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Environmental Sanitation Attitudes in Buruli Ulcer Endemic Communities and its Potential Impact on MU Infections in the Asanti Akim North District, Ghana

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ABSTRACT

Morbidity due to Buruli Ulcer (BU) disease, a cutaneous infection caused by *Mycobacterium ulcerans* (MU), has been increasingly recognized in rural West Africa. The source and mode of transmission remain unknown. Although the disease has received public health attention, its impact on individuals in endemic communities with respect to attitudes towards behavioural sanitation at the community level is yet to be fully explored. In this study, a survey was conducted to access the attitude of behavioural sanitation among respondents of BU communities in relation to MU infections in the Asanti Akim North district, Ghana. Data from these were compared with respondents from their non endemic controls within the same district. Analysis of the results showed that, a greater proportions of BU endemic respondents had knowledge of BU patients (88.57%) compared to the non endemic control (15.71%) ($p<0.0001$; OR = 41.57). However, they had no idea how they got infected. The study also showed that, majority of respondents (17.14%) in BU endemic communities were themselves past patients of the disease compared to their control (9.09%) ($p = 0.0014$; OR = 14.28). Environmental hygiene related behaviours of the respondents based on endemicity were also assessed and analysis of the result showed that, a fewer proportions of BU endemic respondents (28.57%) neglected basic sanitation practices compared to their non-endemic counterparts (80.0%) ($p<0.0001$). The study has shown that, respondents of BU endemic dwellers were not bothered by environmental behavioural hygienic practices and this could possibly exposed BU endemic dwellers to pathogenic assault of MU.

Key words: Sanitation, buruli ulcer, endemic, environmental, *Mycobacterium ulcerans*

INTRODUCTION

Morbidity due to Buruli Ulcer disease (BU), a cutaneous infection caused by *Mycobacterium ulcerans*, has been increasingly recognized in rural West Africa. The source and mode of transmission remain unknown (Raghunathan *et al*., 2005). The main burden of the disease falls on children living in sub-Saharan Africa, but healthy people of all ages, races and

socioeconomic classes are susceptible (Gyasi *et al.*, 2013). Primary risk factors for the development of Buruli Ulcer apart from proximity to slow moving water and exposure to wetlands are the socioeconomic status of disease endemic dwellers (Gyasi *et al.*, 2012).

Although, BU is usually regarded as a disease of subtropical climates, a slowly increasing number of cases have been recorded in Temperate South Eastern Australia for some years now (Fyfe *et al.*, 2010). The typical presentation with indolent, painless, undermined ulcers is easily diagnosed, but atypical forms can be confounded with other causes of skin ulcers. Unless super-infection has occurred, patients usually do not show signs of systemic inflammatory response (Stienstra *et al.*, 2001). Surgical management is more complicated when the disease has advanced and many patients in endemic regions present late because they live in rural areas and their families cannot afford the time to attend hospital in addition to the fear of surgery (Aujoulat *et al.*, 1996). Treatment of advanced disease is often difficult and complicated by persistence and relapse (Benbow *et al.*, 2008). The stigma of the disease is huge and is strongly associated with the mysterious nature of the condition (Stienstra *et al.*, 2001).

Household demand for improved sanitation in developing countries has been an important social and behavioural process with implications for public health, sanitation policy and planning as well as sanitation design (Mandal, 2008). These depend on various factors that include hygiene status of the people, types of resources available, socioeconomic development and cultural factors related to environmental sanitation among many others. Ghana is still lagging far behind many countries in the field of environmental sanitation (Yidana and Koffie, 2013). The potential of these environmental sanitation neglect as a vehicle for disease development cannot be ignored. Improvement in sanitation therefore requires newer strategies and targeted interventions with follow-up evaluation to control disease transmission (Kumar *et al.*, 2011).

These priorities are particularly important because of issues of environment-related health problems which include Buruli Ulcer among many others living in a tropical region like Ghana (Whittington *et al.*, 1993). Asanti Akim North District, a BU endemic community is situated within the semi-equatorial belt of Ghana. Research has shown that, Asanti Akim North is prevalent for most sanitation related diseases and this calls for an urgent appropriate measures to be instituted to curb this challenge (Nkrumah and Nguah, 2011). Although the disease has received public health attention, its impact on individuals in endemic communities with respect to attitudes towards behavioural sanitation at the community level is yet to be fully explored. This study seeks to investigate the attitudes of behavioural sanitation and its possible impact on MU infection in Buruli Ulcer endemic communities of the Asanti Akim North district, Ghana.

MATERIALS AND METHODS

Study area and population: The Asante Akim North Municipal Assembly is one of the 30 Districts in the Ashanti Region. It was carved out of the erstwhile Asante Akim District Council in 1988 as part of the Ghana's Decentralization Process. It has Konongo-Odumase as its twin Capital Town. The Municipality is located in the eastern part of Ashanti Region and lies between latitude 60 30' North and 70 30' North and longitude 00 15' West and 10 20' West. It covers a land area of 1,160 sq. km with an estimated population of 142,434 for 2006 (projection from 2000 Population Census). The Municipality shares boundaries with Sekyere East on the north, Kwahu South on the East, Asante Akim South on the South and Ejisu-Juaben Municipal on the West.

There are 17 towns in this municipal and a population estimated to be 169,976 as at the 2010 census. Farming is the predominant major occupation among people comprising half of all

occupations. There are also significant number of people employed in trading (16.3%) and in vocational service activities and 15% of those working are also engaged in a minor occupation. The municipal lies within the semi-equatorial belt and is characterized by double rainfall maxima occurring in July and November.

Study design and communities: The study was a cross-sectional survey with Endemic verses Non endemic. The Endemic communities were: Siribuoso, Ananekrom and Dukusen while the non-endemic counterpart were Agogo, Pataban and Betenase.

Research methods: The study used combinations of desk studies, checklists and interviews, questionnaire administration as well as field observations. Interviews and Focus Group Discussions (FGD) were organized with key informants whiles households were interviewed using the household survey questionnaires to augment the data collection. The use of multiple complementary methods made it possible to triangulate and eliminating bias that could occur if using only one method (Adubofour *et al*., 2012). Heads of households who had stayed in the community for more than 4 years and were willing to participate in the study were interviewed during the household survey. Households which fell outside the aforementioned criteria were however excluded from the study. Asante Twi, the main local language in the Ashanti region was used for the interviews. The study was conducted between January and June 2012.

Interview and FGD with key informants: Interview and FGD's with key informants including the Assemblyman and unit committee members were organized. Relevant questions were asked to gather information regarding the general perception of BU and environmental sanitation. The meetings were recorded and later transcribed.

Respondents' survey: Structured questionnaires designed for respondent included both open-ended and closed questionnaires (Appendix 1). A total of 140 questionnaires were administered to respondents in BU endemic communities (70 questionnaires) and non endemic (70 questionnaires) communities on social demography, general perception of BU and attitudes towards environmental sanitation. These numbers were selected randomly taking into consideration, the approximate population size of the study communities (Lagardere, 2007).

Field observation: This study methodology involved a transect walk and visual inspection of household and community based attitudes towards the environmental sanitations practises and personal hygiene of the people. The transect walk and the visual inspection were carried out early in the mornings and late in the evenings when household members were at home. Bushes and some unapproved locations where some members of the community used as place of convenience were also observed.

Data analysis: The study was based on qualitative and quantitative methods of data analysis. Chi-square test was used to test for significance difference between categorical variables. Questionnaires were entered manually into Microsoft Excel 2007. Chi-square test was used to examine associations between dichotomous variables from respondents in endemic compared to the control (Gyasi *et al*., 2011). Two-tailed tests were used with $p<0.05$ considered significant (Odeyinka *et al*., 2007).

RESULTS

The study participants who responded to questionnaires from this survey consist of males and female, ranging between 5 to 90 years. Majority of these respondents had some form of basic education with farming as their main occupation as shown in Table 1. When social demographic data of answered questions were analysed based on endemicity, with respect to age, the study showed that, with the exception of age less than 20 years, none of the age categories differed significantly ($p>0.05$) (Table 1). There were about 2 times more respondents from this age category in BU endemic communities (11.43%) compared to the control (5.71%) (OR = 2.129). The non significant difference between respondents from BU endemic communities compared to their control counterpart ($p>0.05$) was also seen with marital status and educational level as shown in Table 1. With respect to occupation however, the study showed that, greater proportions of the respondents from the endemic communities (8%) were unemployed compared to their control and this was significant ($p = 0.0039$; OR = 19.18) (Table 1).

A comparative analysis of respondents' general perception of BU infections and its relation to the general knowledge of the disease was evenly distributed in both endemic and non endemic communities ($p>0.05$) as shown in Table 2. However, a greater proportions of BU endemic respondents had knowledge of BU patients i.e., 62 out of 70 (88.57%) compared to the controls, i.e.,

Table 1: Respondents demographic data stratified by location in the Asanti Akyim North district

Variables	(%) Total (140)	(%) Endemic (70)	(%) Non endemic (70)	p-value	Odds ratio (OR)
Age					
Less than 20	12(8.5714)	8(11.43)	4(5.71)	0.2272	2.1290
20-25	23(16.43)	13(18.6)	10(14.3)	0.4938	1.3680
26-30	31(22.14)	12(17.14)	19(27.14)	0.1542	0.5554
31-40	45(32.14)	22(31.43)	23(32.86)	0.8564	0.9366
Over 40	29(20.71)	15(21.43)	14(20.0)	0.8348	1.0910
Sex					
Male	76(54.23)	34(48.57)	42(60.0)	0.1747	0.6296
Female	64(45.71)	36(51.43)	28(40.0)	0.1747	1.5880
Marital status					
Married	93(66.43)	46(65.71)	47(67.14)	0.8580	0.9397
Single	32(22.86)	15(21.43)	17(24.29)	0.6873	0.8503
Divorced	6(4.29)	2(2.86)	4(5.71)	0.4040	0.4853
Separated	2(1.4286)	1(1.43)	1(1.43)	1.0000	1.0000
Widowed	7(5.0)	6(8.57)	1(1.43)	0.0525	6.4690
Educational level					
Primary	44(31.43)	25(35.71)	19(27.14)	0.2747	1.4910
Secondary	42(30.0)	15(21.43)	27(38.57)	0.0269	0.4343
Tertiary	3(2.14)	3(4.23)	0(0)	0.0800	7.3110
Never been to school	51(36.43)	27(38.57)	24(34.29)	0.5983	1.2030
Occupation					
Farmer	103(73.57)	48(68.57)	55(78.57)	0.1797	0.5950
Others	26(18.57)	12(17.14)	14(20.0)	0.6638	0.8276
Apprentice	3(2.14)	2(2.86)	1(1.42)	0.5595	2.0290
Unemployed	8(5.71)	8(11.43)	0(0)	0.0036	19.180

OR: Odds ratio, p: p-value, whiles all other parenthesis within the Table represent the various percentages. The endemic communities were: Siribuoso, Ananekrom and Dukusen while the non-endemic ones were Agogo, Pataban and Betenase

Table 2: A comparative analysis of perception of general knowledge of BU stratified by endemicity

Variables	(%) Total (140)	(%) Endemic (70)	(%) Non endemic (70)	p-value	Odds ratio (OR)
Do you know a disease called BU?					
Yes	117(83.57)	63(90.00)	54(77.14)	0.04010	2.66900
No	23(16.43)	7(10.00	7(10.00)	0.04010	0.37500
Do you know anyone suffering from BU?					
Yes	73(52.14)	62(88.57)	11(15.71)	<0.00010	41.57000
No	67(47.86)	8(11.43)	59(84.29)	<0.00010	0.02406
If yes how is he/she related to you?					
Self	13(9.29)	12(17.14)	1(9.09)	0.00140	14.28000
Sibling	15(10.71)	11(15.71)	4(36.36)	0.05580	3.07600
Parent	1(0.71)	0(0.00	1(9.09)	0.31560	0.32860
Spouse	3(2.14)	3(4.29)	0(0.00)	0.08000	7.31100
Children	20(14.30	20(28.57)	0(0.00)	1.00000	1.00000
Others	21(15.00	16(22.86)	5(45.45)	0.00920	3.85200
Don't remember	8(5.71)	8(11.42)	0(0.00)	1.00000	1.00000
Do you know how they were infected?					
Yes	10(7.14)	6(8.57)	4(5.71)	0.51160	1.54700
No	113(80.71)	59(84.29)	54(77.14)	0.28410	1.58900
Not applicable	17(12.12)	5(7.14)	12(17.14)	0.07010	0.37180
Was medical attention sought?					
Yes	67(47.86)	59(84.29)	8(11.43)	<0.00010	41.57000
No	5(3.57)	3(4.29)	2(2.86)	0.64880	1.52200
Don't know	68(48.57)	8(11.43)	60(85.71)	<0.00010	0.02150
If yes where?					
Agogo Presby Hospital	67(47.86)	6(8.57)	4(5.71)	<0.00010	32.76000
Other health care unit	5(3.57)	59(84.29)	54(77.14)	0.17190	4.18200
Don't know	68(48.57)	8(11.43)	12(17.14)	<0.00010	0.02150
Do you have direct contact with wetlands on your way to the farm?					
Yes	84(60.00	47(67.14)	37(52.86)	0.08450	1.82300
No	55(39.29)	23(32.86)	32(45.71)	0.11940	0.58110
Don't know	1(0.71)	0(0.00	1(1.43)	0.31560	0.32860
Does your daily activities makes you have direct contact with soils around wetlands?					
Yes	125(89.29)	61(87.14)	64(91.43)	0.41240	0.63540
No	13(9.29)	9(12.86)	4(5.71)	0.14540	2.43400
Don't know	2(1.43)	0(0.00	2(2.86)	0.15430	0.19430
If yes which one of the following fits?					
Weeds and water	103(73.57)	48(68.57)	55(78.57)	0.17970	0.59500
Washing cloths	37(26.43)	22(31.43)	15(21.42)	0.17970	1.68100
What kind of footwear do you wear to work?					
Wellington boots	32(22.86)	12(17.14)	20(28.57)	0.31030	3.09000
Slippers	95(67.86)	50(71.43)	45(64.29)	0.36560	1.38900
Wellington and Slippers	5(3.57)	3(4.29)	2(2.86)	0.64880	1.52200
Others	1(0.71)	1(1.43)	0(0.00)	0.31560	3.04300
Barefooted	7(5.00	4(5.71)	3(4.29)	0.69820	1.35400

OR: Odds ratio, p: p-value, whiles all other parenthesis within the Table represent the various percentages. The endemic communities were: Siribuoso, Ananekrom and Dukusen while the non-endemic ones were Agogo, Pataban and Betenase

11 out of 70 (15.71%) and this was significant ($p<0.0001$; OR = 41.57). The study also showed that, majority of respondents (17.14%) in BU endemic communities were themselves past patients of the

disease compared to their non-endemic counterpart (9.09%) and this was also statistically significant (p = 0.0014; OR = 14.28). Surprisingly, greater proportions of BU endemic dwellers (8.57%) had no idea how they were infected but sought medical attention from the Agogo Presbytharian Hospital, within the Asanti Akim North District, Ghana as shown in Table 2.

We sought to analyse the perception of environmental water contact and whether or not respondents engaged in chores that would necessitate bodily contact with water. Analysis of the results from these variables showed that, none of these constituted a significant risk with respect to endemicity (p>0.001) (Table 2). Socioeconomic status of respondents was also assessed as part of the study when participants were interviewed with respect the type of footware worn on the feet when going to the farm. Analysis of results from answered questionnaires showed that, greater proportions of respondents from BU endemic areas (71.43%) worn Charlie wote (A type of footware worn by people of low socioeconomic status to farm in the District) compared to the non-endemic areas (64.29%) (p = 0.3656) (Table 2).

Although respondents from both endemic and non-endemic communities were habitual hand washers, engaging in this salubrity act, at least 3 times in a day, a greater proportion of BU endemic dwellers (18.57%) washed hands before eating with bare hands compared to the non-endemic control (7.14%) and this was significant (p = 0.0434; OR = 2.969) (Table 3). Further analysis of respondents' perception of hygienic behaviours also showed that, fewer proportions of these respondents (45.71%) washed their clothes once every week compared to their control (71.43%) and the difference in this hygienic behavior was statistically significant as shown in Table 3. When hygienic behaviour related questions were asked e.g., how long one spends in the bathroom and how many times in day a participant bath were asked, analysis of results of answered questionnaires showed that, none of these variables showed a significant difference in terms of locations of the respondents (Table 3).

The study also showed that, majority of respondents in BU endemic communities washed their clothes at least twice every week (8.57%) but had their bath once in a day (32.86%) but this was not significant as shown in Table 3. In Table 3 below, after the analysis of results based on source of water used for drinking and for domestic purposes with respect to location were asked, the study showed that though BU endemic communities had both boreholes and even stand pipes in some communities, few proportions of BU endemic respondents (14.3%) patronized theses boreholes compared to respondents in non-endemic communities (75.71%) and this was significant (p<0.0001).

It therefore did not come as a surprise when majority of respondents from endemic communities (45.71%) perceived they were not satisfied with the quality of their water for drinking and for domestic purposes compared to control (Table 3) (p<0.0001; OR = 5.052). They further perceived 8.57% of respondents in BU endemic communities selected for the study showed that, their water was hard and wasted a lot of washing detergents during laundry as shown in Table 3 below (OR = 6.469).

Environmental hygiene related behaviours of the respondents based on endemicity were also assess during the study and analysis of the result showed that, a fewer proportions of BU endemic respondents 20 out of 70 (28.57%) patronized the community dump sites compared to their non-endemic counterparts 56 out of 70 (80.0%) (p<0.0001) (Table 4). Majority of BU endemic

Table 3: The perception of water usage pattern, hygienic behaviours and buruli ulcer

Variables	(%) Total(140)	(%) Endemic (70)	(%) Non endemic (70)	p-value	Odds ratio (OR)
How often do you wash your hands in a day?					
2 times	21(15.0)	10(14.29)	11(15.71)	0.8129	0.8939
3 times	20(14.29)	10(14.29)	10(14.29)	1	1
More than 3 times	99(70.72)	50(71.43)	50(71.42)	0.8527	1.071
When is the washing done?					
Before eating	18(12.86)	13(18.57)	5(7.14)	0.0434	2.969
After visit the toilet	4(2.86)	2(2.86)	2(2.86)	1	1
After daily work	118(84.29)	55(78.57)	63(90.0)	0.0632	0.4074
What do you wash your hands with?					
Soap and water	74(52.86)	42(60.0)	32(45.71)	0.0904	1.781
Only water	66(47.14)	28(40.0)	38(54.29)	0.0904	0.5614
How often do you wash your clothes?					
Once a week	82(58.57)	32(45.71)	50(71.43)	0.002	0.3368
Once every two weeks	8(5.71)	6(8.57)	2(2.86)	0.1453	3.188
3 times a week	37(26.42)	21(30.0)	16(22.86)	0.3379	1.446
Everyday	13(9.29)	11(15.71)	2(2.86)	0.0025	12.86
After work how long does it take to have your bath?					
Less than 20 min	51(36.43)	26(37.14)	25(35.71)	0.9607	1.017
20-40 min	7(5.0)	2(2.86)	5(7.14)	0.2447	0.3824
40-60 min	11(7.86)	8(11.43)	3(4.29)	0.1163	2.882
More than 60 min	71(50.71)	34(48.57)	37(52.86)	0.6121	0.8423
How many times do you take your bath in a day?					
Once daily	41(29.29)	23(32.86)	18(25.71)	0.3531	1.414
Twice daily	85(60.71)	39(55.71)	46(65.71)	0.2258	0.6564
Three times daily	14(10.0)	8(11.43)	6(8.57)	0.5731	1.376
What is your source of drinking water?					
Stream	29(20.71)	29(41.43)	0(0)	<0.001	
Borehole	63(45.0)	10(14.3)	53(75.71)	<0.0001	0.05346
Stand pipe	25(17.86)	10(14.3)	15(21.42)	0.2699	0.6111
Streams and boreholes	16(11.42)	14(20.0)	2(2.86)	0.0014	8.5
Stream and standpipe	7(5.0)	7(10.0)	0(0)	0.0066	16.65
Do you perceive any problem with your water?					
Yes	42(30)	32(45.71)	10(14.29)	<0.0001	5.053
No	98(70)	38(54.29)	60(85.71)	<0.0001	0.1979
If yes, what negative effects do you notice?					
Waste soap	7(5.0)	6(8.57)	1(1.43)	0.0525	6.469
Skin itches with bathing	2(1.43)	0(0)	2(2.86)	0.1543	0.1943
Stomach upset	0(0.0)	0(0)	0(0)	1	1
Colour change	17(12.14)	17(24.29)	0(0)	<0.0001	46.12
Odour	1(0.71)	1(1.43)	0(0)	0.3156	3.043
Colour and odour	3(2.14)	3(4.29)	0(0)	0.08	7.311
Muddy	1(0.71)	1(1.43)	0(0)	0.3156	3.043

OR: Odds ratio, p: p-value, whiles all other parenthesis within the Table represent the various percentages. The endemic communities were: Siribuoso, Ananekrom and Dukusen while the non-endemic ones were Agogo, Pataban and Betenase

participant (17.4%) instead choose to dump their refuse in open spaces around their immediate surrounding and this was about 4 times the number of respondents in the control communities (4.29%) as shown in Table 4 ($p = 0.0139$; OR = 4.62). In this study, it was also established that, greater proportions of respondents in endemic communities (67.14%) did not have specific planes

Table 4: The perception of environmental sanitation stratified by endemicity

Variables	(%) Total (140)	(%) Endemic (70)	(%) Non endemic (70)	p-value	Odds ratio (OR)
How do you dispose of your solid waste					
Burn	49(35.0)	38(54.29)	11(15.71)	<0.000	6.3690
Community skip	0(0)	0(0)	0(0)	1	1.0000
Community dump site	76(54.39)	20(28.57)	56(80.0)	<0.0001	0.1000
Open space	15(10.71	12(17.14)	3(4.29)	0.0139	4.6200
How do you dispose of your liquid waste					
Lead to drain	6(4.29)	1(1.43)	5(7.14)	0.0951	0.1884
No specific plan	45(32.14)	22(31.43)	23(32.86)	0.8564	0.9366
Throw on the ground	89(63.57)	47(67.14)	42(60.0)	0.3799	1.3620
Do you have a toilet in your house?					
Yes	18(12.86)	12(17.14)	6(8.57)	0.1298	2.2070
No	112(87.14)	58(82.86)	64(91.42)	0.1298	0.4531
What type of toilet facility do you use?					
Domestic latrine	15(10.71)	12(17.14)	3(4.29)	0.0139	4.6210
Public toilet	112(80.0)	49(70.0)	63(90.0)	0.0031	0.2593
Open defecation	13(9.29)	9(12.86)	4(5.71)	0.1454	2.4340

OR: Odds ratio, p: p-value, whiles all other parenthesis within the Table represent the various percentages. The endemic communities were: Siribuoso, Ananekrom and Dukusen while the non-endemic ones were Agogo, Pataban and Betenase

for liquid waste disposal as they abandoned their liquid waste to empty into drains within open spaces in their immediate compound. When the mode of faecal discharge management practices were analysed, the study showed that, majority of the endemic respondents (12.86%) defeacated openly in a free range compared to respondents in the control communities (5.71%). This was however not significant as shown in Table 4 below.

DISCUSSION

Environmental sanitation envisages promotion of health of a community by providing clean environment and breaking the cycle of disease. It also depends on various factors that include hygienic status of the people and the types of resources available among many others (Kumar *et al*., 2011). Our study showed that, BU was not perceived to be affected by age, sex, marital status, educational level nor occupational type and this was consistent with an earlier study (Quek *et al*., 2007). The common knowledge of Buruli Ulcer infection among endemic and non endemic communities of the study area was also anticipated. This was also consistent with a study carried out by Gyasi *et al*. (2011) on the perception of risk factors to the development of Buruli Ulcer.

The Ashanti Akim North District, within the Ashanti Region of Ghana has been endemic for Buruli Ulcer in recent times (Stinear *et al*., 2007). Personal observation during data collection visit showed that, there was a visible sights of people with permanent contractual disabilities as a result of BU infection although they had no clue how they were infected. In spite of efforts that have gone into Buruli Ulcer research ever since it was declared a neglected tropical disease by global public health dimension, the pathogenesis of the disease is poorly understood (Merritt *et al*., 2010). In the absence of any effective control strategy for *M. ulcerans* infections worldwide, the WHO has mandated the Global Buruli Ulcer Initiative Programme to launch a campaign to educate endemic communities on early detection and case management (WHO, 2008). This may have generative adequate awareness among endemic the district.

The absence of any strong correlation with respect to endemicity when the perception of environmental water contact and whether or not respondents engaged in chores thereby necessitating bodily contact with water was expected. Focus groups discussions, conducted within BU endemic communities and their control counterpart showed activities involving water contact was predominant in all the communities within the study area. Water was used to irrigate some cash crops in addition to other domestic chores by inhabitants within the Asanti Akim North District. It was realized during the study visits that, water was a scarce comidity in the district especially in the dry season. Lack of access to portable water, especially for basic domestic needs could lead to poor sanitation practices. This was consistent with earlier research (Bakker, 2003). The significantly greater number of respondents in BU endemic communities who washed hands before having a meal compared to their control also came as a surprise to the research team. BU infection has occurred in remote regions where basic amenities and infrastructure i.e., access to good drinking water, hospitals facilities and good sanitation practices is virtually non-existent (WHO, 2008). The only possible reason could be attributed to the close proximity of both BU endemic and non endemic regions in all affected countries. This may have informed this perception.

The non significance difference in terms of socioeconomic status of the people with respect to endemicity was in contrast to earlier studies conducted by Asiedu and Etuaful (2000). Although it was established from the study that people from BU endemic communities were habitual hand washers before and after having a meal with bare hands as well as washing their clothes at least once a week, this was not the only salubrity behaviours to control disease transmission. Endemic dwellers were also committed to doing personal laundry at least once a week. The relationship between health and hand washing as well as drinking water supply source was the basis of United Nation Drinking Water Supply Decade 1981-90 study and this was consistent with our study (Akuoko-Asibey and McPherson, 2009).

The significantly greater number of people in BU endemic communities drinking from streams instead of bore holes could be exposed to pathogenic assault, especially when they washed, bathed and discharged garbage into these same water source (Sorensen *et al.*, 1989). In spite of the numerous concerns with the quality of the stream, they were perceived to have become accustomed to the taste and were not ready to compromise in resorting to water from their bore holes. The poor liquid and solid waste management practices exhibited by BU endemic dwellers did not come as a surprise. Buruli Ulcer is a sanitation related disease as research conducted by Aiga *et al.* (2004) has shown that, failure to bath on habitual basis constituted a significant risk to MU infections.

CONCLUSION

The study has shown that, the people of BU endemic communities in the Asanti North district were not bothered by environmental hygienic practices. This behavioural practices could possibly exposed BU endemic dwellers to pathogenic assault of some tropical disease through contact with infected environmental material. This development is rather disturbing especially, as scientists around the globe have been unsuccessful to elucidate the mode of transmission of this terrible disease.

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APPENDIX 1

Environmental sanitation attitudes in buruli ulcer endemic communities and its potential impact on MU infections in the Asanti Akim North District, Ghana

Name of community…….. Household number of respondent……..

Name of respondent…….. Respondents

Code……..

Section A: Respondents socio-demographic data

1. How old are you?

Less than 20 [1] 20-25 [2] 26-30 [3] 31-45 [4] 46-50 [5] over 50[6]

2. What is your sex?

Male [1] female [2]

3. What is your marital status?

Married [1] Single [2] Divorced [3] Separated [4] Widowed [5]

4. What is your educational level?

Primary [1] Secondary [2] Tertiary [3] Never been to school [5]

5. What is your main occupation?

Farmer [1] Others [2] Apprentice [3] Unemployed [4]

Section B: General knowledge, attitude and perception of BU

6. Do you know a disease called BU?

Yes [1] No [2]

7. Do you know anyone suffering from BU in this community?

Yes [1] No [2]

8. If yes, how is she? he related to you?

Self [1] Sibling [2] Parent [3] Spouse [4] Children [5] Others [6]

Don't remember [7]

9. Do you know how he/she got infected with BU?

Yes [1] No [2] Not applicable [3]

10. If yes to Q9, was medical attention sought?

Yes [1] No [2] Don't know [3]

11. If yes to Q10, where was it sought?

Agogo Presby Hospital [1] Other health care unit [2] Don't know [3]

12. Do you have direct contact with wetlands on your way to the farm?

Yes [1] No [2] Don't know [3]

13. Do you make bodily contact with soils around wetlands during the discharge of your main occupation?

Yes [1] No [2] Don't know [3]

14. If yes which one of the following categories best fits the description?

Weeds and water [1] Washing cloths [2]

15. What kind of footwear do you wear to work?

Wellington boots [1] Slippers [2] Wellington and slippers [3] Others [4]

Barefooted [5]

Section C: Perception of water usage pattern

16. How often do you wash your hands in a day?

2 times [1] 3 times [2] more than 3 times [3]

17. When is the washing done?

Before eating [1] After visiting the toilet [2] After daily work [3]

18. What do you wash your hands with?

Soap and water [1] Only water [2]

19. How often do you wash your clothes?

Once a week [1] Once every two weeks [2] 3 times a week [3]

Everyday [4]

20. After work how long does it take to have your bath?
Approximately,
Less than 20 min [1] 20-40 min [2] 40-60 min [3] more than 60 min [4]
more than 60 min [5]
21. How many times do you take your bath in a day?
Once daily [1] Twice daily [2] Three times daily [3]
22. What is your source of drinking water?
Stream [1] Borehole [2] Stand pipe [3] Streams &Borehole [4]
Streams and standpipe [5]
23. Do you perceive any problem with drinking water?
Yes [1] No [2]
24. If yes, what negative effects do you notice?
Waste soap [1] Skin itches with bathing [2] Stomach upset [3] Colour [4]
Odour [5] Colour and odour [6] Muddy [7]
25. How do you dispose of solid waste?
Burn [1] Community skip [2] Community dump site [3] Open space [4]
26. How do you dispose of your liquid waste?
Lead to drain [1] No specific plan [2] Throw on the ground [3]
27. Do you have a toilet in your house?
Yes [1] No [2]
28. What type of solid facility do you use?
Domestic latrine [1] Public toilet [2] Open defecation [3]

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