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Factors Responsible for Indiscriminate Disposal of Sachet Water Wastes in Anambra State, Nigeria

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Abstract

Notwithstanding the benefits accruing from sachet water production and consumption, the indiscriminate and improper disposal of the waste poses huge environmental problems. The study therefore identified factors responsible for indiscriminate disposal of sachet water wastes in Anambra State, Nigeria. Structured questionnaire were used to collect data from a sample of 161 respondents. Percentage, mean score, factor analysis, Pearson's correlation matrix of interrelation and Principal Component Analysis (PCA) were employed for data analysis. Statistical analysis of the data shows attitude/behaviour (0.620) and people's ignorance of the effects (-0.532) as psychological factors responsible for indiscriminate disposal of sachet water waste while affordability (0.562) and lack of recycling plants (0.610) were economic factors responsible for indiscriminate disposal of sachet water waste. Attitude and need (80.10 %) and environmental control (13.24%) were the two underlying dimensions used in explaining these factors which are responsible for indiscriminate disposal of sachet water waste. For proper and adequate disposal of sachet water wastes, the study suggests public enlightenment campaigns aimed at helping people change their attitude about indiscriminate disposal of sachet water waste.

Keywords: Sachet, indiscriminate, waste, water, disposal

1. Introduction

Sachet water is the packaging of drinking water in a non-biodegradable synthetic polyethylene (polythene). Sachet water is popularly called pure water in Nigeria. Sachet water was introduced to the Nigerian markets around 1990 but its regulation by the National Agency for Food and Drug Administration and Control (NAFDAC) started in 2001 (Akunyili, 2003). Sachet water gained much popularity in Nigeria because the product is convenient for use, affordable and economically viable. It brought 'potable' water to the doorsteps of many Nigerians. The venture has also given employment to Nigerians which enables them to put food on their table.

Notwithstanding the benefits accruing from sachet water production and consumption, the indiscriminate disposal of the waste in various undesired sites such as along the streets, gutters, motor parks, schools, markets, homes, and venues of social functions etc. poses a lot of threat on the environment especially on the soils on which farming is done. The sachets are made of non-biodegradable synthetic polyethylene (polythene) which does not decompose in the soil even after many years. The polythene even when subjected to burning produces major known and harmful green house gases (GHGs) like carbon monoxide, nitrous oxide and carbon dioxide.

Sachet water waste disposal is a vast problem that needs to be tackled because of the implications it has on biophysical environment such as soil, vegetation air and water. Some studies have examined the environmental problems of sachet water waste examples are Okafor (1999); Toyobo, Oyeleke and Amao, (2013); Ezeokpube, Obiora and Phil-Eze, (2014). Others like Anyadike, (2006); Mojekeh and Eze, (2011) examined the water quality of sachet water. Virtually most literature reviewed, concentrates on either the water quality or the environmental problems associated with sachet water. There was no detailed study on what prompts people to indiscriminately dispose sachet water waste. The study therefore sought to identify respondents' perception on the factors responsible for the indiscriminate disposal of sachet water wastes in the study area and identify major underlying component influencing these factors.

2. Methodology

The study was conducted in Anambra State, Nigeria. Anambra State is located 7°16'00"N and 7°00'00"E (www.evi.com). The State has a total of 21 Local Governments Areas (L.G.As) namely: Aguata, Anambra East, Anambra West, Anaocha, Awka North, Awka South, Ayamelum, Dunukofia, Ekwusigo, Idemili North, Idemili South, Ihiala, Njikoka, Nnewi North, Nnewi South, Ogbaru, Onitsha North, Onitsha South, Orumba North, Orumba South and Oyi.

Seven (7) L.G.As namely Aguata, Awka North, Awka South, Nnewi North, Nnewi South, Onitsha North and Onitsha South were purposively selected because of dense populations in these areas and also high concentration of sachet water factories. Two categories of respondents were used. They were : households that consume sachet water and workers in the factories were sachet water is produced. In each L.G.A, 20 households

were identified from the communities/wards. The heads of these households served as respondents. This gave a total of 140 respondents (i.e. 20 heads of households multiply by 7 L.G.As). Furthermore, in each L.G.A, 1 sachet water factory was identified and 3 high rank staff in each factory served as respondents. This gave a total of 21 respondents (i.e. 3 respondents multiply by 7 factories). Therefore a grand total of 161 respondents were used for the study.

Eight structured factors in the checklist were used to analyze the respondents' perception on the factors responsible for indiscriminate disposal of sachet water wastes in Anambra State. The mean score of the responses was assessed on Likert five point response continuum scale of 'Strongly Agreed was rated 5, Agreed 4, Undecided 3, Disagreed 2 and Strongly Disagreed 1'. Adding all the ratings together gave a total of 15 points. Therefore, in the interpretation, any mean score of 3.0 and above is considered a factor responsible for indiscriminate disposal of sachet water waste. For policy relevance, data were further subjected to exploratory factor analysis procedure using the principal factor model with varimax in grouping the reasons. Only variables with loadings of 0.4 and above (10% overlapping variance) were used in naming the factors while variables that loaded high in more than one factor were discarded (Comrey, 1962). The result was further subjected to Principal Component Analysis (PCA) to identify major underlying component influencing the factors responsible for indiscriminate disposal of sachet water wastes.

3. Results and Discussion

3.1 Factors responsible for indiscriminate disposal of sachet water wastes

3.1.1 Percentage, mean and factor analysis distribution of respondents on factors responsible for indiscriminate disposal of sachet water wastes

Table 1 shows the relative frequency distribution on respondents' perception of the factors responsible for indiscriminate disposal of sachet water wastes. Entries in the Table indicate: Attitude and Behaviour (Z1): The responses indicating that attitude and behaviour of the people over indiscriminate disposal of sachet water wastes scored 34.4% under Strongly Agreed column, 30.5% for Agreed, 18.1% for Strongly Disagreed while 11% and 6% were scored for Disagreed and Undecided respectively. The analysis recorded a mean score of 3.5 which was above cutoff mean of 3.0, this implies that Z1 is one of the factors responsible for indiscriminate disposal of sachet water in the study area.

Affordability (Z2): From the sampled respondents over the affordability of sachet water as a factor; the result was equally high, with a mean score of 3.7. Strongly Agreed has the highest score of 44.1%, followed by Agreed with 20.4%, Disagreed scored 14.8% while Strongly Disagreed and Undecided were recorded for 11.8% and 9% respectively. 64.5% of the respondents believe that Z2 contributes to the factors simply because it is cheap to buy. 26.6% of the respondents do not believe that Z2 could be a factor while 9% of the respondents could not air a view on Z2.

Lack of law enforcement against offenders (Z3): The responses indicating that lack of law enforcement against offenders over indiscriminate disposal of sachet water wastes scored 45% under Strongly Agreed column, 40.2% for Agreed, Undecided, Strongly Disagreed and Disagreed obtained very low scores with 6.2%, 6% and 2.6% respectively. 85.2% of the respondents believe that Z3 could be a factor and could be reduced by paying of fine, 6.2% could not express an opinion on this Z3 while 8.6% do not believe that Z3 could be a factor. A mean score of 4.2 was high, which implies that B3 is one of the factors responsible for indiscriminate disposal of sachet water wastes.

Lack of recycling plants (Z4): From the result, the sampled respondents that indicated lack of recycling plant as a factor that contributes to indiscriminate disposal of sachet water wastes scored 42.4% under Agreed column, 30.5% for Strongly Agreed, 19.8% for Undecided while 5.4% and 1.9% were scored for Disagreed and Strongly Disagreed respectively. The analysis returned a mean score of 3.9 which was high, this implies that people opinion was high because 72.9% of the respondents agree that Z4 can be a problem unless when recycled to produce other new useful products. 19.8% of the respondents could not express an opinion on this factor while 7.3% of the respondents disagree that Z4 could be a factor.

Lack of dustbins/dumpsters (Z5): Responses indicating lack of dustbins/dumpsters as a factor which contributes to indiscriminate disposal of sachet water wastes recorded 67.7% for Strongly Agreed, 19.5% for Agreed, 6.2% for Disagreed, while 5% and 1.5% were recorded for Undecided and Strongly Disagreed. 87.2% of the respondents strongly agreed that Z5 is a problem, therefore provision of dustbins and dumpsites at various strategic places could help to minimize the problem. 7.7% of the respondents disagree that Z5 could be a problem while 5% of the respondents could not express an opinion on B5. A mean score of 4.5 was obtained in the result which implies that people's opinion on Z5 was very high.

People's ignorance of the effects (Z6): Sampled respondents indicating people's ignorance of the effect on indiscriminate disposal of sachet water wastes recorded Strongly Agreed the highest score with 34.2%, followed by Agreed with 31.4%, 26.5% for Undecided, 5% for Disagreed and 2.8% for Strongly Disagreed. Our analysis returned a mean score of 3.9 and this implies that people response was high. 65.6% of the respondents agree that Z6 can be problem since there is no enlightenment programme organized for the public on the effect, 26.5% of

the respondents were indecisive to express an opinion on Z6 while 7.8% of the respondents disagree that Z6 could be a factor.

No recollection incentives (Z7): The result recorded responses indicating that no recollection incentives could be a factor that contributes to the indiscriminate disposal of sachet water wastes scored 50.7% under Agreed column, 30.5% for Strongly Agreed, 12.3% for Undecided while 4.3% and 2.2% were recorded under Disagreed and Strongly Disagreed respectively. There is a strong consensus that 81.2% of the respondents agree that Z7 contributes to the factors responsible for indiscriminate disposal of sachet water wastes by none giving of rewards, 12.3% of the respondents could not express an opinion while 6.7% disagree that Z7 could be a factor. A mean score of 4.0 was obtained from the result, which implies that people response was high.

Its portability (Z8): Recorded 37.8% for Strongly Agreed, 34.8% for Agreed, 15.1% for Strongly Agreed, 7.1% for Disagreed and 5.2% for Undecided. 72.6% of the respondents believe that Z8 contributes immensely to the factors responsible for indiscriminate disposal of sachet water wastes due to its light weight. 22.2% of the respondents do not believe on Z8 while 5.2% were unwilling to air an opinion on Z8. Our analysis obtained result of a mean score of 3.7, which implies that people's opinion on Z8 was equally high in the study area. From the above analysis, we can conclude that people's opinion on the factors responsible for indiscriminate disposal of sachet water wastes in the study area was high because all the variables were high

For policy relevance, data were further subjected to exploratory factor analysis procedure using the principal factor model with varimax in grouping the factors. Table 1b shows varimax rotated factor on factors responsible for indiscriminate disposal of sachet water waste. Based on the variable loading, two factors were identified and named. Factor one was named psychological related factors while factor 2 was named economical related factors.

Entries in the Table show that factors that loaded high under psychological related factors (factor 1) were attitude and behavior (0.620) and people's ignorance of the effects (-0.532). The Table equally shows that the factors that loaded high under economical related factors (factor 2) were affordability (0.562) and lack of recycling plants (0.610). Lack of law enforcement against offenders was discarded because it loaded high under the two factors.

Table 1a. Relative frequency distribution of the factors responsible for indiscriminate disposal of sachet water wastes

		5	**4**	**3**	**2**	**1**		
Code	Factors	Strongly Agreed	Agreed	Undecided	Disagreed	Strongly Disagreed	Total	Mean (M)
Z1	Attitude and behaviour	184 34.4%	163 30.5%	32 6.0%	59 11.0%	97 18.1%	535	3.5
Z2	Affordability	236 44.1%	109 20.4%	48 9.0%	79 14.8	63 11.8%	535	3.7
Z3	Lack of law enforcement against offenders	241 45.0%	215 40.2%	33 6.2%	14 2.6%	32 6.0%	535	4.2
Z4	Lack of recycling plants	163 30.5%	227 42.4%	106 19.8%	29 5.4%	10 1.9%	535	3.9
Z5	Lack of dustbins/dumpsters	362 67.7%	105 19.5%	27 5.0%	33 6.2%	8 1.5%	535	4.5
Z6	People's ignorance of the effects	183 34.2%	168 31.4%	142 26.5%	27 5.0%	15 2.8%	535	3.9
Z7	No recollection incentives	163 30.5%	271 50.7%	66 12.3%	23 4.3%	12 2.2%	535	4.0
Z8	Its portability	202 37.8%	186 34.8%	28 5.2%	38 7.1%	81 15.1%	535	3.7

Source: Field work, 2013

Table 1b. Varimax rotated matrix on factors responsible for indiscriminate disposal of sachet water wastes

Reasons	Factor1 (Psychological	Factor2 (Economical)
Attitude and behaviour	**0.620**	0.267
Affordability	0.262	**0.562**
Lack of law enforcement against offenders	**0.571**	**0.554**
Lack of recycling plants	0.442	**0.610**
Lack of dustbins/dumpsters	0.262	0.173
People's ignorance of the effects	**-0.532**	0.226
No recollection incentives	0.340	0.532
Its portability	-0.256	0.252

Source: Field work, 2013.

3.1.2 Underlying component influencing the factors responsible for indiscriminate disposal of sachet water wastes

Furthermore, Principal Component Analysis (PCA) was employed to identify major underlying component influencing the factors responsible for indiscriminate disposal of sachet water wastes. The relationship between the factors responsible for indiscriminate disposal of sachet water wastes was established using the Pearson's correlation matrix of interrelation. A correlation matrix of all the factors used in the analysis is presented in Table 2. This matrix shows that some of the variables are equally correlated among themselves and contributed nothing significantly. It eventually resulted into 8X8 matrix of the interrelationship. From the matrix presented in the table above, four (4) variables have positive correlations with each other, while the remaining four (4) variables have no significant correlation coefficient. A total of two (2) significant correlations coefficient at 0.05 levels were obtained, while a total of four (4) variables have significant correlation coefficient at 0.01 levels. Variables that have significant correlations are Attitude and Behaviour (Z1), Affordability (Z2), Lack of law enforcement against offenders (Z3) and Lack of recycling plants (Z4) while variables that have no significant correlations are Lack of dustbins/dumpsters (Z5), People's ignorance of the effects (Z6), No recollection incentives (Z7) and Its portability (Z8).

Table 2. Correlation matrix on the factors that are responsible for indiscriminate disposal of sachet water wastes

Code	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8
Z1	1.000							
Z2	.822	1.000						
Z3	.934*	.827	1.000					
Z4	.666	.509	.868	1.000				
Z5	.781	.989**	.828	.551	1.000			
Z6	.545	.585	.803	.919*	.668	1.000		
Z7	.754	.499	.889	.972**	.510	.809	1.000	
Z8	.990**	.812	.973**	.764	.788	.655	.830	1.000

*Correlation is significant at the 0.05 level
**Correlation is significant at the 0.01 level
N.B: Significant coefficient is ±0.9 at 95% confidence level

To reduce the effect of this inter-correlation, PCA transformed our factors of varimax rotation into orthogonal components, which was utilized to maximize variances and place the component axes in a unique position such that the components can be interpreted by significant loadings exceeding 0.7. After this varimax rotation, two (2) components were obtained. The two components with their variable loadings (i.e. correlations between each variable and that factor); their eigen values (i.e. the sum of the squared loadings); the percentage of total explained variance; the cumulative percentage explained by each factor are represented in Table 3.

Interpretation of the Components

From Table 3, it was observed that Component I explains 80.10% of the total variance among the factors, while Component II explains the least with a percentage of 13.24%. Thus, the two components explain 93.34% leaving a total variance of 6.66% unexplained.

Component I

Component I has an eigen value of 6.408 and explains 80.10% of the total variance. High positive loadings were found on five (5) variables namely Attitude and Behaviour (Z1), Affordability (Z2), Lack of law enforcement against offenders (Z4), Lack of dustbins/dumpsters (Z5) and its portability (Z8). These variables describe the underlying dimension of attitude and need of people towards indiscriminate disposal of sachet water wastes.

Component II

Component II has an eigen value of 1.059 and thus explains 13.24% of the total variance in the raw data. Together with Component I, it explained a total Cumulative variance of 93.34%. It has high positive loadings on three (3) variables namely Lack of recycling plants (Z4), People's ignorance of the effects (Z6) and No recollection incentives (Z7). These variables describe the underlying dimension of environmental control both from the general public and the sachet water producing companies. Therefore, the two (2) components explained almost all the variance at 93.34%, leaving 6.66% of the total variance unexplained.

Table 3. PCA of the factors responsible for indiscriminate disposal of sachet water wastes (Varimax Rotation)

Code	Variables	Components	
		I	II
Z1	Attitude and Behaviour	*.809	.478
Z2	Affordability	*.956	.230
Z3	Lack of law enforcement against offenders	*.710	.698
Z4	Lack of recycling plants	.288	*.954
Z5	Lack of dustbins/dumpsters	*.917	.282
Z6	People's ignorance of the effect	.347	*.836
Z7	No recollection incentives	.321	*.928
Z8	Its portability	*.759	.591
	Eigen value	6.408	1.059
	% of explained variance	80.10	13.24
	Cumulative%	80.10	93.34

*Significant loadings exceeding 0.7.
Source: Field work, 2013

The PCA model has been used to identify two (2) important components which could be employed to explain the factors responsible for indiscriminate disposal of sachet water wastes. The model has transformed eight (8) variables to two (2) underlying dimensions which are shown in Table 4.

Table 4. The relative strength of the major factors responsible for indiscriminate disposal of sachet water wastes

S/N	Components	Underlying dimensions	Relative contribution (100%)	Cumulative (100%)
1	I	Attitude and need	80.10	80.10
2	II	Environmental control	13.24	93.34

4. Conclusion

The indiscriminate disposal of sachet water waste in various undesired sites such as along the streets, gutters, motor parks, schools, markets, homes, and venues of social functions etc. poses a lot of threat on the environment especially on the soils on which farming is done. Such threats prompted the need to identify the factors responsible for its indiscriminate disposal. Statistical analysis of the data shows attitude/behaviour (0.620) and people's ignorance of the effects (-0.532) as psychological factors responsible for indiscriminate disposal of sachet water waste while affordability (0.562) and lack of recycling plants (0.610) were economic factors responsible for indiscriminate disposal of sachet water waste. Principal Component Analysis (PCA) was used to transform the eight (8) variables to two underlying dimensions to explain the factors responsible for indiscriminate disposal of sachet water waste as attitude and need (80.10 %) and environmental control (13.24%). For proper and adequate disposal of sachet water wastes in other to save our environment, the study suggests public enlightenment campaigns aimed at helping people change their attitude about indiscriminate disposal of sachet water waste.

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