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Water Availability and Purity of Water used in Fourteen Perinatal Units

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Summary

Olamijulo SK. Water Availability and Purity of Water Used in 14 Perinatal Units. *Nigerian Journal of Paediatrics* **1984; 11: 47.** Water availability and the degree of purity of the available water were investigated in seven delivery rooms and seven newborn units located in Oyo and Kwara States. Only two of these 14 perinatal units had abundant and regular water supply, but in the remaining 12 units, the water supply was scanty and irregular. The mean coliform count of water used in the seven delivery rooms was 700,143 colonies per 100ml (range, 11,000–1.7 million), while the mean coliform count of water used in the newborn units was 606,171 colonies per 100ml (range 3,200–1.5 million). By WHO standards, the water used in all the fourteen units was too heavily polluted to be used as potable water. In eleven units, the water being used was too polluted to be acceptable even as raw water capable of being treated to tolerable levels of purity by conventional treatment methods.

Introduction

INFECTIONS constitute one of the leading causes of morbidity and mortality among newborn babies in Nigeria. In a review of our experience of 1,391 consecutive admissions into the Neonatal Unit, Wesley Guild Hospital, Ilesha, 24.8% of the neonatal admissions were for infections and 25% of the deaths were associated with infections.[1] In a review of childhood mortality at the University College Hospital, Ibadan, between January 1969 and December 1973, septicaemia was identified as the principal cause of death in 7.6% of 725 neonatal deaths.[2]

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It is essential to identify and correct the more important factors predisposing to neonatal infections so as to reduce neonatal morbidity and mortality. The present study examined the availability of water and the degree of purity of such water available for hand washing and other essential activities in some delivery rooms and newborn units.

Materials and Methods

Seven delivery rooms and seven newborn units were visited by the author without prior notice. The units included Federal Government University Teaching Hospitals, State Government owned 'Specialist Hospitals' and Local Government maternity centres. Four of the seven units

in each category, were located in Oyo State, while the remaining three were located in Kwara State. Each unit was inspected for availability of pipes and taps for water distribution. Such taps when present, were turned on for water collection. If the tap was dry, enquiry was made from the ward staff about how often public water supply ran through the tap and what alternative source the unit depended on, for water supply. Enquiry was also made about the regularity of supply from such alternative sources.

A sample of water available for use in each unit was taken into previously autoclaved sterile bottles with appropriate precautions to avoid extraneous contamination in the process. The water was inspected for colour and visible dirt particles and processed for total coliform count between two and four hours after obtaining the sample.

Coliform count

A 1:100 dilution of the water sample was made with sterile distilled water. One sterile absorbent pad was put in one millipore disposable petri-dish. Two millilitres Endo media were poured on to the absorbent pad. Millipore equipment parts were sterilized in ultraviolet light sterilizing unit for five minutes. With a pair of sterile forceps, one sterile millipore filter paper was placed in a funnel. The funnel was attached to a suction system. One millilitre of the diluted sample was poured on the filter paper. Two to five millilitres of sterile buffer solution was used to wash the sample on to the paper. The suction machine was switched on and water was sucked through the paper into the flask below the funnel. The filter paper was placed on the absorbent pad in the petri-dish which already contained the media. The petri-dish was incubated for 24 hours at 37°C. The number of colonies growing on the filter paper was multiplied by 100 x 100 to give the total coliform count per 100ml water.

Results

Twelve of the 14 units visited were fitted with pipes and taps for water distribution. In two units, water was running from the town supply. In addition to the usually regular water supply, both units were fitted with standby overhead tanks which were used as reservoirs to meet emergencies. In 10 of the units, the taps were dry. Two of them had water running through them within the month prior to the visit. Eight of them had never conveyed water for as far back as the staff could remember. At the points where water must be required for use, twelve of the 14 units had scanty water supply available. Six units were supplied irregularly by water tankers. Four units were supplied by wells on the institution's premises and two units by a spring, about two kilometers away (Tables I and II).

TABLE I

Water Availability in 7 Delivery Rooms

Institution	*Fitted Water Taps*	*Water Supply*	*Water Source*
1	Dry	Scanty, irregular	Water tanker
2	Running	Abundant, regular	Direct public supply
3	Dry	Scanty, irregular	Water tanker
4	Dry	Scanty, irregular but potentially regular	Well
5	Dry	Scanty, irregular	Water tanker
6	Dry	Scanty, irregular but potentially regular	Well
7	None	Scanty, irregular but potentially regular	Spring

TABLE II

Water Availability in 7 Newborn Units

Institution	*Fittea Water Taps*	*Water Supply*	*Water Source*
1	Dry	Scanty, irregular	Water tanker
2	Running	Abundant, regular	Direct public supply
3	Dry	Scanty, irregular	Water tanker
4	Dry	Scanty, irregular but potentially regular	Well
5	Dry	Scanty, irregular	Water tanker
6	Dry	Scanty, irregular but potentially regular	Well
7	None	Scanty, irregular but potentially regular	Spring

TABLE III

Characteristics of Water in 7 Delivery Rooms

Institution	*Colour*	*Visible Dirt Particles*	*Total Coliform Count/100ml*
1	Colourless	Moderate	130,000
2	Colourless	None	11,000
3	Brown	Plentiful	1,200,000
4	Brown	Plentiful	1,500,000
5	Brown	Plentiful	1,700,000
6	Brown	Moderate	300,000
7	Colourless	None	60,000

Mean Total Coliform Count/100ml of water = 700,143

TABLE IV

Characteristics of Water in 7 Newborn Units

Institution	*Colour*	*Visible Dirt Particles*	*Total Coliform Count/100ml*
1	Colourless	Moderate	180,000
2	Colourless	None	3,200
3	Brown	Plentiful	1,100,000
4	Brown	Plentiful	1,020,000
5	Brown	Plentiful	1,500,000
6	Brown	Moderate	400,000
7	Colourless	None	40,000

Mean Total Coliform Count/100ml water = 606,171

In eight units, water being used was brown. In 10 units, dirt particles were visible in the water. The total coliform count in delivery rooms ranged from 11,000 colonies per 100ml to 1.7 million colonies per 100ml with a mean of 700,143 colonies per 100ml. In the newborn units, the total coliform count ranged from 3,200 colonies per 100ml to 1.5 million colonies per 100ml with a mean of 606,171 colonies/100ml water (Tables III and IV). The bacteriological quality standards as given by the WHO[3] are contained in Table V.

Discussion

Abundant supply of clean water is essential for the maintainance of sanitary conditions in delivery rooms and newborn units. Although the present study was carried out during mid rainy season, water was found to be a scarce commodity in as many as 12 of the 14 perinatal units visited. In many of the units, the same utensils had to be used repeatedly for several patients without washing the utensils. Gloves were present in two of the seven delivery rooms, in very short supply in one and completely absent in four units.

TABLE V

*Bacteriological Quality Standards**

Classification		*Total Coliform Count/100ml water*
I	Bacterial quality applicable to disinfection treatment only	0 — 50
II	Bacterial quality requiring conventional methods of treatment (coagulation, filtration, disinfection)	50 —5000
III	Heavy pollution requiring extensive types of treatment	5000 — 50,000
IV	Very heavy pollution, unacceptable unless special treatment designed for such water is used, source to be used only when unavoidable	>50,000

* Source: WHO[3]

In some units not distant from wells containing water, water was still scarce for use. This was often due to the reluctance of staff to undertake repeatedly, the arduous task of fetching water by the primitive manual method from the wells. Such units could experience a dramatic improvement in the volume of water available for use in them if some mechanical device could be used to pump up the water to a tank at such a height that the water would easily be distributed by gravity.

Apart from severe scarcity of water, such water as was available was often very polluted. The water in eight units was brown and dirt particles were visible to the naked eye in the water being used in ten units. The mean total coliform count from delivery rooms was 700,143 colonies per 100ml water. The mean from newborn units was 606,171 colonies per 100ml water. Experience has shown that water in which the number of coliform organisms is below a certain range of values will not contain pathogenic bacteria. This range is specified in documents on drinking water standards such as the International Standards for drinking water.[4] The supervision of a water supply should be aimed at the delivery of water which does not contain coliform organisms. In any case, coliform colonies should not exceed 3 per 100ml water. In small rural communities where no piped water supply is available, a private supply, such as a shallow well, adequately protected from obvious sources of pollution, should be considered adequate if the coliform count is less than 10 colonies per 100ml. If it fails repeatedly to keep within that limit, the supply should be condemned for drinking purposes.[5]

In addition to quality standards for drinking water, there are standards set for permissible degree of pollution of raw water. The ultimate purity of water even after the best available treatment procedure is related to the degree of pollution of the raw water. In the present study, the water in the best unit at the point of use, was by world standards, like raw water requiring conventional methods of treatment. Two units were using water comparable to heavily polluted raw water requiring extensive methods of treatment. The remaining eleven units were using water so heavily polluted that they would be unacceptable, unless special treatments designed for such water are used and such a source is to be used only when unavoidable. Although repeated bacteriological testing over a period of time is standard practice in the quality control of drinking water, the quality of the water samples in this study was so bad that the magnitude of the pollution problem was established without a need for repeated samples from individual units.

Water is known to be a source of many diseases afflicting man. Although no attempt was made in the present study to establish a cause and effect relationship, water scarcity and water pollution are no doubt, very important factors in the aetiology of neonatal infections in this part of the world. The surprising aspect of the conditions discovered in the present study is not why many babies die of neonatal infections, but how many more survive, in spite of the appallingly unsanitary conditions under which they are born.

It is strongly recommended that provision of regular, abundant, clean water and particularly in sensitive areas like delivery rooms, newborn units and operating theatres should form one of the most basic requirements for public hospital accreditation in Nigeria. For the benefit of the public, the Nigeria Medical Council and/or a standards Committee of the Nigerian Medical Association should regularly publish crucial data about Nigerian hospitals. Such data will assist the public to know the actual state of affairs in these public hospitals with a view to choosing from a position of knowledge, where to go for help when they want to deliver their babies and what urgent forms of help specific hospitals need, to which, not only governments, but private individuals, can respond.

Professionals in positions from which they can influence government policy must keep reminding politicians that a contract for any health institution is incomplete without first ensuring before the keys are handed over, a guarantee of a constant supply of clean water to the institution, from whatever source.

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References

1. Oyedeji GA, Olamijulo SK and Joiner KT. Experience at Wesley: 1,391 consecutive admissions into the Neonatal Unit (Hurford Ward). *J Trop Paediat* 1983; **19**: 206–12.
2. Adeyokunnu AA, Taiwo O and Antia AU. Childhood mortality among 22,255 consecutive admissions in the University College Hospital, Ibadan. *Nig J Paediat* 1980; **7**: 7–15.
3. World Health Organization. In: Standards of potable water quality. WHO Monograph series. 1968; **49**: 172–82.
4. American Public Health Association. US Public Health Services standards of drinking water quality. In: Standard methods for the examination of water and waste water. Washington: *Amer Public Health Ass* 1971: 635–8.
5. Coghlan JD. Bacteriology of water. In: Medical microbiology. Cruickshank R,ed. Edinburgh: Churchill Livingstone Ltd, 1975: 273–84.

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