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The study of hygiene behaviour in Botswana: a combination of qualitative and quantitative methods

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Summary This paper describes a study from northern Botswana which explored the relationship between hygiene behaviour and diarrhoeal diseases in young children. Both qualitative and quantitative data collection methods were used. The qualitative methods included observations, key informant interviews, in-depth interviews and focus groups. The quantitative methods included spot check observations, anthropometric measurements, the monitoring of diarrhoea morbidity and the administration of a socioeconomic questionnaire. A profile of hygiene behaviours was developed for this community and traditional beliefs related to diarrhoea were identified. The methods described provided considerable information in a short period of time. They were also relatively inexpensive and easy to implement, thus providing a model for further studies dealing with hygiene behaviour in developing countries. The information gathered enabled the identification of areas needing further research, the development of health education programmes and provided the basis for larger epidemiological studies.

keywords hygiene behaviour, faecal indicator bacteria, diarrhoea

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Introduction

The transmission of diseases spread via the faecal–oral route is affected by water and sanitation related hygiene behaviours. The inclusion of an understanding of these hygiene behaviours is important in successful water and sanitation programmes in developing countries. Hygiene behaviour can be grouped into five domains: disposal of human faeces, use and protection of water sources, water and personal hygiene, food preparation and storage, and domestic and environmental hygiene (Boot & Cairncross 1993). This study explores various aspects of the five domains as well as providing the socioeconomic and cultural context for the communities.

Several studies have shown the importance of hygiene interventions on the incidence of diarrhoeal diseases. Some of these are listed in Table 1. Clearly, hygiene behaviour plays a major role in the reduction of these diseases. Basically the methods used to study hygiene behaviour can be divided into two categories: qualitative and quantitative techniques. Qualitative methods are used to define and describe behaviours and to explain why they occur. Hygiene behaviour studies have traditionally used only quantitative methodologies as these data can be analysed statistically. Cairncross and Kochar (1994) describe a number of hygiene behaviour studies which successfully combine qualitative and quantitative methods of data collection. The authors conclude that combinations of techniques are necessary to understand the complexity of hygiene behaviour.

The use of qualitative techniques to explore behaviours related to health is derived from anthropological research (Scrimshaw & Hurtado 1987).

Table 1 The impact of hygiene interventions on the incidence of diarrhoea

Authors and country	Comparison	Reduction in incidence (%)
Alam *et al.* Bangladesh (1989)	Source of washing water, faeces in yard, handwashing before serving food and after defaecation	40 in children where all four observed as opposed to 1 or 0
Black *et al.* Atlanta, GA, USA (1981)	Hand-washing programme	48
Han and Hlaing Burma (1989)	Hand-washing after defaecation and before preparing or eating meals	30
Khan Bangladesh (1982)	Hand-washing with soap	35 in shigellosis; 37 in non-*Shigella* diarrhoeas
Stanton and Clemens Bangladesh (1987)	Hand-washing before food preparation, no defaecation in living area, no garbage in children's mouths	26
Torun Guatemala (1982)	Hygiene education	14 throughout the year; 32–36 for peak season
Wilson *et al.* Indonesia (1991)	Hygiene education and soap	89

Qualitative and quantitative techniques are used together in 3 basic combinations:

(1) Qualitative data are a source of hypotheses which are tested by quantitative data.
(2) Quantitative research facilitates qualitative research in that the data obtained quantitatively may lead to further questions which can be answered through qualitative methods.
(3) Both methods combined produce a general picture, through complementing each other (Bryman 1988).

In this study both types of method were combined.

Diarrhoea presents a major health problem in young children in Botswana, with an estimated 3.8 episodes per child per annum. Diarrhoea is responsible for some 20% of all reported deaths of children under 5 years of age in Botswana (Government of Botswana 1989). As hygiene behaviour is important in reducing the incidence of diarrhoea, this study explores the relationship between hygiene behaviour and diarrhoeal diseases in Botswana. Its three main objectives were

(1) to develop an in-depth profile of hygiene behaviours thought to be associated with the transmission of diarrhoeal diseases;
(2) to explore traditional attitudes towards diarrhoea and handwashing;
(3) to develop low-cost, simple methods appropriate for gathering information on hygiene behaviour and diarrhoea in developing countries.

Materials and methods

The study took place in 2 villages in the North East District of Botswana, from July 1990 to July 1991. The villages, which were chosen by the Ministry of Local Government and Lands, were considered demographically similar and a reasonable distance from adequate laboratory facilities. Both villages are made up of 3 tiers as is common in Botswana: families live in compounds in the village centre, surrounded by fields where the staple food, sorghum, is grown. The fields are surrounded by posts where cattle are kept and form the third tier.

The study was designed as a pre-intervention study in order to gather information on which hygiene interventions could be based. It was divided into 3 parts: a preliminary phase, a sampling phase and a follow-up phase. In the preliminary phase qualitative methods were used to gain familiarity with the community and hygiene behaviours. The methods used included observation, focus groups, indepth interviews and key informant interviews. Also utilized were Government of Botswana reports, a book on traditional healers (Staugård 1985) and information conversations. From this preliminary phase, quantitative methods, such as socioeconomic questionnaires, spot check observations, the collection of bacteriological samples, anthropometric measurements and monitoring of diarrhoea morbidity and mortality, were developed for use in the sampling phase. The follow-up phase used focus groups and in-depth interviews to gain further information on handwashing. Table 2 illustrates the techniques used in the study and the time periods involved.

Data collection was undertaken by the principle researcher, a trained microbiologist. She was assisted by Family Welfare Educators, primary health care workers trained by the Government of Botswana for a period of 16 weeks. They are from the villages they serve, usually female, and help with clinic duties as well as community outreach work. Because they are acquainted with everyone in the village they were well received by the families in the study. Family Welfare Educators acted as interpreters in this study and provided much useful information. An enumerator, trained by the Government of Botswana, administered the socioeconomic questionnaires. Diarrhoea morbidity and mortality were monitored by one woman chosen from each village on the basis of her cooperation and reliability. Both village workers were literate and well known in the communities.

Table 2 Study methods

Type of data	Study phase
Observations	Preliminary
Focus groups	(6 months)
In-depth interviews	
Key informant interviews	
Anthropometric measurements	Sampling
Diarrhoea morbidity monitoring	(6 months)
Socioeconomic questionnaires	
Spot check observations	
Bacteriological sample collection	
Focus groups	Follow-up
In-depth interviews	(1 month)

Qualitative techniques

Observations were semi-structured in that specific information was sought on breast-feeding, food preparation and storage, eating, bathing, water usage and storage, presence of animals, wealth indicators, handwashing, presence and disposal of faeces. Each family was visited 3 times, with the visits lasting between 30 minutes and 3 hours. All visits were unannounced and were non-participatory direct observation. The activities of all family members present were recorded with particular emphasis on hygiene behaviours. Twelve families were chosen for observation, 6 from each village as described in Schroeder *et al.* (1989). They were chosen by purposeful sampling, so that cooperation would be ensured and that a full spectrum of village life could be obtained, and included families from different tribes, socioeconomic backgrounds and areas of the villages.

Focus groups are small, homogeneous thematic discussion groups. Two focus groups, one in each village, were held to develop the diarrhoea morbidity monitoring methodology in the preliminary phase. Another two focus groups were held to obtain information about handwashing in the follow-up phase of the study. The participants were mothers

Name of child _____
Date of birth _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
 Fever							
 Diarrhoea							
 Diarrhoea with blood							
 Cough							

Figure 1 Diarrhoea morbidity monitoring form in English.

living in the villages, with children under 5 years of age, chosen by the Family Welfare Educators because they were considered forthcoming and cooperative.

Key informant interviews involve semi-structured interviews with people who have 'specialized' knowledge on a subject of interest, in this case diarrhoea. During the preliminary phase, a total of 7 key informant interviews were held with Family Welfare Educators, health facility nurses, a traditional healer, a paediatrician and the regional health inspector.

In-depth interviews are structured, open-ended interviews. They were held with the 12 mothers of the observation families during the preliminary phase at the third visit so that the mothers felt at ease with the interviewer. Questions dealt with causes and treatment of diarrhoea; water storage, collection and usage, and handwashing. The second set of in-depth interviews took place during the follow-up phase in order to gain more detailed information regarding handwashing.

Quantitative techniques

A sample size of 116 families was chosen, 58 from each village, using systematic random sampling. Only families with children under 6 years of age were included in the study.

Anthropometric measurements were made on all children 6 years and under living in the 116 households, giving a sample size of 208 children. Each child was weighed to the nearest 0.5 kg and measured to the nearest 0.5 cm. Name and sex were recorded together with the date of birth if this was available.

Diarrhoea morbidity monitoring employed a form in Setswana and Kalanga developed from information obtained in the focus groups. Figure 1 shows the form in English.

As the majority of mothers were illiterate or semi-literate, the form used pictures to identify the 4 symptoms. Various pictures were presented to the focus groups and modified until it was agreed that they clearly represented diarrhoea, diarrhoea with blood, fever and cough. Fever and cough were included in order to de-emphasize diarrhoea and reduce over-reporting. Local terms felt to have a clear and consistent meaning were used for diarrhoea. Due to problems with diarrhoea recall (Snyder & Merson 1982), it was decided that recording on a daily basis was the best option, so

mothers were asked to fill out the form on a daily basis. For each day mothers were asked to place a tick in the box for symptoms the child had and a cross for any not present. Blank spaces were counted as missing data. The forms were colour-coded to differentiate between several children in the same family. A photograph was taken of each child and attached to a coloured frame corresponding to the colour of the diarrhoea morbidity forms for that child. The forms were pretested by several mothers in a nearby village and found to be relatively easy to use. Diarrhoea morbidity was monitored for 10 weeks, 2 weeks during the rainy season and the remainder during the dry season to correspond with the collection of bacteriological samples. This was also the peak time for diarrhoea. Instructions were supplied in Setswana, the main language in Botswana. Pencils were given to care-givers. Village workers collected the forms on a weekly basis, enquired about missing data and dealt with any problems.

The socioeconomic questionnaire consisted of questions dealing with size of household, tribe, education, number of children, sources of income, water sources, water storage, sanitation facilities, land ownership, crops, animal ownership, possession of goods such as radio and bicycle, and health of the children. This questionnaire was administered to each of the care-givers from the 116 families.

Spot check observations mainly covered water storage, size of house, presence of animals in the compound, presence of faeces, left-over food and infant bottles, condition of the compound, presence of unwashed dishes, washing water and toilet.

Bacteriological sample collections for analysis included stored drinking water, other stored water if available, swab from an eating plate, swab from a household cloth, swab from an infant feeding bottle if available, and a fingertip imprint from care-givers and all children present. All water sources used by the families were also tested. The samples were tested for the presence of faecal coliforms.

Membrane filtration was used for all water samples as outlined in Report 71 (PHLS 1984). Membranes were placed on absorbent pads saturated with membrane lauryl sulphate broth and incubated at 30°C for 3–4 hours and then at 44°C for 15 hours. Confirmatory tests were conducted on all faecal coliform colonies as described by Senior (1989).

To sample plates, cloths and bottles a sterile cotton swab was used. This was moistened in sterile Ringer's solution and swabbed over a defined area for 5 seconds. The swab was immediately spread over an entire plate of MacConkey agar no. 3. Plates were incubated for 24 hours at 37°C. All separate, lactose fermenting, non-mucoid colonies were subcultured for confirmatory tests. The methods used were as described in Ekanem *et al.* (1983).

Impression plates were used for the fingertip bacteriology, using MacConkey agar no. 3 with incubation at 37°C for 24 hours. One plate was used for each person. The position of each fingertip was recorded on the plate.

For data analysis of field notes, qualitative data were transcribed and separated into sets of information on index cards. The index cards were grouped into categories of related sets of information: personal hygiene, domestic hygiene, diarrhoea and breastfeeding. The categories were then subdivided. The information in each subdivision was summarized to present the ideas given to the principal investigator.

Anthropometric data were entered into EpiNUT (a nutritional assessment software package). The rest of the quantitative data was analysed using Epi Info, version 5.

Results

Several themes concerning hygiene and diarrhoea emerged from the qualitative data.

(1) Handwashing in Botswana occurs for three main reasons:
   to remove contamination or 'dirt'
   for cosmetic purposes (e.g. before going out)
   for comfort (e.g. after eating an orange)
   Handwashing before meals is usually considered sufficient to remove all contamination encountered throughout the day.

(2) Traditional concepts of dirt or contamination differ from bacteriological concepts of contamination. Cow dung and infant faeces are traditionally not dirty, while human adult faeces and menstrual blood are very contaminating or dirty.

(3) Choice of water source was dependent on factors other than bacteriological quality, such as distance of the source and taste of the water. Although most families reported a protected water source as their primary source, when probed further, many said they used an unprotected source for drinking because of the taste, and the protected source for clothes and dish washing.

(4) Diarrhoea is considered by mothers to have a variety of causes, most of which are not associated with faecal–oral disease transmission. One of these is *pogwana*, a traditional term for diarrhoea associated with a sunken anterior fontanelle. The sunken fontanelle was said to cause the diarrhoea. Other causes included child being bewitched, teething, improper foods and cold weather. A total of 19 causes was identified.

(5) Diarrhoea prevention and treatment are traditionally very different from that offered by the health services. To prevent diarrhoea, especially severe diarrhoea associated with dehydration, many mothers mentioned the importance of visiting a traditional healer as soon as the child was born in order for the child to receive special protection. With regard to treatment, traditional herbal teas are usually given first and may remain the only treatment as only 4% of families regularly keep ORS packets at home and as considerable difficulties have been reported with preparation of sugar salt solutions (MOH/MLGL 1991).

The quantitative data were used to describe the socioeconomic situation in the community, to quantify indicators of hygiene behaviour and to relate these variables to the incidence of diarrhoea. In the 116 families taking part in the study there were 208 children under the age of 6 years.

The anthropometric measurements were expressed in Z-scores which express deviation from the reference median in terms of standard deviations. The mean Z-score for weight for age was −0.69 (s.d. 1.41, n=207) and for weight for height 0.04 (s.d. 1.3, n=204). The mean Z-score for height for age was −1.17 (s.d. 1.35, n=202). The standard cut-off point of −2 s.d. was used and 24.3% of the children fell below this for height for age. This population therefore appears to be stunted, indicating poor overall social conditions (WHO Working Group 1986).

Table 3 Mean episodes of diarrhoea by age of child

Age (months)	Mean episodes (s.d.)
0–6 (n=17)	1.7 (2.0)
7–12 (n=9)	1.4 (1.0)
13–18 (n=20)	1.1 (1.5)
19–24 (n=18)	1.1 (1.1)
25–36 (n=23)	0.7 (1.3)
>37 (n=57)	0.5 (1.0)

Mothers recorded diarrhoea on a daily basis for a total of 70 days. If the mother was not present the main care-giver filled out the form. Of the 208 children taking part in the study, 64 had more than 15 days of data missing and were therefore excluded from the analysis, leaving 144 children with 15 days or less of missing data. The mean number of days with any diarrhoea was 3.1 (s.d. 5.6, n=144); for episodes of diarrhoea the mean was 0.9 (s.d. 1.3, n=144). An episode was defined as days with diarrhoea separated by at least 3 diarrhoea-free days. Diarrhoea morbidity was monitored for a short period only in this study. It was felt to be a priority to monitor morbidity during the time of sample collection in order to compare it with the hygiene practices which occurred at the same time of year. In order to determine the mean number of days and episodes of diarrhoea per annum, morbidity would need to be measured for a longer time period as seasonal variations are common in many countries.

It was decided to combine days of diarrhoea with and without blood for the purpose of analysis as both are spread by the faecal–oral route. They were separated on the diarrhoea morbidity form in order to give an indication of the extent of the problem of bloody diarrhoea, which is associated with dysentery. Table 3 shows a breakdown of episodes of diarrhoea by age. Children under 1 year of age had the most diarrhoea, children over 3 years the least. Morbidity rates are usually found to be highest in the 6–11-month age group (Snyder & Merson 1982). The high morbidity in the under 6-month-old children in this study may be due to the popularity

Table 4 Hygiene observations

Possession of toilet (n=108)	
No toilet	53 (48)
Toilet in good condition	32 (58)
Toilet dirty or not in use	23 (42)
Animals in or near the cooking area (n=110)	51 (46)
Faeces in the compound (n=110)	36 (33)
Condition of the compound (n=110)	
Much debris and not swept	3 (3)
Some debris not swept	35 (32)
Partially swept	55 (50)
Well swept with no debris	17 (15)

Values in parentheses are percentages.

of bottle feeding in this community as well as the use of herbal teas and other fluids given to breast-fed infants.

Many families in both villages were economically deprived with no cattle or other livestock. They did not grow enough crops to feed themselves and many did not have a wage-earner or a source of remittance. Water was usually clean at source but often contaminated after storage. The hygiene observations are presented in Table 4 and results of the bacteriological samples in Table 5. No relationship was found between fingertip contamination and immediate prior activity.

Socioeconomic, water, sanitation and hygiene variables were compared with diarrhoea morbidity. Of the socioeconomic variables, only cattle possession was found to be associated with diarrhoea so that families owning 11 or more cattle had fewer days with diarrhoea (Kruskal-Wallis H=7.77, P=0.02).

The individual hygiene indicators (faeces in compound, etc.) were not found to be associated with diarrhoea, nor were positive bacteriological samples. A hygiene index was developed as during the spot check observations it appeared as though certain behaviours clustered, so that families with one or two indicators seemed to have others. This index combined compound condition; plate, cloth and care-giver fingertip counts; distance to water source; toilet possession; animals in the kitchen; and faeces in the compound. The scoring was as follows: compound condition 1 worst to 4 best; eating plate, cloth and fingertip counts positive 1, negative 2; water source distance furthest 1 to closest 4; no toilet, animals in the kitchen, faeces in the compound yes 1, no 2. The highest score possible was 20 (good hygiene) and the lowest 8 (poor hygiene). The scores were divided into 4 groups with half below and half above the median and the lowest quarter below the 25th percentile and the highest quarter above the 75th percentile. Children from families with poor hygiene conditions had more diarrhoea than children from families with good levels of hygiene (Kruskal-Wallis H=17.9, d.f.=3, P=0.0005).

Discussion

Integrating several types of methods provided a well rounded picture of what, when and why specific hygiene behaviours occur. Qualitative data, including family profiles, provide the cultural context. It is unique to this community and helps to answer the 'why' questions associated with hygiene behaviour. Quantitative data make it possible to move from this private experience into the wider area of public knowledge. Including quantitative data permits generalizations and comparisons with data from other studies.

Data collection methods not used in this study included structured observations, even though they can be very useful in quantifying data for statistical purposes. They were not used because they are extremely time consuming and require skilled local observers. More research is also needed into the length and frequency of structured observations due to variations in hygiene behaviour (Curtis *et al.* 1993). Handwashing, for example, may take place infrequently in some cultures so that even during many hours of observation it may not occur. Questionnaires were not used to record attitude or practice of hygiene behaviours because of inaccuracies associated with them. Several studies have highlighted the danger of over-reporting 'good' behaviours (Stanton *et al.* 1987, Curtis *et al.* 1993).

The hygiene index was not subject to more complex statistical manipulation of the data such as multivariate analysis due to the small sample size and the highly skewed nature of the diarrhoea morbidity data. This finding must be interpreted with caution because of the subjective nature of calculating indices.

Table 5 Presumptive faecal coliforms isolated from samples

	Positive		Negative	
	n	(%)	*n*	(%)
Cloth (n=98)	28	(29)	70	(71)
Plate (n=109)	34	(31)	75	(69)
Fingertips of care-givers (n=108)	19	(18)	89	(82)
Fingertips of children (n=170)	34	(20)	136	(80)
Stored drinking water				
Mean presumptive faecal coliforms/100 ml water	73.67 (s.d. 235.69, n=102)			

However, it is possible that certain hygiene behaviours occur together and that they influence diarrhoea morbidity. This relationship could be explored in a larger study.

Traditional beliefs influence hygiene behaviours to a great extent and it is important to understand them before initiating a health education programme. Our small sample size did not allow us to draw definite conclusions about the relationship between hygiene behaviours and the incidence or prevalence of diarrhoea morbidity, but it did provide a foundation for larger epidemiological studies. This combination of low-cost methods was an effective and feasible way to obtain useful information on which to base both health education programmes and hygiene interventions, and well illustrates the need to use a variety of methods for community studies. The use of any single type of method can distort the conclusions of a study by producing a premature focusing of the results. Our findings were presented to the Government of Botswana with the understanding that they would be included in hygiene education programmes and form the basis for future studies.

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