) is a process of documenting the nature, scope, relationship, dimensions and direction of events, behaviour, attitudes, interest about persons or things. It was selected to conduct the study because it involves collecting information using the questionnaire and using a relatively large number of participants for information, and this study has met the requirement because a large sample was involved.

Population of the study

The target population of the study comprised all the factory workers in the nine industries in the two (2) local government areas in Aba metropolis in Abia State with the total of1691 factory workers (the factories).

Sampling and sampling techniques

The sample size consisted of 169 factory workers (76 seniors and 93 junior) drawn through proportionate sampling technique from the 1691 factory workers in the nine industries located in Aba metropolis. Ten per cent of the factory workers were proportionately selected from the six departments. The choice of ten per cent of the population is considered appropriate for a sample when the population is large or runs into a few thousand (Ya'uAhmad & Mukhtar, (2019).

Instrument for Data Collection

The instrument for data collection was a -13- item researchers' constructed questionnaire titled Industrial Waste Management Questionnaire (IWMQ) which was divided into three sections. Section sought information on the worker's personal data, while section B contained five items describing modes of their industrial waste disposal. Section C comprised of eight items describing the perceived effects of improper industrial waste disposal on the health of the factory workers. The items of the instrument were organized to elicit the socio-demographic information in respect to the workers' cadre, gender and location. The items were also organized to reflect the purpose of the study, research questions and hypothesis. All factory workers found in the selected industries were administered to with one copy of the questionnaire to fill out and were requested to return on the spot to ensure maximum return rate. The researchers also interpreted the questions where necessary to non-experienced workers. The returned copies of the instrument were cross-checked for completeness of responses. Improperly filled out copies of the questionnaire would be discarded. Information from the properly filled copies was coded into Add SPSS to analyze the data generated. The research questions were answered using frequencies and percentages. In determining the perceived effects of improper industrial waste management, the respondents were requested to choose the options that are appropriate to their views. Chi-square statistic was used to test the null hypothesis at .0 level of significance. The face validity of the instrument was established by three research experts in Health and Physical Education, and two from Measurement and Evaluation in MOUAU. Cronbach alpha was used to determine the internal consistency of the instrument using forty (40) factory workers in one industry outside the sample for the pilot study for reliability. The instrument yielded a reliability index of 0.83. The sections were subjected to further reliability computation. The reliability indices were high enough to assume the instrument reliable for use for the study.

Method for data collection

The instrument was administered on 169 participants of the sampled factory workers by the researchers and two operation officers in each industry as assistants collecting a letter of introduction which served as clearance of evidence that the ethics of the profession would be maintained. The two research assistants were instructed on data collection and all the completed copies of the questionnaire were collected back from the participants immediately after completion. Every worker was given a copy of the questionnaire to avoid bias through the main sampled copies were remarked by the researchers.

Method of data analysis

The completed copies of the questionnaire were coded and analyzed using 'Add SPSS'. All the 23 items in the instrument were used to determine the perceived effect of improper industrial waste management on factory workers. Data obtained were analyzed using frequencies and percentages to answer the research questions and Chi-square statistic was used to test the cadre difference in the hypothesis of the study.

Results

Table1: Modes of waste disposal used by factory workers (n=169)

Items	F	%
Gutter	50	29.5
Open space	42	24.58
Bin/storage by ASEPA	35	20.7
Collected by govt. agencies	32	18.9
Incinerator	10	5.9
Total	169	100

Data in Table 1 reveal different modes of waste disposal used by the selected industries. The results show that 29.5 per cent of the factory workers indicated that they gutter for their waste disposal. About one quarter (24.8%) of the industrial workers indicated that they use open space; 20.7% of them claimed that they use bin/storage and waste disposal system provided to them by the Abia State Environmental Program Agency; 18.9% of the companies indicated that the government agencies regularly come to collect their waste products; while 5,9% of them claimed that they use incinerator.

Table 2: Perceived effects of improper industrial waste disposal on the health of factory workers

Cadre	Workers identified without effects	Workers with effects	Total number of worker
Senior	29 (17.16%)	69 (40.83%)	98(57.99%)
Junior	24 (14.20%)	47 (27.81%)	71(42.01%)
Total	53 (31.36%)	116 (68.64%)	169 (100%)

Data in Table 2 reveal the opinion of senior and junior workers' on the perceived effects of industrial waste on the health of factory workers. One can observe from the table that 17.16% of the senior workers and 14.20% of the junior workers respectively indicated that improper industrial waste disposal had no effects on the health of factory workers. A total of 40.83% and 27.81% of the senior and junior workers respectively indicated that improper industrial waste disposal had effects on the health of factory workers. One can also observe from the data that 31.36% of both senior and junior workers indicated that improper industrial waste disposal had no effects on the health of factory workers, while 68.64% the factory workers indicated that improper industrial waste disposal had effects on the health of factory workers. The above data suggest that improper industrial waste disposal had high effects on the health of factory workers.

Table 3: Chi-square Test on the perceived effects of industrial waste on the health of factory workers based on cadre

	Workers'Level							
	Senior		Junior					
	Yes O(E)	No O (E)	Yes O(E)	No O(E)	χ^2Value	df	p-value	Decision
Perceived effects of Industrial Waste	29(30.73)	69(67.27)	24(22.27)	116(48.73)	107.13	1	3.841	Reject

$\rho < 0.05$ Significant; O(E) = Observed frequency(Expected frequency)

Table 3 above shows the effects of improper industrial waste disposal among senior and junior factory workers in Aba. The value of 107.13 implies a high effect of improper industrial waste disposal on factory workers in Aba. Since the calculated X^2 - value of 107.113 is greater than the table or critical X^2 -value (3.841), one can conclude that there is a significant effect of improper industrial waste disposal on senior and junior factory workers in Aba.

Discussion of Findings

The finding in table 1 revealed that the different companies make use of different modes to dispose of their waste materials as best known to them but the efficiencies of their modes are far below the expectation of them. This finding is expected since they are into production; they must use one method or the other to dispose of their waste materials. This finding is in line with that of Meis (2011) which reported that pressure and stains put on the environment through the physical waste of industries caused diverse environmental problems which need to be taken care of.

Implications of the Study for Health Promotion and Health Education

Health promotion can be said to be the process by which the individual health status is being up-graded through forming and maintaining healthy habits and lifestyle. Health promotion is the enablement of the individuals, families, communities and society and to develop their full health potential (Park, 2012). Umeakuka, Iweama and Chukwurah (2019) described health promotion to be the development of the individual, group, institutional, community and systemic health. Healthy environmental management is basic for healthy living. Zaharia (2015) opined that water is a natural patrimony that must be protected and conserved. When the acquired knowledge of environmental health management habit is formed and put into practice, there will be optimum good health for the people. In Aba, if there would be workshops, seminars and orientation for factory workers and the industrialists on proper management of industrial wastes, there would be an improvement on peoples' health.

Health education is the primary agent of bringing about desirable health practices in children who could contribute to the promotion of good health. An adequately health informed child has the combination of learning experiences designed to help him and his community to improve their health by increasing their knowledge or

influencing their attitudes, practices and conducts concerning an individual, family and community health (WHO, 2018). Health education, apart from being fundamental to satisfying workers' basic rights to be protected from hazards, it is also a statutory requirement in all work environment (Ememabasi & Ikoro, 2016). Therefore, school health education curriculum planners need to revise the plan of the curriculum to give adequate attention to healthy environment management which is an aspect of environmental sanitation. The environmental health promotion is a contemporary health issue requiring awareness of creation and mass education to avert and reverse the impending effects of global warming on planet earth (Akpan and Ekenedo, 2017). Health education, on the other hand, comprises of consciously constructed opportunities for learning involving some forms of communication designed to improve health literacy and developing life skills which are conducive to individuals and community health (Ralph, 2018). Primarily, health education is concerned with developing an understanding of health, providing and improving necessary experiences and services which play a key role in the maintenance and improvement of health (Sohil, 2016). When the school child is adequately informed about the maintenance and promotion of a healthy environment from childhood he would abide by it.

Conclusion

Based on analysis and findings of the study, it was concluded that perceived effect of industrial waste management is high among factory workers in Aba, compared with other towns in Nigeria and there is a significant effect of improper industrial waste management among factory workers in Aba.

Recommendations

Following from the findings of the study, the following recommendations were made:

1. There should be workshops, seminars and orientation for factory workers and the industrialist's Aba on proper management of industrial wastes.
2. The government should provide standard systems of industrial waste disposal in communities and locations of the industries.
3. Abia State government should enforce the issue of polluters paying some amount of money so that their menace to the environment may be reduced.
4. Industrial waste treatment centres should be constructed and located in every local government area for the sustainability of the industries.

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