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Effect of a health-risk reduction training program on the knowledge and safe waste-handling practices among Waste-pickers in dumpsites in Ogun State, Nigeria

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Abstract
Objective: This study assessed the effect of a health-risk reduction training program on waste-pickers waste-handling practices in dumpsites in Ogun State, Nigeria.
Methods: A quasi-experimental study was conducted among 60 waste-pickers recruited by multistage sampling technique divided into intervention and control group. There was a baseline assessment of waste-handling practices in both intervention and control groups using a structured interviewer-administered questionnaire. Thereafter, health-risk reduction training was given using lectures, and demonstrations. Three months after the intervention, another assessment of the same waste-pickers was conducted with the same instrument. Waste-handling practices and knowledge responses were measured on a 54-point rating scale and 17-point rating scale respectively. Data were analyzed using IBM SPSS version 23 to generate descriptive and inferential.
Results: At baseline, the waste-pickers in the control group had a mean waste-handling score of 17.80±6.89 while the experimental group had a mean of (17.97±5.47). After the training program, there was a statistically significant increase in the mean waste-handling score of the experimental group (47.30±3.28; p= 0.000) while there was no increase in the mean waste-handling score of the control group (17.80±6.89). This significant increase in the mean waste-handling score of the experimental group (53.83±0.38; p=0.000) was also observed at 3 month follow-up period.
Conclusion/Recommendation: The health-risk reduction training was effective in improving the waste-handling practices of waste-pickers. It is recommended that waste-pickers should be trained on proper waste-handling by the government.

Keywords: Dumpsite, Health-risk reduction, Knowledge, Waste-pickers, Waste-handling

Plain English Summary

Waste-pickers working in open dumpsites face the most direct risk of exposure to solid waste affecting their health. Hence, this study assessed the effect of a health-risk reduction training program on waste-pickers waste-handling practices in dumpsites in Ogun State, Nigeria. The quasi-experimental design was adopted involving a sample of 60 waste-pickers selected from two dumpsites in Ogun State assigned into the control and intervention groups. Before the training program, there was no statistically significant difference in the waste-picker mean waste-handling score in the control group and the intervention group (p>0.05) After the training program there was a statistically significant increase in the mean waste-handling score of the experimental group (47.30±3.28; p= 0.000) while there was no increase in the mean waste-handling score

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of the control group (17.80±6.89). This significant increase in the mean waste-handling score of the experimental group (53.83±0.38; p=0.000) was also observed during the third-month follow-up period. The results of that study showed that health-risk reduction training was effective in improving the waste-handling practices of waste-pickers.

Background

Nigeria with an estimated 200 million people accounts for 20% of the total population in sub-Saharan African (1). Municipal solid waste generation has been increasing due to waste generated daily by individuals in the country (2). This rapid population growth and industry has led to an increase in the use of materials capable of producing hazardous wastes. Waste is always generated when human beings engage in economic activities and various materials are used. Such waste can be hazardous or non-hazardous. When waste is not handled properly, it can pose a risk to the atmosphere, the water, soil, and living organisms (3). The waste generation rate in Nigeria is estimated at 0.65-0.95 kg/capita/day which gives an average of 42 million tonnes of wastes generated annually. This is more than half of 62 million tonnes of waste generated in sub-Sahara Africa annually and how and where to dispose of this waste becomes a huge problem for the nation; only about 20-30% of the waste is gathered and 70% are dumped in treacherous places (2, 4). It is common to find large heaps of garbage lying in a disorganized manner in and around cities as a result of the failure of municipal corporations to handle large quantities of waste (4).

Disposal of solid waste at a landfill site is the primary disposal method used in most developing countries including Nigeria (5). Most of the wastes dumped are decomposable materials while the remaining recyclables are picked up by waste pickers or scavengers (6). Waste-pickers were described as those who make a living by collecting and selling recyclable materials out of municipal solid waste (7). Scavenging is a widespread and regular activity in nearly all cities in developing countries. Some waste pickers work at a single site that holds a great quantity of waste like dumpsites, or transfer stations. While some are dynamic, collecting materials from factories, offices, stores, schools, hospitals, and residential areas. Others work at dumpsites, canals, and rivers where people dump their refuse (8). It is projected globally, that about two million persons work informally as waste pickers. These groups of persons are the first to suffer the consequences of the poor management of solid wastes (9). They engage in waste separation, waste reuse, aiding recycling, and reducing pressure on the environment. They often do not wear any protective equipment and face great risks of injuries linked to the type of material they are collecting (10). These waste pickers are vulnerable to injuries owing to a lack of the needed personal protective equipment (PPE) and consequently are faced with deplorable working conditions. Scavenging is therefore considered a treacherous occupation (11). Researchers have proposed that protective equipment which includes proper clothing, gloves, and boots should be made available to scavengers, to reduce pathogenic infections and improve their activities (12, 13, 14). Hence this study determines the effect of health-risk reduction training programs on knowledge and safe waste-handling practices among waste-pickers in dump-sites in Ogun State, Nigeria.

Methods

The present study was carried out at the Oke-Saje dumpsite and Ikoto dumpsite in Ogun State. A quasi-experimental study design was applied to assess the effect of health-risk reduction training on waste-pickers knowledge and waste-handling practices.

For the intervention program, 60 waste-pickers were selected; 50% of waste pickers (30) were subjected to the pre-developed educational health-risk training program (Intervention group) while the other 50% (30) was not and was designated as (Control group). Both groups were subjected to a pre-test and two post-tests, one immediately after the end of the intervention program, and the other, three months later. A predesigned and pre-coded interviewer-administered questionnaire was filled by the waste-pickers, to assess their waste-handling practices.

The knowledge question on solid waste-handling consists of seventeen questions. This evaluates the waste pickers' knowledge of solid waste handling/exposure, and the health effects of waste. It comprises multiple-choice and dichotomous of Yes/ No. The knowledge questions were scored as follows: score "1" for a correct answer, Score "0" for an incorrect answer, and for don't know. The total mean knowledge score was calculated for each question by summing up every category, and total scores were calculated (17x1=17) ranging from (0-17

points), then were adjusted out of 100 (0%-100%) and were graded as follows: poor knowledge (0-8.5points) and good knowledge (8.6-17).
The safe waste-handling practice questions were scored as follows: Score "2" for 'every time' answer, Score 1 for sometimes answer, and Score 0 for never answer
The total mean safe waste-handling score was calculated for each question by summing up every category, and total scores were calculated (27x2=54) ranging from (0 - 54 points); then were adjusted out of 100 (0%-100%) and were graded as follows: Good level of waste-handling practice (28-54 points) >50%, Poor level of waste-handling practice (0-27 points) ≤ 50%.

Intervention program
An intervention program was designed according to the results of the pre-test. The program was structured according to the needs of the waste-pickers under study. The training manual was prepared, reviewed, and tested before use. The training program was facilitated by the researcher who is an environmental health consultant.
Four training modules were delivered over four weeks; the participants' attended the sessions in the morning from 10:00 am to 11:30 am, once weekly. The methods used in the intervention program included: lectures and demonstrations. The contents of the four sessions of the health training intervention program were as follows: Environmental effect of solid waste, the importance of preventing exposure to solid waste from entering the body, diagnosis, first-aid, and treatment of disease-related to waste handling and disposal. There is also a practical demonstration of the use of PPE and personal hygiene.

Statistical analysis
Data were collected, revised, coded with their input to the statistical software IBM SPSS (Statistical Package for the Service Solution) version 23. Descriptive statistics including frequency distribution and percentages were performed. For quantitative variables, mean and standard deviation were calculated. Inferential statistics include *t*-test and Cohen d effect size. The two-tailed tests, alpha error of 0.05, and p-value less than 0.05 were considered significant.

Results
Socio-demographic Characteristics of the Waste-Pickers
The mean ages of the waste-pickers in the intervention and the control groups were 25.27±4.90 and 29.90±4.44 respectively. Their ages ranged from 18 to 43years. Most of the participants in the two groups were within the 24-29 age brackets. All the participants in the two groups were male. Half of the participants in the intervention were married while 60% in the control group were married. Most of the participants in the two groups were of the Islamic faith. While only 16.7% and 33.3% of the participants were Christians in the experimental and the control group respectively. Fifty percent of the participants in the experimental group had no formal education with only 6.7% of the participants with tertiary education, while 20% of the participants in the control group had no formal education with only 3.3% of the participants with tertiary education. Most of the participants in the two groups lived in temporary shelters in the dumpsite. Most of the participants in the two groups had been scavenging for between 5-6 years (See, Table 1).

Table 1: Socio-demographic characteristics of waste-pickers in the Experimental and Control Group

Variables	Experimental F (%)	Control N F (%)	Statistics	*p*-value
Age(years)	**25.27±4.90**	**29.90±4.44**	**F = 14.746**	**0.000**
18-23	13 (43.3)	1(3.3)		
24-29	13 (43.3)	15 (50.0)		
30-35	2 (6.7)	12(40.0)		
36-41	2 (6.7)	0 (0.0)		
42-47	0 (0.0)	2 (6.7)		
Gender				
Male	30(100)	30(100)		
Religion			**F = 2.231**	**0.141**
Christian	5 (16.7)	10 (33.3)		
Islam	25 (83.3)	20 (66.7)		
Marital Status			**F =0.592**	**0.445**

Married	15 (50.0)	18 (60.0)		
Single	15 (50.0)	12 (40.0)		
Educational Status			**F = 2.328**	**0.132**
Non-Formal	15 (50.0)	6 (20.0)		
Primary School	12 (40.0)	20 (66.7)		
Secondary School	1 (3.3)	3 (10.0)		
University Education	2 (6.7)	1 (3.3)		
Where do you live			**F = 4.193**	**0.045**
Rented Apartment	2 (6.7)	3 (10.0)		
Relative/Friends	1 (3.3)	1 (3.3)		
Own Home/ Family	0 (0.0)	1 (3.3)		
Temporary shelter in dump site	27 (90.0)	25 (83.3)		
How long have you been scavenging?			**F = 1.627**	**0.207**
1-5	7 (23.3)	6 (20.0)		
6-10	19 (63.3)	17 (56.7)		
11-15	4 (13.3)	7 (23.3)		

Baseline Knowledge and Safe Waste-handling Practices of Waste-pickers

The mean ± SD scores for the waste-pickers level of knowledge on waste handling practices in the experimental and control groups were 7.17±1.64 and 6.53±2.43. Only 30% in the experimental group, had good knowledge of waste handling practices while a much lower proportion 16.7 % in the control group, had good knowledge. When the waste-pickers mean scores of levels of knowledge on waste handling practices measured in this study were compared for the control and experimental groups at baseline, independent t-test computation showed that there was no significant difference (*P*>0.05) (See, Table 2).

Furthermore, the waste-pickers mean score and standard deviation for the control and the experimental groups were 17.97±5.47 and 17.80±6.89. All of the participants in the intervention group had a low practice of waste handling while 93.3% of the control group had low practice. When waste-pickers waste handling mean scores measured in this study were compared for the control and the intervention group at baseline, independent t-test computations showed no significant difference (*P*>0.05) (See, Table 2).

Table 2: Baseline knowledge and Safe Waste-handling Practices of Waste-pickers

Knowledge of Waste Handling Practices	Experimental F (%)	Control F (%)	Statistics t=value	*p*-value
Measured on a 17-point Rating Scale				
Poor (0-8.5)	21 (70.0)	25 (83.3)		
Good (8.6-17)	9 (30.0)	5 (16.7)		
Mean ± SD	7.17 ± 1.64	6.53± 2.43	1.18	0.24
Safe Waste-handling Practices				
Measured on a 54-point Rating Scale				
Poor	30 (100.0)	28 (93.3)		
Good	0 (0.0)	2 (6.7)		
Mean ± SD	17.97± 5.47	17.80± 6.89	0.104	0.918

The effect of the Training Program on Waste-picker Knowledge and Safe Waste-handling Practices

The effects of the training program are summarized in table three. Overall, the intervention group showed significantly higher mean knowledge scores than the control group at immediate post-intervention and follow-up period (P<0.05). The intervention group and control group had a mean knowledge score of 11.93±1.64 and 7.17±1.64 respectively at immediate post-intervention. At the follow-up period, the intervention group had a mean knowledge score of 14.37±2.86 while there was no increase in the mean knowledge score of the control group (7.17±1.64).

Furthermore, the waste-pickers safe waste-handling practices mean score for the

experimental group increases significantly at immediate post-intervention (47.30±3.28) compared with the control group mean score (17.80 ± 6.89) (p<0.05). Also, there was a significant increase in waste-handling practices of the intervention group compared with the control group at the follow-up period (p<0.05).

Table 3: The Effects of the Training Program on Waste-picker Knowledge and Safe waste-handling practices

Knowledge	Experimental Group			Control Group		
	Post intervention	Follow-up	p-value	Post intervention	Follow-up	p-value
Poor	0(0.0)	0(0.0)	0.001	25(83.3)	25(83.3)	0.62
Good	30(100)	30(100)		5(16.7)	5(16.7)	
Mean ± SD	11.93±1.64	14.37±2.86		6.53±2.43	6.53±2.43	
Waste-handling practices						
Poor	0(0.0)	0(0.0)	0.001	28(93.3)	28(93.3)	0.49
Good	30(100)	30(100)		2(6.7)	2(6.7)	
Mean ±SD	47.30±3.28	53.83±0.38		17.80±6.89	17.80±6.89	

*N/A-Cannot be computed

Comparison of the effect of the mean score of waste-pickers knowledge and Safe waste-handling practices between the baseline and the follow-up period

Evaluating the impact of the intervention on the waste-pickers level of knowledge on waste handling practices by comparing the baseline and the three months' follow-up means scores for the experimental group using paired sample t-test revealed that there was a statistically significant difference in the mean scores and the effect size computed indicating the magnitude of the differences in means between baseline and the 8th-week follow-up was significant. The intervention group had an effect size of -3.141 with a p-value of 0.000. However, the control group had no effect size since there was no difference in the mean scores between the baseline and follow-up period (ES=0.000; p=0.67) (See Table 4).

In addition, evaluating the impact of the intervention on waste-pickers safe waste handling practices by comparing the baseline and the follow-up means scores for the experimental group using paired sample t-test, revealed that there were statistically significant differences in the mean scores and the effect size computed indicating the magnitude of the differences in means between baseline and the follow-up period was significant. The intervention group had an effect size of -9.407 with a p-value of 0.000. However, the control group had no effect size since there was no difference in the mean score between the baseline and the follow-up period (ES=0.000; p=0.49) (See, Table 4).

Table 4: Comparison of the effect of the mean score of waste-pickers knowledge and waste-handling practices between the baseline and the follow-up period

Knowledge	Experimental Group				Control Group			
	Baseline	Follow-up	p-value	*ES	Baseline	Follow-up	p-value	*ES
Poor	21 (70.0)	0(0.0)	0.001	3.14	25(83.3)	25(83.3)	0.67	0.000
Good	9 (30.0)	30(100)			5(16.7)	5(16.7)		
Mean ± SD	7.17 ± 1.64	14.37±2.86			6.53±2.43	6.53±2.43		
Waste-handling practices								
Poor	30 (100.0)	0(0.0)	0.001	9.40	28(93.3)	28(93.3)	0.49	0.000
Good	0 (0.0)	30(100)			2(6.7)	2(6.7)		
Mean ± SD	17.97± 5.47	53.83±0.38			17.80±6.89	17.80±6.89		

*ES: Effect size

Discussion

This study evaluated the effect of a health-risk reduction intervention training program on waste-pickers knowledge and waste-handling practices in dumpsites in Ogun State, Nigeria. The result of the analysis of the present study revealed that all the respondents in the intervention and the control group were male; this is similar to the findings by Magaji and Dakyes (15) who established in their research that the practice was mainly conducted by males in Abuja. However, the result is at variance with a study done at Onderstepoort dumpsite in South Africa where it was reported that both males and females engaged in the business of waste picking (16). This disparity in result could be a result of the difference in the study area. The overall mean age of respondents in the intervention and the control group was 27.58±5.2years with the age bracket of 24-29years. The study showed that more than half of the respondents in the intervention and control group had primary education. This finding conforms to those of Simatele and Etambakonga (17), where it was established that the highest level of education attained by their respondents was a primary school. Contrary to this study was a study in South Africa where the majority of the respondents attained secondary educational status in both groups (16). The result also showed that most of the respondents in both groups lived in a temporary shelter near the dumpsite.

Furthermore, this study shows that the baseline data on knowledge and waste-handling practices of the waste-pickers in the experimental group and the control group had no significant differences. This explains that the experimental and control group were matched before the intervention. This finding is similar to the finding of Thirarattanasunthon et al, (18). The present study revealed significant improvement in waste-pickers knowledge regarding waste-handling after the intervention as compared with the control group. This indicates that the training program had a very good effect. This is due to the content of the training intervention program. The findings of the present study are supported by Thirarattanasunthon et al, (18) and Kumar, Somrongthong et al (19).

Concerning the waste-pickers waste-handling practices, this study revealed that there was a significant increase in the waste-pickers waste-handling practice after the training program, while the control remains the same. This finding is similar to the findings of Thirarattanasunthon et al, (19).

In conclusion, the health-risk reduction training led to a significant increase in the waste-pickers knowledge regarding waste-handling and also, improvement in their waste-handling practices. This implies that waste-pickers exposed to solid waste at dumpsites should be trained on how to properly use their protective equipment and adhere strictly to safety recommendations concerning routine work at these sites to help reduce health risks.

Declarations

Ethics approval and consent to participate

Written approvals from Babcock University Health Research Committee (BUHREC) and Ogun State Waste Management Authority (OGWAMA) were obtained, indicating that an academic research study within Oke-Saje and Ikoto dumpsites was to be done. The sample participants agreeing to participate voluntarily in the study were informed of the date of the program. Confidentiality was ensured throughout the study period and only code numbers were used instead of the participants' names.

Consent for publication

Competing Interests

There is no competing interest.

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Authors' Contributions

TA formulated the title, collected data, did the data analysis, and prepared the manuscript. AM reviewed the literature and collected the data.

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