Water Handling And Hygiene Practices On The Transmission Of Diarrhoeal Diseases And Soil Transmitted Helminthic Infections In Communities In Rural Ghana

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Abstract
In Ghana, diarrhoeal diseases have been identified as the second commonest health problem treated in outpatient clinics. In this study, the relevance of water handling and hygienic practices on the transmission of diarrhoeal diseases and soil-transmitted helminthic infections in three communities in Ghana was evaluated. Specifically, the research looked at physico-chemical qualities of household water, the incidence of diarrhoeal diseases and soil-transmitted helminthic infections. Thirty households were selected by the systematic random sampling technique from the three communities namely Mayera, Ashongman village and Tetegu. Within each household, domestic water was collected and transported to the laboratory for physico-chemical testing. Standardized questionnaires were also administered. The questionnaires addressed issues such as water storage, treatment and hygienic practices among households. The incidence of diarrhoeal diseases and soil transmitted helminthic (STH) infections among households were also assessed. The commonest water sources included pipe-borne water, borehole, rainwater and water from rivers. Most households in the three communities did not treat their water before use. The commonest water storage containers included barrels without lids, pots and plastic containers. There was no significant correlation between STH and diarrhoeal diseases at both Mayera and the Ashongman communities (R=0.279, p=0.136 for Mayera; R=0.311, p=0.094 for Ashongman). However, there existed a weak significantly positive correlation between the incidences of diarrhoeal diseases and the incidence of STH at the Tetegu community (R=0.384, p=0.036). Health education in the aspect of proper hand washing with soap under running water should be intensified in the three communities.
Keywords: diarrhoeal disease, water handling, hygiene, soil transmitted helminth, water quality

1. Introduction

Diarrhoeal diseases occur world-wide and cause 4% of all deaths and 5% of health loss to disability (WHO 2002). The World Health Organization (WHO) estimates that there are 0.75 cases of diarrhoeal diseases per person worldwide every year. This rate varies between regions, sub-Saharan Africa having the highest rate of 1.29 cases per person annually (Hutton & Haller 2004). It is most commonly caused by gastrointestinal infections which kill around 2.2 million people globally each year, mostly children in developing countries (WHO 2002). It is estimated that 6,000 children die every day from diarrhoeal diseases alone and a large proportion of diarrhoeal disease in the developing world are due to poor water, sanitation and hygiene (WHO/UNICEF 2006).

In Ghana, diarrhoeal diseases have been identified as the second commonest health problem treated in outpatient clinics (Kanton 2007). Statistics from the Ministry of Health indicate that diarrhoeal diseases account for 84, 000 deaths annually in Ghana, with 25% being children under five years (Ghana News Agency 2003).

Hygienic interventions including hygiene education and promotion of hand washing with soap can lead to a reduction of diarrhoeal disease cases by up to 45%. Improvements in drinking-water quality through household water treatment, such as chlorination at point of use, can lead to a reduction of diarrhoeal disease episodes by between 35% and 39% (Prüss, *et al.* 2004).

The health impacts from the use of unsafe water, poor sanitation and poor hygienic practices are mainly preventable through investment in appropriate infrastructure and implementation of effective policies. For instance, water supply, sanitation and hygiene interventions can reduce water-related diarrhoeal morbidity in developing countries by up to 25%, 32% and 45%, respectively (OECD 2007).

As simple as hand washing may seem, it is one of the most important factors in stopping the spread of germs and staying healthy. Unwashed hands can accelerate the spread of bacteria, parasites, and viruses that are transmitted from human and animal faeces or the environment. Washing hands after using the bathroom, before and after preparing and eating food, whenever hands are visibly soiled, and more frequently during times of

illness can help stop the spread of disease from person to person.
These diseases are infectious, which means that they can spread from one person to another. High standards of hygiene and sanitation are needed to stop such diseases from spreading (Cutting 1991).
Most studies examining the role of water, sanitation and hygiene in disease transmission have been interventionist looking at changes in water supply, excreta disposal or hygienic practices, and assessing the effects on diarrhoea morbidity or mortality rates generally in young children (Prüss-Űstun *et al*. 2004).
This study therefore sought as its objective to assess the influence of water use and hygienic practices on the transmission of diarrhoeal diseases and soil-transmitted helminthic infections in three communities in rural Ghana. The study also assessed physico-chemical quality of water and the incidence of diarrhoeal diseases and soil-transmitted helminthic infections.

2. Methodology

2.1 Study site

The study was done in three communities drawn from the Ga municipalities of Ghana namely Mayera community (from Ga West Municipality), Ashongman community (from Ga East Municipality) and Tetegu (from Ga South Municipality). Mayera (5° 029' -5° 048'N 0° 008' -0° 030'W). The community lies wholly in the Coastal Savanna Agro-ecological Zone. The Mayera community has a major river called the Nsaki River which serves as a major source of water for most households in this community. Ashongman community (5° 44' 17'' N 0° 11' 42° W) covers a land area of about 166 sq km. The population is concentrated mainly along the urban and the peri-urban areas of the municipality. The urban/peri-urban population constitutes about 73% with the remaining 27% residing in the rural portion towards the Akwapim hills. Ashongman village falls in the Savannah agro-ecological zone. The community has had numerous issues with the provision of fresh water. On the issue of sanitation in the municipality, there is an estimated 31% coverage for households. Tetegu is also a community of the Ga South municipality. The municipality shares boundaries with Awutu-Senya East District to the West, Accra Metropolitan to the East, Ga West Municipal to the North and to the South with the Gulf of Guinea. Most of the inhabitants are farmers and fishermen.

2.2 Household selection

Thirty households were selected from each community. The inclusion criteria for households were restricted to households having at least one child less than five years. A household is defined in this context as persons who have eaten from the same pot and slept under the same roof for at least five days of the week. The systematic random sampling technique was employed. The households were arranged serially and selection was based on a random number. The researchers then picked every third household. In the case where a household had no child under five years, the researchers moved to the next household. The procedure was followed until the thirtieth household was reached.

2.3 Data collection and analysis

Standardized questionnaires were administered to the various households in the three communities. The questionnaires addressed issues such as water infrastructure, sanitation, water storage and treatment and hygienic practices among households. The incidence of diarrhoeal diseases and soil transmitted helminthic infections among households were also assessed. Water handling refers to the steps taken by households to ensure water management which include how water is collected, transported, stored and used. Water handling practices include the various processes that water passes through from the source to the exposed individuals.

2.4 Water quality test

Water was collected from the various households in the three clusters and transported to the Volta Basin Research Project's (VBRP) laboratory (University of Ghana) for analysis. The tests conducted included both physico-chemical and bacteriological analysis of the water. The following water quality parameters were measured and recorded: pH, conductivity, Total Dissolved Solids and Turbidity.

2.4.1 Physico-Chemical Analysis

2.4.1.1 Conductivity and Total Dissolved Solids

The Conductivity and Total Dissolved Solids were measured with a conductivity meter ELE Int. (2006). This composite meter allowed readings to be taken fast and thereby eliminates errors due to temporal changes. These two parameters were recorded concurrently.

2.4.1.2 Hydrogen ion concentration (pH)

This was measured using a portable HACH pH meter (Model EC 10, HACH Company Ltd, 1996). Procedure Manual. USA. This was measured by direct reading.

2.4.1.3 Turbidity

Turbidity is caused by the presence of suspended matter, such as clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms in water. The turbidity test measures an optical property of the water sample which result from the scattering and absorbing of light by the particulate matter in the water. The amount of turbidity recorded is dependent on such variables as size, shape and refractive properties of the particles. The turbidity was directly determined using a Turbidimeter Model 2100P (HACH Company Ltd, 1996). Procedure Manual. USA. Twenty five millilitres of sample was measured and placed into the cell holder, each measurement preceded by a calibration.

2.4.1.4 Nitrates

The nitrate level in each sample was measured using Nitrate Powder Pillows in a direct reading HACH Spectrophotometer Model DR. 2000. HACH Company Ltd. (1996). Procedure Manual. USA. Twenty five millilitres of the sample was measured into the sample cell. One Nitraver 5 Nitrate Reagent Powder Pillow was added to the sample and vigorously shaken for 1 minute. The solution was allowed to react for five minutes after which another cell was filled with 25ml of only the sample (blank). After the five- minute reaction period, the blank sample was placed in the spectrophotometer for calibration, and the prepared sample placed into the cell holder to determine the Nitrate concentration at 500nm.

2.4.1.5 Phosphate – Phosphorus

The phosphate level was measured using Phosphate Powder Pillows in a direct reading HACH Spectrophotometer Model DR 2000 HACH Company Ltd. (1996). Procedure Manual. USA. The sample cell was filled with 25ml of the water sample and one Phos Ver 3 Phosphate Powder Pillow was added to the cell content (the prepared sample) and swirled immediately to mix, allowing a two-minute reaction period. Another sample cell (the blank) was filled with 25ml of sample and placed into the cell holder to calibrate it. After the calibration, the prepared sample was placed in the cell holder and the level of phosphorus determined at 890 nm.

3.Results

3.1 Treatment of water after collection

At the Mayera community, all the 30 households sampled did not treat their water before drinking (Table 1). The Tetegu community had 28 out of 30 households (93%) not treating their water before drinking. Two respondents (6%) treated their water before drinking. At the Ashongman village, 26 (86%) out of 30 households did not treat their water before drinking. Two households (6%) treated their water by boiling before drinking and 2 households (6%) also treated their water with alum before drinking (Table 1).

3.2 Storage of water after collection

All the 30 households sampled at the Mayera community stored their water in one way or the other (Table 2). Respondents from 15 households stored their water in barrels while respondents from 3 households stored their water in gallons. Plastic containers without covers were used by respondents from four households to store their water. Also, respondents from eight households stored their water in plastic containers with covers (Table 2).

Barrels were the most-used medium to store water at the Tetegu community as respondents from 11 households used barrels. Plastic containers were used by respondents from eight households to store water. Respondents from two households used plastic containers without covers to store water. Respondents from eight households also used plastic containers with covers. Also, respondent from one household used clay pots to store water (Table 2)

At the Ashongman village, respondents from 11 households used gallons; respondents from eight households used plastic containers with covers to store their water. Also, respondents from seven households at the Ashongman village stored their water in barrels. Respondents from four households used plastic containers without covers to store their water (Table 2).

Table 1: Treatment of water before drinking and the mode of treatment by the respective communities.

Community				Mode of treatment				
				Boiling	Alum	No treatment	Others	Total
Mayera	Treatment of water before drinking	No	Count			30		30
			% of Total			100.0%		100.0%
	Total		Count			30		30
			% of Total			100.0%		100.0%
Tetegu	Treatment of water before drinking	Yes	Count			1	1	2
			% of Total			3.3%	3.3%	6.7%
		No	Count			28	0	28
			% of Total			93.3%	.0%	93.3%
	Total		Count			29	1	30
			% of Total			96.7%	3.3%	100.0%
Ashongman Village	Treatment of water before drinking	Yes	Count	2	2	0		4
			% of Total	6.7%	6.7%	.0%		13.3%
		No	Count	0	0	26		26
			% of Total	.0%	.0%	86.7%		86.7%
	Total		Count	2	2	26		30
			% of Total	6.7%	6.7%	86.7%		100.0%

Table 2: Medium of Domestic water storage by the three communities

			Medium of Domestic water storage					
			Barrel	Gallons	Plastic containers without covers	Plastic containers with covers	Pots	Total
Community	Mayera	Count	15	3	4	8	0	30
		% of Total	16.7%	3.3%	4.4%	8.9%	.0%	33.3%
	Tetegu	Count	11	8	2	8	1	30
		% of Total	12.2%	8.9%	2.2%	8.9%	1.1%	33.3%
	Ashongman Village	Count	7	11	4	8	0	30
		% of Total	7.8%	12.2%	4.4%	8.9%	.0%	33.3%
Total		Count	33	22	10	24	1	90
		% of Total	36.7%	24.4%	11.1%	26.7%	1.1%	100.0%

3.3 Handwashing with soap and the incidence of diarrhoeal diseases

At the Mayera community, respondents from 18 households (60%) out of the thirty households washed their hands with soap after defecation out of which eight reported diarrhoeal diseases (Table 3). Out of the respondents from 12 households who did not wash their hands with soap after defecation, eight households reported the incidence of diarrhoeal diseases whereas respondents from four households did not have diarrhoeal diseases.

At the Tetegu community, respondents from 18 households (60%) washed their hands with soap after defecation out of which respondents from ten households reported the incidence of diarrhoeal diseases. Respondents from 12 households did not wash their hands with soap after defecation. Also, respondents from seven households who did not wash their hands with soap reported diarrhoeal diseases but respondents from five households who did not wash their hands with soap did not report diarrhoeal diseases (Table 3).

At the Ashongman village, respondents from 21 households out of the 30 households sampled washed their hands with soap after defecation. Out of this, respondents from 17 households did not report any diarrhoeal diseases but respondents from four households reported the incidence of diarrhoeal diseases. Out of the respondents from nine households who did not wash their hands with soap after defecation, respondents from seven households did not report diarrhoeal diseases but respondents from two households reported the incidence of diarrhoeal diseases (Table 3).

Table 3: Hand washing with soap and the incidence of diarrhoeal diseases in the three communities.

Community				Incidence of diarrhoeal diseases		Total
				Yes	No	
Mayera	Washing hands with soap after defecation	yes	Count	8	10	18
			% of Total	26.7%	33.3%	60.0%
		No	Count	8	4	12
			% of Total	26.7%	13.3%	40.0%
	Total		Count	16	14	30
			% of Total	53.3%	46.7%	100.0%
Tetegu	Washing hands with soap after defecation	yes	Count	10	8	18
			% of Total	33.3%	26.7%	60.0%
		No	Count	7	5	12
			% of Total	23.3%	16.7%	40.0%
	Total		Count	17	13	30
			% of Total	56.7%	43.3%	100.0%
Ashongman Village	Washing hands with soap after defecation	yes	Count	4	17	21
			% of Total	13.3%	56.7%	70.0%
		No	Count	2	7	9
			% of Total	6.7%	23.3%	30.0%
	Total		Count	6	24	30
			% of Total	20.0%	80.0%	100.0%

3.4 Disposal of faecal matter from children and the incidence of diarrhoeal diseases in the three communities.

At the Mayera community, 13 households disposed of faecal matter from their children into the bush, out of which nine (30%) reported the incidence of diarrhoeal diseases (Table 4). Two households (6%) also stated that

their children defecated openly after which they covered it (CAT method). This household did not report diarrhoeal diseases. One household also disposed of faecal matter from their children together with their household refuse. This household reported the incidence of diarrhoeal diseases. One household disposed of the faecal matter from their children into the public toilet and this household reported the incidence of diarrhoeal diseases. Twelve households representing 40% did not have children (Table 4).
At the Tetegu community, 20 households (66%) disposed of the faecal matter of their children into the bush, out of which 11 households reported the incidence of diarrhoeal diseases. One household also reported the incidence of diarrhoeal diseases and this household disposed of their children's faeces together with their household refuse.
At the Ashongman village, the commonest mode of disposal of faecal matter from children was the bush (Table 6). Eight households (26%) disposed of faecal matter from their children into the bush. Out of this, two households reported the incidence of diarrhoeal diseases. Four households (13%) who used the CAT method of defecation and also four other households (13%) who disposed of faecal matter from their children into the pit latrine did not report the incidence of diarrhoeal diseases. Three households (10%) disposed of their children's faeces together with their household refuse, out of which one household reported the incidence of diarrhoeal diseases.

Table 4: Disposal of faecal matter from children and the incidence of diarrhoeal diseases in the three communities.

Community				Incidence of diarrhoeal diseases		Total
				Yes	No	
Mayera	Disposal of children's faeces	Throwing it in a bush	Count	9	4	13
			% of Total	30.0%	13.3%	43.3%
		CAT method	Count	0	2	2
			% of Total	0.0%	6.7%	6.7%
		N/A	Count	5	7	12
			% of Total	16.7%	23.3%	40.0%
		throwing it together with refuse dump	Count	1	0	1
			% of Total	3.3%	0.0%	3.3%
		Throwing it into the pit latrine	Count	0	1	1
			% of Total	0.0%	3.3%	3.3%
		throwing it into the KVIP	Count	1	0	1
			% of Total	3.3%	0.0%	3.3%
	Total		Count	16	14	30

			% of Total	53.3%	46.7%	100.0%
Tetegu	Disposal of children's faeces	Throwing it in a bush	Count	11	9	20
			% of Total	36.7%	30.0%	66.7%
		N/A	Count	5	4	9
			% of Total	16.7%	13.3%	30.0%
		throwing it together with refuse dump	Count	1	0	1
			% of Total	3.3%	0.0%	3.3%
	Total		Count	17	13	30
			% of Total	56.7%	43.3%	100.0%
Ashongman Village	Disposal of children's faeces	Throwing it in a bush	Count	2	6	8
			% of Total	6.7%	20.0%	26.7%
		CAT method	Count	0	4	4
			% of Total	0.0%	13.3%	13.3%
		N/A	Count	3	8	11
			% of Total	10.0%	26.7%	36.7%
		throwing it together with refuse dump	Count	1	2	3
			% of Total	3.3%	6.7%	10.0%
		Throwing it into the pit latrine	Count	0	4	4
			% of Total	0.0%	13.3%	13.3%
	Total		Count	6	24	30
			% of Total	20.0%	80.0%	100.0%

3.5 Incidence of STH against incidence of Diarrhoeal Diseases in the three communities.

At the Mayera community, out of the inhabitants of 13 households (43%) who reported the incidence of helminth infection, the inhabitants of nine households (30%) also reported the incidence of diarrhoeal diseases. Out of the inhabitants of 17 households (56%) who did not report any incidence of helminth infection, the inhabitants of 10 households (33%) did not also report diarrhoeal diseases (Table 5).

At the Tetegu community, there appeared to be a strong correlation between diarrhoeal diseases and the incidence of STH. Out of the respondents from 18 households (60%) who reported the incidence of STH, respondents from 13 households (43%) also reported the incidence of diarrhoeal diseases. Inhabitants of eight households (26%) out of 12 households (40%) who did not have STH also did not have diarrhoeal diseases.

At the Ashongman village, respondents from 11 households (36%) reported the incidence of STH, out of which respondents from four households (13%) also reported diarrhoeal diseases. Also, respondents from 19 households (63%) did not report STH, out of which respondents from 17 households (56%) did not have diarrhoeal diseases.

Table 5: Incidence of STH against incidence of Diarrhoeal Diseases in the three communities.

Community				Incidence of diarrhoeal diseases		Total
				Yes	No	
Mayera	Incidence of STH	Yes	Count	9	4	13
			% of Total	30.0%	13.3%	43.3%
		No	Count	7	10	17
			% of Total	23.3%	33.3%	56.7%
	Total		Count	16	14	30
			% of Total	53.3%	46.7%	100.0%
Tetegu	Incidence of STH	Yes	Count	13	5	18
			% of Total	43.3%	16.7%	60.0%
		No	Count	4	8	12
			% of Total	13.3%	26.7%	40.0%
	Total		Count	17	13	30
			% of Total	56.7%	43.3%	100.0%
Ashongman Village	Incidence of STH	Yes	Count	4	7	11
			% of Total	13.3%	23.3%	36.7%
		No	Count	2	17	19
			% of Total	6.7%	56.7%	63.3%
	Total		Count	6	24	30
			% of Total	20.0%	80.0%	100.0%

3.6 Correlations between the incidences of Diarrhoeal diseases and Soil- transmitted helminth infections in the communities.

There was no significant correlation between soil-transmitted helminth infections and diarrhoeal diseases at both Mayera and the Ashongman communities ($p>0.05$). However, at the Tetegu community, there was a significant correlation between soil-transmitted helminth infections and diarrhoeal diseases ($p<0.05$). There existed a weak positive significant correlation between the incidence of diarrhoeal diseases and the incidence of soil-transmitted helminth infections.

Table 6: Correlations between the incidences of Diarrhoeal diseases and Soil- transmitted helminth infections in the communities.

Symmetric Measures						
Community			Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Mayera	Interval by Interval	Pearson's R	0.279	0.174	1.535	0.136
	Ordinal by Ordinal	Spearman Correlation	0.279	0.174	1.535	0.136
	N of Valid Cases		30			
Tetegu	Interval by Interval	Pearson's R	0.384	0.170	2.204	0.036
	Ordinal by Ordinal	Spearman Correlation	0.384	0.170	2.204	0.036
	N of Valid Cases		30			
Ashongman Village	Interval by Interval	Pearson's R	0.311	0.181	1.733	0.094
	Ordinal by Ordinal	Spearman Correlation	0.311	0.181	1.733	0.094
	N of Valid Cases		30			

4. Discussion

4.1 Hygienic Practices and Incidence of Diarrhoeal diseases and STH

Hand washing with soap especially after defecation, has been identified as an important hygienic practice which can lead to a reduction of diarrhoeal diseases and STH (Curtis and Cairncross 2003). Fewtrell *et al.* (2005) also found hand washing with soap to reduce diarrhoeal morbidity by 44%. At the Tetegu community, there was a reason for concern because 10 out of 18 households who washed their hands with soap reported diarrhoeal diseases. This may mean that diarrhoeal diseases may be caused by other routes such as water quality and sanitation infrastructure other than the hygiene interventions in this community. The other two communities reported the normal thing to be expected when people washed their hands. The more households washed their hands with soap after defecation, the less they had diarrhoeal diseases.

Disposal of faecal matter of children is a major concern for diarrhoeal disease incidence and STH. There was a high incidence of diarrhoeal disease among households who disposed of their children's faeces in the bush at the Mayera community. This was due to the fact that these children were not allowed to use the main public latrine. This was the same scenario at the Tetegu community, where as many as 55% reported of diarrhoeal disease who disposed of their children's faecal matter into the bush. The community had no toilet facility, so most households resorted to open defecation which can lead to a high faecal-oral load in the environment. Sanitation is likely to be effective in controlling worm infections and diarrhoeal diseases. In the three communities, sanitation is only thought of in adult terms, but children who bear the highest brunt for diarrhoeal diseases and STH and are also the most likely source of infection were mostly neglected, thus leading to the trends observed in this study. The safe disposal of faecal matter of children is thus of critical importance.

4.2 Water facility used and the incidence of diarrhoeal diseases

The fact that water, sanitation and hygiene contribute to most diseases, especially diarrhoeal diseases and soil-transmitted helminth (STH) infections cannot be over-emphasized.

Diarrhoeal diseases attributed to poor water supply, sanitation and hygiene account for 1.73 million deaths each year and contribute over 54 million Disability Adjusted Life Years (DALY), a total equivalent to 3.7% of the global burden of disease (WHO 2002). DALY is the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability. This places diarrhoeal diseases due to unsafe water, sanitation and hygiene as the sixth highest burden on a global scale, a health burden that is largely preventable (WHO 2002).

Also, a knowledge of the transmission routes of soil-transmitted helminth infections shows that they are wholly attributable to water, sanitation and hygiene (Fewtrell *et al*. 2005).

In the study area, the commonest water facilities used were public stand-pipe (by Ashongman and Tetegu) and river (by Mayera). Most of the households resorted to the use of these water facilities because of their easy accessibility. Reasonable access was defined as the availability of at least 20 litres per capita per day from a source within one kilometer of the user's dwelling (WHO/UNICEF/WSSCC 2000).

World Health Organization recognizes public stand-pipes as improved water facilities and recognizes unprotected wells and springs (where the river fell) as unimproved water facility (WHO/UNICEF/WSSCC 2000).

The Mayera community was served with three boreholes (considered as improved water facility). However, most of the respondents did not use this facility but resorted to the Nsaki river because according to them, the water from the boreholes was very salty. A measure of the total dissolved solids and conductivity measures of the borehole (which have impact on water quality) recorded 1019 mg/L and 612 μS/cm, respectively. These values were higher than the recommended WHO standards for total dissolved solids (1000mg/L) and conductivity (400 μS/cm). This may explain why the people resorted to the Nsaki river which had a conductivity measure of 58.1 μS/cm and total dissolved solids measure of 35 mg/L.

No significant association between the water facility used and the incidence of diarrhoeal diseases in the three clusters can be explained by the fact that, most diarrhoeal diseases are not only waterborne but can be transmitted from person to person on hands, food and other formites because of poor hygiene. Fewtrell *et al.* (2005) identified a 25% reduction in diarrhoeal morbidity by water supply intervention. One of the reasons why water supply intervention can still be quite effective is because accessible, plentiful supplies of water facilitate better hygienic practices and more hand washing with soap in particular (Curtis and Cairncross 2000). This may be so because, in enumerating diseases caused by faecal-oral routes such as diarrhoeal diseases and STH, isolation of a single intervention may result in a negligible effect on disease incidences. For example, in the developed countries with improved water supplies, diarrhoea is still endemic (Roy *et al*. 2006; Colford *et al.* 2006). It is therefore important to consider faecal-oral transmission routes as interrelated and intervention measures must aim at all risk factors of water, sanitation and hygienic practices.

5. Conclusion

Water usage and hygienic practices profoundly impact on the incidence of diarrhoeal diseases and soil-transmitted helminthic infections in the various households.

There was no significant correlation between STH and diarrhoeal diseases at both Mayera and the Ashongman communities (R=0.279, p=0.136 for Mayera; R=0.311, p=0.094 for Ashongman). However, there existed a weak significantly positive correlation between the incidences of diarrhoeal diseases and the incidence of STH at the Tetegu community (R=0.384, p=0.036).

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