

OPATUNJI &amp; ODHIAMBO

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**35th WEDC International Conference, Loughborough, UK, 2011****THE FUTURE OF WATER, SANITATION AND HYGIENE:  
INNOVATION, ADAPTATION AND ENGAGEMENT IN A CHANGING WORLD****Consumption practices and user perception of an  
emerging alternative drinking water option (sachet water)  
in Ibadan, Nigeria***O. S. Opatunji & F. O. Odhiambo, Nigeria***REFEREED PAPER 1269**

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*Water utilities in Nigeria particularly in cities are unable to provide a safe supply of drinking water to the majority of residents. As a result, many city residents have come to rely upon sachet water as their sole source of drinking water. Though most sachet water consumers believe that it is safe, a few studies have shown that some sachet water does not conform with regulatory standards. Consumers are aware of the need for regulation of the sachet water industry especially in regard to assuring its quality. However, sachet water retailing practice can endanger public health and this risk is compounded by people's consumption practices. Given the central role sachet water plays as a source of drinking water, there is need for proper regulation of the sub-sector and proper hygiene education for both consumers of sachet water and retail outlets.*

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**Introduction**

In many low income countries, safe, adequate and affordable drinking water supplies remain a problem. Yet the need for safe, adequate and good quality drinking water cannot be over-emphasised in day to day living as it is critical in ensuring sound health and well being, in fact as much as there is need for clean fresh air for good health and survival so is the need of good quality drinking water vital. In most towns and cities, water utilities have the responsibility of delivering drinking water and supplies to residents. However, in many low income countries, utilities are often unable to meet demand from all residents and ration the water they produce. Usually, it is the richest suburbs which get priority in water provision. Alongside insufficient supply, the quality of water they produce is sometimes doubtful. Ibadan city in Nigeria is no different. The utility here provides only a patchy service.

As a result, many of the residents of Ibadan rely on a variety of sources for their water including boreholes, wells and packaged water of different kinds. Historically, small shopkeepers would sell drinking water in their premises by the cup for on the spot consumption. Over time, customers began to demand portability. In response shop keepers started to package water in crudely fashioned and hand-tied polyethylene packets much like sachets, which were then frozen and retailed as 'ice water'. This effectively met the portability function demanded by consumers. However, with time, consumers began to question the quality of ice water. Equally, the population consuming ice water was growing. These two developments led investors to conclude that the time had come to upscale the ice water cottage industry into full-fledged packaged water. Thus was born sachet water.

The factories producing sachet water draw their raw water from boreholes most of which would be classed as an improved source under WHO /UNICEF JMP criteria. The water goes through a conventional treatment process after which it ends up at an automatic Form, Fill, and Seal (FFS) machine that forms the sachets from polyethylene, fills each sachet with 60cl of water and finally seals them ready for distribution.

Several small- and medium-sized factories have sprung up producing sachet water as its importance as a source of drinking water has grown. In fact, commentators estimate that sachet water enterprises form between 10-15% of total manufacturing output in Nigeria (Akunyili, 2003) illustrating that sachet water is a

significant source of drinking water for urban Nigerians. Further, these factories provide much needed employment.

Though ostensibly a safe product, recent studies of sachet water in Ibadan have shown samples failing microbiological tests (Ademoroti, 1996; Agada, 1998; Adekunle, et al 2003; Ajayi, 2008). All the studies drew their sachet samples from retail outlets. Dada in his study (2009), had similar findings and also found that some sachet water producers failed to comply with labelling standards established by the regulator. However, they conclude that overall, sachet water is a safe drinking water option.

### Objective

This paper reports on a study of sachet water conducted in Ibadan city of Nigeria in 2009. The study was a wide-ranging study of quality assurance measures employed in the production process but also investigated consumers' behavioural patterns in consuming sachet water. This paper focuses on the latter issue and in particular, argues that given the ubiquity of sachet water as a drinking water option for residents of Ibadan, there needs to be greater focus on ensuring adequate regulation of the sub sector. Equally, there is urgent need for a policy to guide the development of the sub-sector.

### Methodology

This study was carried out in Ibadan city, Nigeria in the summer of 2009. The researcher collected data for this study by carrying out semi-structured interviews with people who use sachet water in Ibadan city. The interview was concerned with people's usage of sachet water. The initial part of the interview relied on closed questions to obtain biometric information from the respondent. Subsequent questions were open-ended and designed to elicit respondent's views on the issues addressed. It was important that the respondent's perspective should be understood further necessitating open-ended questions. The broad categories of questions asked related to aspects of use, cost, affordability, accessibility, consumption and regulation.

The sample drawn was purposive in that the researcher approached people asking them if they consume sachet water. If they replied in the affirmative, the researcher asked if they would be prepared to grant a short interview on their consumption of sachet water. If they declined, the researcher approached the next passer-by until he found one who consumed sachet water and accepted an interview. This took place at the market place, at a church, on a university campus, and at the bus station. The researcher also approached people found purchasing sachet water in the market place. In all, 137 interviews took place. The researcher codified the interview data using categories and assigned numbers, making the data amenable to quantitative analysis using Excel. The researcher drew the sample from a cross-section of society thereby improving the reliability of the sample. Thus, in spite of a sample size of 137, it is possible to generalise to the wider Ibadan population based on the study findings.

### Results

The results of the questionnaires show that 94.6% of respondents use package water as their main source of drinking water while 5.4% uses other sources of drinking water (Table 1).

<b>Description of activity</b>	<b>%</b>
Respondents that use packaged sachet water daily	94.6
Respondents that use well water	2.4
Respondents that use drinking water from borehole	1.7
Respondents that use drinking water from mains	0.6
Respondents that use drinking water from bottled water	0.2
Respondents that use drinking from other sources	0.5

Table 2 and 3 shows that 92% of respondents that use sachet water use it both at home and out of the home while 8% did not specify where Sachet water was being used but agree using of sachet water. 37% of sachet water users use it out of the home and so 63% use water at home.

<b>Table 1. Sachet water usage</b>	
<b>Description of activity</b>	<b>%</b>
Respondents that use sachet water at home and out of the home daily	92%
Respondents that did not signify where sachet water is being used	8%

<b>Table 3. Location of sachet water usage</b>	
<b>Description of activity</b>	<b>%</b>
Respondents that use sachet water outside the home	37%
Respondents that use sachet water in the home	63%

Regarding the cost of sachet water, Table 4 shows how this varies with household size. Though the per capita cost of sachet water may not at first sight seem large, when calculated for a large household, the amount can be significant.

<b>Table 4. Daily cost of using sachet water</b>			
<b>Sachet Water Consumption per cap</b>	<b>Cost per cap</b>	<b>Household of 4 pc per day</b>	<b>Household of 6 pc per day</b>
2-4 Sachet water	N10-20	N40-80	N60 -120
5-6 Sachet water	N25- 30	N100-120	N150- 180
Above 6 Sachet water	> N35	> N185	> N360

The above notwithstanding, about 75% of the respondents believe the price of sachet water at N5.00 (about \$0.04) per sachet is affordable as shown in Table 5. A further 19% believe it is cheap while 5% believe it is expensive.

<b>Table 2. Sachet water affordability</b>	
<b>Description of activity</b>	<b>%</b>
Respondents that believe Sachet Water is Affordable	<b>75%</b>
Respondents that believe Sachet Water is very Cheap	<b>19%</b>
Respondents that believe Sachet Water is Expensive	<b>5%</b>
Respondents uncertain about cost of Sachet water	<b>1%</b>

The percentage of respondents who travel less than 100m to get sachet water is 63% and those that get it delivered to them is 25%. Thus respondents who have easy access to sachet water is a combination of the above which is 88% as shown in Table 6.

<b>Table 3. Sachet water accessibility</b>	
<b>Description of activity</b>	<b>%</b>
Respondents that travel less than 100m to get Packaged Sachet Water	63%
Respondents that get Sachet Water Delivered to them at home	25%
Total Respondents that Have easy access to Sachet Water	88%
Respondents that travel more than 100m to get Packaged Sachet Water	12%

The percentage of respondents' that consume between 2-4 sachets of water per day is 58.3% and those that consume between 5-6 sachets of water per day is 18.8 % . Those consuming above 6 Sachets Water per day are 9.4%. One Sachet of water contains on average, 0.5L water. From this, we can calculate the quantity of water consumed daily as shown in Table 7.

<b>Table 4. Sachet water consumption rate</b>	
<b>Description of activity</b>	<b>%</b>
Respondents that drink between 2-4 Water Sachets /day	1-2L
Respondents that drink between 5-6 Water Sachets /day	2.5-3L
Respondents that drink above 6 Water Sachets /day	above 3L

### Consumption practices

Table 8 presents the hygiene measures practiced by respondents when consuming sachet water. Most respondents (76.8%) examine their sachet before drinking water from it while 19.2% do not. A much smaller number (12.3%) will use a sleeve say, to clean the sachet before consuming water and 15.4 % . will rub the sachet with their hands before drinking. About half the respondents (54.6%) use their teeth to create a tear before drinking while only 10% reported using scissors for this.

<b>Table 5. Hygiene practice when consuming sachet water</b>	
<b>Description of activity</b>	<b>%</b>
Respondents that Examine Water Sachets before drinking	76.8
Respondents that do not Examine Water Sachets before Drinking	19.2
Respondents that Rub Water Sachets on Cloth before Drinking	12.3
Respondents that Rub Water Sachets with hands before Drinking	15.4
Respondents that Cut Water Sachets directly with teeth before Drinking	54.6
Respondents that Cut Water Sachets with Scissors and pour in a cup before Drinking	10

The findings show that a third of respondents do not store sachet water at all but use it on the fly (Table 9). Two thirds of respondents buy sachet water in quantities to store. Of those who store, 26.2% store their water in a refrigerator while another 28.6 % store it in a cupboard or on the floor. A small number (7.1%) use a combination of storage methods while just 4.8% of respondents store sachets on Pallets.

Description of activity	%
Respondents that Do not Store Water Sachets	33.3
Respondents that Store bags of Water Sachets in the Refrigerator	26.2
Respondents that Store bags of Water Sachets on the Bare Floor	28.6
Respondents that Store bags of Water Sachets on Floor and in the Refrigerator	7.1
Respondents that Store bags of Water Sachets on Pallets	4.8

Given concerns about the quality of water, the researcher asked respondents their views about regulation of sachet water vendors. The majority, 93.8% of respondents believe that regulation of sachet water sales is important with just 0.8% believing that regulation is not important. 5.4% have no views either way (Table 9).

Description of activity	%
Respondents that Believe Water Sachets Should be Regulated	93.8
Respondents that Believe Water Sachets Should Not Be Regulated	0.8
Respondents that are uncertain about Water Sachets being Regulated	5.4

In spite of the reported concern with water quality found in previous studies, only 37.9% of respondents in this study believe that sachet water regulation should address water quality (see table 11). A much smaller proportion, (6.0%), believe that regulation should be restricted to product packaging while 24% believe that regulation should address both quality and packaging. 14.7% of respondents believe that regulation should look address all aspects.

Description of activity	%
Respondents that believe that sachet water should be regulated on water quality	37.9
Respondents that believe sachet water Should be regulated based on packaging alone	6.0
Respondents that believe sachet water should be regulated based on quality and packaging of the product	24%
Respondents that believe sachet water should be regulated in all areas	14.7

Of those respondents who favour regulation addressing quality, their main concern is with taste (19.4%) while 17.3% reported concern with suspended solids in the water. A further 13.3% believes that a major problem with the packaging is leakage. Just 2.0% are concerned with proper and adequate labelling of the product.

## **Discussion**

### **Usage levels**

The results show that a very high proportion of people interviewed (94%), rely solely on sachet water for drinking purposes. It is interesting too that the consumption of sachet water is not restricted to use outside of the home but that a large number of people use sachet water as their source of drinking water in the home too. This probably reflects the water utility's poor service levels in providing water at all. In cities, the usual source of drinking water is municipal. In the absence of a functioning and reliable mains supply, it is easy to see why sachet water is so popular. Other sources that people could use are boreholes and wells. However, boreholes are very expensive and to install and are usually only a realistic option for the rich. The other option, hand dug wells, are not an attractive option for many city residents as well water can be of poor quality.

### **Affordability**

The results show that 75% of respondents find sachet water affordable. This was a somewhat surprising finding as most people regard packaged water as an expensive option and many people would find it particularly expensive if it was their only source of drinking water. However, sachet water manufacturers have managed to price their product at a level where most people report that it is affordable. In total, 94% of respondents believe that sachet water price is not an issue for them. Previous studies have shown that samples of sachet water have failed water quality tests (Ademoroti, 1996; Agada, 1998; Adekunle, et al 2003; Ajayi, 2008). It is a moot question whether to keep the price of sachet water so low manufacturers are cutting down on production costs by for example, applying less stringent quality assurance processes.

### **Accessibility**

The results show that just 12% of people who use sachet water travel more than 100m to purchase their supplies. This statistic when read with the findings on affordability reveal strong reasons for the very high number of respondents (94%) relying solely on sachet water for their drinking water supply. In terms of convenience, (as compared to other options), sachet water is the next best thing to having a piped supply to the home. Given its rapid turnover, most informal traders will stock sachet water making it readily available within 100 metres of where people live. Further, given its high turnover, sachet water is a reliable source of income for informal traders. However, one can argue that the downside to the relaxed distribution chain whereby any trader can stock sachet water is that a significant proportion of sachet water will be sold from premises that are inadequately fitted out to store sachet water hygienically. The lack of hygiene arises from the small footprint of informal shops leading to sachet water being stored on the floor with consequences for recontamination.

### **Consumption rate/ per cap usage**

Table 5 shows the daily consumption of sachet water by respondents. Sachet water comes in 50cl quantities. The findings showed that nearly 3/5ths of respondents (58.3%) consume between one to two litres a day. This is well within the minimum recommended average consumption of one litre per person per day suggested by Dewettinck and Houtte (2001). Another (18.8%) consume between two and a half to three litres of water daily. This is a surprisingly high consumption rate. Many people (even those with a safe piped water supply) 'supplement' their water intake by drinking beverages during the day. Thus to find that nearly 30% of respondents consume more than two and a half litres of pure water per day is unexpected and again is confirmation that sachet water is affordable for most.

### **Hygiene practices**

Most people consider sachet water to be of good quality as it is packaged water. This belief seems to get in the way of good hygiene practice. The results indicate that whereas many users examine the sachet before drinking from it, (76.8%), the measures they take to protect themselves from any surface contamination are largely inadequate. For example, rubbing the sachet with bare hands though it may appear to clean the

sachet, this is only superficial. Others use an article of their clothing such as a sleeve to clean the sachet. Again, this is not necessarily effective. The practice of creating a tear in the sachet with one's teeth before consumption increases the likelihood of infection where the sachet has bacteria growing on it. Given the poor storage conditions for sachet water particularly in shops, recontamination is a very real possibility. The opposite is also true; the sachet could meet contaminated clothing and 'or hands thereby presenting a potential pathway to infection especially where the water is drunk directly out of the sachet. The foregoing are real dangers. In a recent study, Egwari et al (2009) found that samples taken from the surface of sachet water contained isolates of *E. coli* and pathogens of enteric origins attributed to the distribution and storage process. In another study, Ajayi et al (2008) also report that vendors and distributors have contributed to contamination of sachet water products. Dada et al (2009) observed that microbial quality of sachet water deteriorates as water progress through the production chain from catchments to the consumer and note that there is higher contamination occurring in samples from distributors' sheds probably linked to the storage practices at these points.

### Perceptions on regulation

It is odd given the hygiene behaviour discussed above that a very high percentage of respondents believe that sachet water regulation is important and more specifically, should focus on the quality and the packaging of the product. This indicates a good level of awareness and concern for their personal health and hygiene which is not matched by their behaviour. The respondents were also aware of the adverse effects of consuming unwholesome water hence the practice of always checking the aesthetic properties of sachet water especially for turbidity, odour and taste, before consumption. Although this does not guarantee the microbial safety of the water for drinking, it does indicate awareness of the dangers on the part of consumers. An area of regulation that was not mentioned by the respondents but which could be introduced to safeguard health would be a requirement that all sachets are labelled with instructions to 'Cut and serve'. This may reduce the practice of creating a tear with one's teeth and drinking straight out of the sachet.

There is a clear need for hygiene education among both sachet water consumers and retailers. Consumers need to understand the potential dangers they encounter in consuming sachet water while retailers need training in hygienic storage practices for sachet water. Given the large numbers of people reliant on sachet water, it is incumbent on both government (National and local) and the regulator to ensure that they protect public health. In short, a widespread hygiene campaign to educate the public on good hygiene practice in respect of sachet water would be welcome. This should extend to proper disposal of empty sachets to protect the environment, as there is very high potential for environmental degradation if empty sachets are disposed of indiscriminately.

### Conclusion

Sachet water has come to be the primary source of water for most city residents in Nigeria. It is time for the authorities to recognise and accept this reality. This study has shown that there is urgent need to ramp up the regulation of the sub sector to ensure that manufacturers produce sachet water in hygienic environments and that the production process conforms in all respects to laid down standards. There is also a lot of work to do in educating the public on the dangers of recontamination and steps to take to ensure that their consumption practices do not put them at risk. There is also urgent need for a campaign targeting retailers of sachet water to educate them on how best to protect their stock from recontamination.

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### Contact details

Opatunji S. Olufemi  
Apt 11 Tanni Grey House  
Union Street Loughborough  
Tel: 01509 210770  
Email: femipa@yahoo.com

Odhiambo F.O.  
WEDC, Loughborough  
Tel: +44 1509 222 396  
Fax: +44 1509 211 079  
Email: F.O.Odhiambo@lboro.ac.uk

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