Status of water quality in Lagos

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Introduction

The persistent prevalence of diarrhoea diseases, reported outbreaks of cholera and typhoid in the City of Lagos, generated an interest in investigating the different quality of water supplied to the city and its peripherals.

The paper examines the chemical and bacteriological quality of water from service pipes in houses, storage reservoirs in the homes, public taps and burst pipes. The paper also examines the influence of the distribution network on water quality i.e. the incidence of service pipes running through open drains and also observes and records the operation and maintenance practices of burst pipes during the said period.

Source of water supply

The main source of water supply to Lagos is from the Ogun River, and also from some seven mini waterworks which abstract ground water. Some parts of Lagos receive mainly river water, some ground water and some a mixture of the two.

Sampling areas

Four Local Government were chosen as case studies out of the 13 L.G.A in the State. They are Lagos Island, Surulere, Ojo and Mushin L.G.A. respectively.

Sampling rationale

Each of the L.G.A. was divided into fives zones and 20 samples of water were collected from each zone into 1.5 litre plastic containers and taken directly to the University of Lagos Public Health Laboratory for (chemical) analysis. Samples for bacteriological analysis were collected into previously sterilised containers.

Water sampling

Water samples were collected from
(1) Household taps without storage reservoirs;
(2) Household taps with storage reservoirs
(3) Public Standpost
(4) Burst pipes.

Distribution network

The lengths of pipes running through open drains in each LGA were manually quantified.

A questionnaire was developed and was distributed to about one hundred people. From the questionnaires, information was gathered on the number and frequency of burst pipes in the city.

Method of analysis

Bacteriological analysis

The bacteriologically labelled samples were analysed using the membrane filtration method. The samples were analysed for E. coli and where it was found that the number of E. coli was greater than 10, analysis for Faecal Coliform was carried out to ascertain if there were any faecal contamination.

Physical and chemical analysis

The samples were examined for their physical characteristic, i.e color, odour, and presence of sediments and turbidity. Chemical and bacteriological analysis was in accordance with the laid down methods in the 15th Edition of Water and Waste Water Analysis. The parameters analyzed for were pH, Conductivity, 4-Hour Permanganate value, Iron, Manganese, Ammonia, Phosphate, Nitrate, Sulphate, Chloride, Total hardness, Calcium hardness and Total Alkalinity.

Results

See Table 1.

General observations

60% of the pipes in any L.G.A., run through open drains. These pipes are all illegally connected to the homes. This percentage is really unacceptable and some burst pipes were found to be actually burst and open in the drains. The inhabitants living nearby invariably resort to fetching their daily water supply from these pipes. Such practices will only intensify the occurrence of diarrhoea diseases. The burst pipes were often left to gush out water for several days and sometimes over a week before any repairs are carried out. Investigations into the cause of the delay reveals the following reasons:-

i) Illegal connections of service pipes using inferior materials
ii) Internal corrosion of the pipes, due to soft and corrosive water in the pipes
iii) External corrosion of the pipes due to aggressive soil conditions
iv) Old pipes. Many old pipes abound that need to be replaced, but are not yet replaced.

v) Poor earth cover of pipes results in damage by heavy traffic.

vi) Lack of public awareness of where to report faults.

vii) Insufficient personnel at the Water Corporation to effect repairs.

Chemical analysis

The results of the chemical analysis will not be displayed due to lack of space and also because there was no real threat from the observed chemical analysis. The general chemistry of the water can be summarised as having a pH of 6.89, low in dissolved solids and soft. Such waters having a low pH, low calcium, low total dissolved solids, can often be aggressive to a distribution system. Such waters will aid corrosion of the service pipes and may eventually lead to burst pipes. The organic contents of the water as indicated by the 4hr Permanganate Value, Ammoniacal Nitrogen, Nitrite and Nitrate, were within W.H.O. drinking water guidelines.

Bacteriological analysis

From the view point of water borne diseases, the most single important parameter is bacteriological. The bacteriological quality of the water is displayed in Table 2 and this shows a wide variation as expected.

Burst pipes

Three out of the four LGAs recorded *E. coli* count of less than 10 and one LGA recorded high values of *E. coli* in the water and also recorded the presence of faecal streptococci. It will appear from the results that fetching water from burst pipes has high risks. 25% of water from burst pipes in the State are most probably disease causing.

Household taps with storage reservations

The samples exhibited a wide range of variation in bacteriological count. In general the bacteriological quality of water with storage facilities was worse off than water from any other source.

Public standpost

The bacteriological quality of water from public standposts displayed acceptable levels of *E. coli* contamination, i.e. only I L.G.A. recorded the presence faecal Streptococci in the water sampled. The results are encouraging, as the low income group mostly get their drinking water from public standposts.

Conclusion

From the present survey, the following points become evident:-

- That over 60% of service pipes in the Lagos Metropolis run through open drains.
- That over 50% of consumed water is stored in one way or the other.
- That incidence of burst pipes in any L.G.A. are quite high. (i.e. nearly 20%.)
- That the bacteriological quality of water from Public Standposts are generally acceptable.
- That water from burst pipes have doubtful character, i.e. they lead to water borne diseases.
- That water from households with storage facilities suffer from bacteriological contamination.
- That the water chemistry can be described as a water with a moderate pH value,
- low in Total dissolved solids, low Calcium, low Total hardness and low in alkalinity, i.e water in the Lagos Metropolis has an inherent aggressive nature.

References

Standard Methods from the Examination of Water And Waste Water 15th Edition 1980 APHA - AWWA - WPCF

Acknowledgements

Table 1. Variation of some observed parameters within the L.G.A.s, i.e. % of pipes running through drains, % of burst pipes, and % of household with storage facilities.

L.G.A.	% OF PIPES RUNNING THROUGH DRAINS	% OF BURST PIPES	% OF HOUSEHOLD WITH RESERVOIR
SURULERE	80	8	32
MUSHIN	70	17	28
LAGOS ISLAND	70	20	84
OJO	60	30	60
AVERAGE	60	18.75	50

Table 2
Average values of bacteriological parameters of water from all L.G.A.s

SOURCE OF WATER SUPPLY	L. G. A.				
	A1	A2	A3	A4	TOTAL AVERAGE
BURST PIPES					
Coliform count (MPN/MF) / 100ml	6	3	4.33	N	N
Faecal Streptococci (MPN/MF)/100ml	N.D	N.D	N.D	2	0.5
HOUSEHOLD TAPS					
Coliform count (MPN/MF) /100ml	N.D	N.D	N	3	N
Faecal Streptococci (MPN/MF)/ 100ml	N.D	N.D	2.25	NIL	
HOUSEHOLD TAPS WITH STORAGE RESERVOIR					
Coliform count (MPN/MF) /100ml	15	13	N	3.7	N
Faecal Streptococci (MPN/MF)/ 100ml	3	2	2	N.D	1.75
PUBLIC TAPS					
Coliform count (MPN/MF) /100ml	3	3	4	12	12.25
Faecal Streptococci (MPN/MF) /100ml	NIL	NIL	NIL	2	0.5

NOTE

N.D	=	NOT DETECTED	A2	=	OJO
N	=	NUMEROUS	A3	=	SURULERE
A1	=	LAGOS ISLAND	A4	=	MUSHIN