The impact of socio-economic status and sanitation levels on the prevalence of diarrhoeal diseases in the Akim Oda area of Ghana

K Fening, D Edoh

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Abstract

A survey was conducted between August and October, 1998 in Akim Oda area of Ghana to relate socio-economic differences, as measured by income, education, occupation and housing, among residents in three communities to diarrhoea prevalence. There was clinical and laboratory diagnosis of cholera and administration of structured interview-administered questionnaires to find from residents their demographic, socio-economic, health practices and status, and to seek their opinions on cholera transmission, control and prevention. The survey revealed that residents from Old-town and Aduasa belong to low social class and was reflected in their high illiteracy, unemployment rates and associated poor sanitation. As such, they had the highest prevalence of diarrhoeal diseases. Contrarily, residents from Quarters residential area were found to belong to high social class, which was reflected in their high literacy, employment rates and good sanitation. As such, they had no case of diarrhoea. The underlying factors responsible for this epidemic are discussed.

Name of institutions where the work was done: Akim Oda government hospital and Korle-Bu Public Health and Reference laboratory.

INTRODUCTION

A major goal of epidemiology is to assist in the prevention and the control of disease and in the promotion of health by discovering the causes of disease and the ways in which they can be modified. [1] Low standards of hygiene, both personal and public are responsible for a vast amount of disease everywhere in the world, and particularly in the tropics where primitive living conditions are so common. [2,3,4]

Diarrhoea is a pandemic, and several cases and death occurs worldwide, mostly in children under 5 years of age from developing countries. [5,6] The lack of infrastructure and economic development has made many parts of Africa susceptible to cholera, a disease associated with a lack of clean water and poor sanitation. [4] Thus, diarrhoeal diseases, especially cholera, have become a public health concern in developing countries all around the world, mostly in Africa, South Asia and Latin America. [4,7,8] The World Health Organisation (WHO) estimates that there are 5.5 million cases of cholera and 120,000 deaths each year mostly in Africa where epidemics have become more widespread and frequent. [7] In 2004, 56 countries officially reported to WHO 101, 383 cases of cholera (caused by Vibrio cholerae) and 2345 deaths, out of which 407 of the cases reported occurred in Ghana with 6 deaths. [9] In addition to the morbidity and mortality associated with diarrhoeal diseases, it is a major drain on health resources in developing countries. [6,10]

Furthermore, the relationship between socioeconomic status and health indicators has been widely studied, and it is recognised as a cause-effect relationship and access to social services such as education, housing, food, as well as equitable income distribution is important determinants of individual health conditions. [11] The is need for epidemiological studies on the prevalence of diarrhoeal diseases (especially cholera) and its bearing on the social-economic status among people, using the Akim Oda area of Ghana as a case study. The information obtained from this study serves as baseline for developing control programmes and other necessary interventions aimed at improving resident's perceptions and health habits on diarrhoeal diseases transmission, prevention and control.

The objectives of the study included the following:

1. To determine the social-economic status among residents in the three selected localities, it's bearing

on sanitation levels and prevalence of diarrhoea.

2. To diagnose a specific diarrhoeal disease, cholera by using clinical symptoms and confirming it with a laboratory test.

3. To investigate about the determinant (causal) factors of diarrhoeal diseases in the study localities and to propose preventive and control measures so as to curtail future epidermics.

4. To solicite for the perceptions and opinions of local residents on the transmission of cholera and to establish how this is related to its prevalence in the three localities where the survey was conducted.

MATERIALS AND METHODS

STUDY AREA

The survey was conducted in the Akim Oda area, which belongs to the Birim South District of the eastern Region of Ghana. The three areas selected for the study were Old-town and Quarters located at the western and eastern parts of the Akim Oda town respectively, and Aduasa, a village situated a few miles from Akim Oda. The selection of the three areas for the survey was based on their level of sanitation. Two of the areas, Old-town and Aduasa, had generally poor sanitary conditions (Fig. 1) and Quarters had quite good sanitary conditions.

DEVELOPMENT OF QUESTIONNAIRE AND SELECTION OF INTERVIEWEES

A structured interview-administered questionnaire was designed to carry out a survey about demographic characteristics and the level of sanitation among 120 residents, 40 each, from the three selected communities. This involved questions on their level of education, economic background, health habits and status, source of drinking water, type of toilet facility, as well as their opinions and knowledge on cholera transmission, prevention and control. The selection for an interviewee in each site was done by selecting forty houses at random, where a person was interviewed in each house. The selection of interviewees was not restricted to gender and age; however in houses where there were reported cases of diarrhoea and vomiting, the infected persons were given the chance to be interviewed. The random selection of houses and interviewees helped to minimise the error due to biases in the selection process.

Figure 1

Figure 1: Sanitary site in Akim Oda Old-town in Ghana (observe the surroundings fouled with human excreta).

DIAGNOSIS OF CHOLERA

The clinical diagnosis of cholera was done by medical officers in the government hospital and other clinics in Akim Oda area in the eastern region of Ghana and this was confirmed by bacteriological examination in the public health and reference laboratory in Korle-Bu in the greater Accra region. With the clinical diagnosis, symptoms of cholera were mainly vomiting and frequent copious watery evacuations from the bowel, referred to as “rice water stool” that may result in rapid and extreme dehydration. In the case of the laboratory test, a bacteriological examination was done on the rectal swab of suspected individuals for the presence of the bacterium, V. cholerae. The formation of yellow colonies of micro-organisms on the Thiosulphate Citrate Bile salt Sucrose (TCBS) agar after incubation was an indication of either V. cholerae or Aeromonas hydrophila. This was because both were able to ferment the sucrose, which resulted in the observed yellow colour. The final test used to distinguish between V. cholerae and A. hydrophila was the indole test as V. cholerae was indole positives, whereas A. hydrophila was indole negative. [12]

STATISTICAL ANALYSIS

A paired t test was conducted to determine if a significant difference existed between sex (i.e. male and female) individuals and diarrhoeal disease transmission. [13] The survey information was represented using tables and bar graphs.

RESULTS

PREVALENCE OF DIARRHOEAL DISEASES AND CHOLERA

A total of 1084 diarrhoeal cases were recorded from all the hospitals in the Birim South District of Akim Oda between August and October, 1998 (Fig. 2). About 10% (107/1084) of these diarrhoeal cases were reported at the Akim Oda government hospital (Fig. 3). There were similar (df = 2, t = 0.1387, P = 0.9024) number of male (54/107) and female (53/107) diarrhoeal patients at the Oda government hospital (Fig. 3). A greater number of the patients, 92.5% (99/107) were treated and discharged. However, 7.5% (8/107) of the diarrhoeal patients died, out of which were 6 males and 2 females. Most of the diarrhoeal cases, about 49.5% (53/107) were recorded in August at the Oda government hospital, and there was a reduction in the number of cases to 40.2% (43/107) and 10.3% (11/107) in September and October, respectively.

Generally, with diarrhoeal diseases reported from all the hospitals in the area, there were 30.4% (330/1084) cases in August, followed by 28.5% (309/1084) in September and a sudden increase to 41.0% (445/1084) in October. Interestingly, more cases about 90% (997/1084) were registered from all the other hospitals as compared to the few cases, about 10% (87/1084) from the Oda government hospital (Figs. 2 and 3).

Figure 2

Figure 2: Diarrhoeal cases reported in all hospitals in the Akim Oda area, from August to October, 1998.

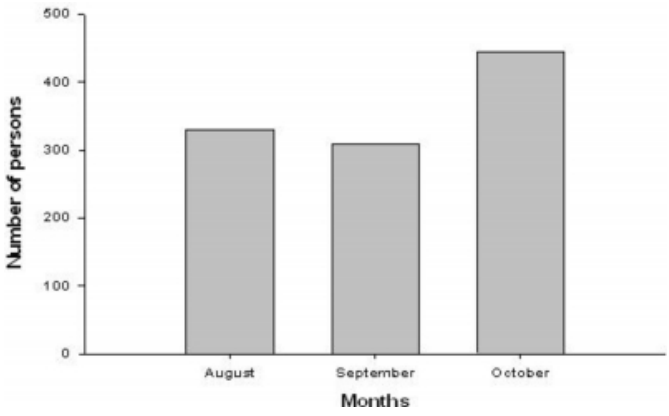
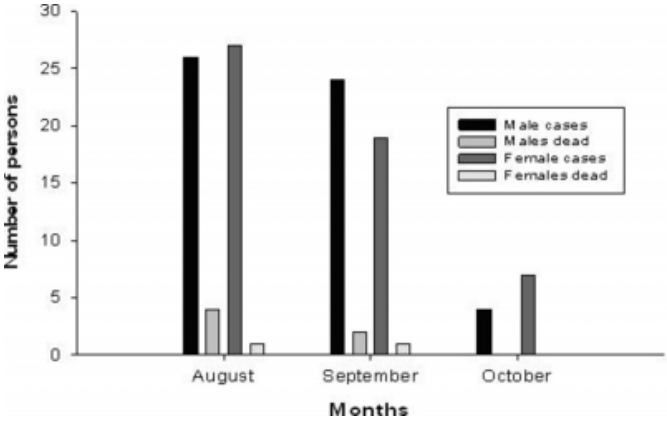


Figure 3

Figure 3: Diarrhoeal cases and number of deaths reported at the Akim Oda government hospital, from August to October, 1998



A bacteriological examination was done on the rectal swab of eight individuals suspected to have cholera and only two of the patients had V. cholerae (inaba) isolated (Table 1). Other bacteria isolated from the rectal swab analysis were A. hydrophila and Vibrio parahaemolyticus.

Figure 4

Table 1: Analysis of rectal swab of eight suspected cholera cases from Akim Oda at the Korle-Bu Public Health and Reference Laboratory, August 1998.

Sample no.	Date	Place	Age (yrs)	Results
1	17/8/98	Birim S. District	-	*A. hydrophila* isolated
2	17/8/98	Birim S. District	-	Negative
3	17/8/98	Birim S. District	55	*V. cholera* isolated (inaba)
4	17/8/98	Birim S. District	-	Negative
5	17/8/98	Birim S. District	-	*V. parahaemolyticus* isolated
6	17/8/98	Birim S. District	70	*V. cholera* isolated (inaba)
7	17/8/98	Birim S. District	-	Negative
8	17/8/98	Birim S. District	-	Negative

- = age unknown

SURVEY INFORMATION

DEMOGRAPHY

Most of the interviewees, about 42.5% (51/120) were in the age group 21-40 years, followed by 31.7% (38/120) persons between 1-20 years, with a few individuals, i.e. 10% (12/120) in the age group 61-80 years. About 46.7% (56/120) of the interviewees were males with the other 53.3% (64/120) being females.

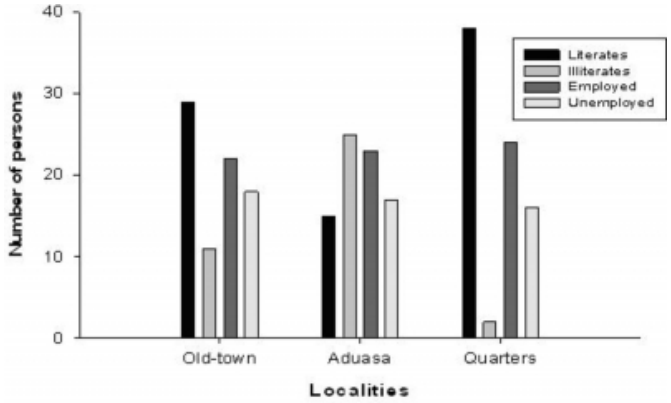
SOCIO-ECONOMIC STATUS

In general, quite a greater number of the interviewees, 68.3% (82/120) were literates, whereas the other 31.7% (38/120) were illiterates. Aduasa had the highest illiteracy rate of 65.8% (25/38), followed by Old-town, 28.9% (11/38) and Quarters with the lowest illiteracy rate of 5.3% (2/38) (Fig.

4). More than half of the interviewees, 57.5% (69/120) had employment, whereas the other 42.5% (51/120) were unemployed. The highest unemployment rate of 35.3% (18/51) occurred in Old-town, followed by Aduasa, 33.3% (17/51), and Quarters, 31.4% (16/51). Most of the interviewees were natives of the area. Specifically, 87.5% (35/40) of the respondents in Old-town were natives of the area, followed by 82.5% (33/40) in Aduasa and a few people, i.e. 35% (14/40) from Quarters.

Figure 5

Figure 4: Literacy and employment rates of respondents from Old-town, Aduasa and Quarters localities of Akim Oda area of Ghana.



PERSONAL AND COMMUNITY HYGIENE OF RESIDENTS

A greater number of interviewees, 81.7% (98/120) do wash their hands thoroughly after attending to nature's call. All respondents from Quarters (100%) do wash their hands after visiting the toilet, with 77.5% (31/40) from Aduasa and 67.5% (27/40) from Old-town (Fig. 5). About half of the interviewees, 48.3% (58/120) do heat their left over food (which was mostly cold) before eating, whereas the other 51.7% (62/120) eat without re-heating. Of the number that heat their cold foods before heating, 63.8% were from Quarters, 20.7% (12/58) from Old-town, with a few people, 15.5% (9/58) from Aduasa (Figure 5).

A few respondents, 14.2% (17/120) had access to safe drinking water, i.e. treated pipe-borne water, with 85.8% (103/120) having no access to safe drinking water. All respondents in Aduasa did not treat their water before drinking, although these water were collected from unsafe sources. A good number of the respondents, 82.1% (23/28) treated their unsafe water in Quarters and a few people, 17.9% (5/28) treated their unsafe water in Old-town (Fig. 6).

A few respondents, 17.5% (21/120) had good toilet facility, i.e. water closet and these privileged ones were from Quarters. On the contrary, majority of the respondents, 82.5% (99/120) from Old-town and Aduasa utilised alternative toilet facilities such as public latrines, removable and irremovable pit latrines and free range system which are of low hygienic standards. A majority of the respondents, 58.5% (31/58) who use the public toilet facility were from Old-town and the rest, 41.5% (22/58) were from Aduasa (Fig.7). None of the respondents from the Quarters used the public toilet facility. All the 6 residents who utilised the free range system, i.e. defaecating at any open place or bush were from Aduasa.

Figure 6

Figure 5: Number of persons (%) washing/not washing their hands after attending to nature's call, and those heating/not heating their food in three localities in the Akim Oda area of Ghana.

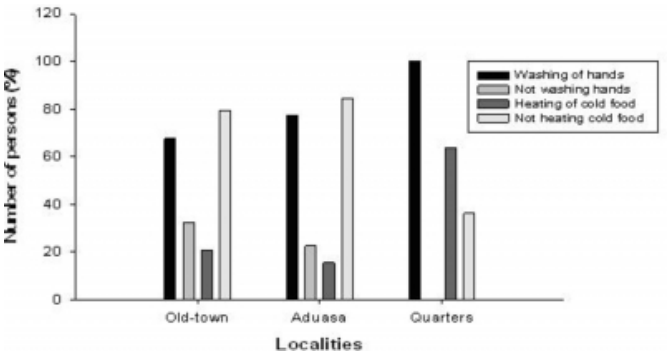


Figure 7

Figure 6: Accessibility of respondents to safe/unsafe and treated/untreated water in three localities in Akim Oda area of Ghana.

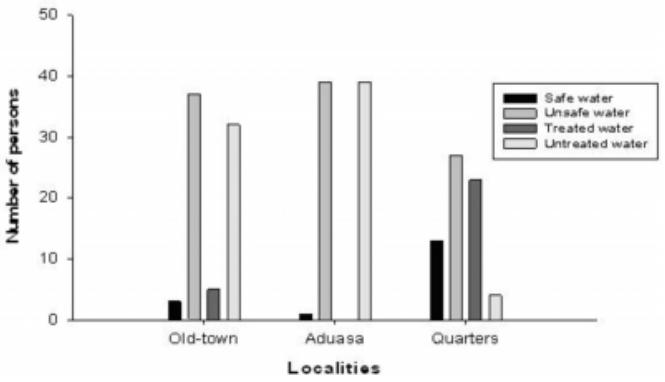
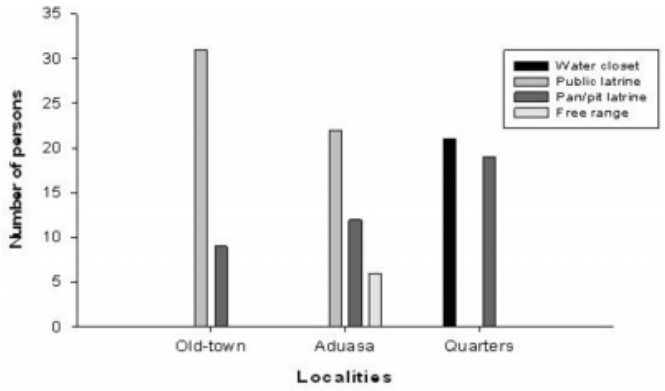


Figure 8

Figure 7: Accessibility of respondents to toilet facilities in three localities in Akim Oda area of Ghana.

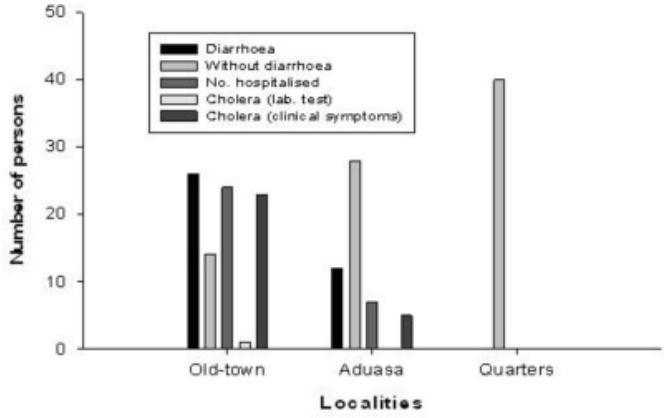


HEALTH STATUS AND PREVALENCE OF CHOLERA

A total of 36.7% (38/120) of the respondents had diarrhoea and vomiting conditions during the study period, whereas the other 68.3% (82/120) were free from diarrhoea and vomiting (Fig. 8). The highest diarrhoea and vomiting cases, 68.4% (26/38) were from Old-town and the other 31.6% (12/38) were from Aduasa. Most of the diarrhoea and vomiting cases, 76.3% (29/38) were diagnosed either by clinical or laboratory means to be cholera. Most of the cholera cases, 82.8% were from Old-town, whereas the other 17.2% (5/29) were from Aduasa. There were no reported cases of diarrhoea and vomiting or cholera in the Quarters.

Figure 9

Figure 8: Health status and prevalence of diarrhoea and cholera among residents in three localities in the Akim Oda area of Ghana.



OPINIONS OF RESPONDENTS ON CHOLERA TRANSMISSION

In general, a few people, 12.5% (15/120) had no knowledge about cholera and its transmission. About 46.7% (7/15) of the people with no knowledge on cholera were from Old-town, followed by 40% (6/15) from Aduasa and a few individuals, 13.3% (2/15) from Quarters. Surprisingly, most interviewees, 87.5% (105/120) had a fair knowledge about cholera and its transmission (Table 2). They attributed the cause of cholera to living under insanitary personal and environmental conditions, and drinking water or eating food that is contaminated with the cholera germ. They recommended vaccination, use of disinfectants to clean the household of infected persons, isolation of infected individuals from healthy populations, seeking immediate medical care when infected, good personal, food and environmental hygiene practices, as intervention measures. They also suggested the administering of oral rehydration salt (ORS), coconut water, salt solution and the use of other drugs such as trisilicate tablets and tetracycline.

However, a few people, 2.9% (3/105) gave answers that were not related to the transmission, control and prevention of cholera. For example, a respondent from Old-town attributed the cause of cholera to someone eating a new food that he or she is not used to (Table 2). Another person from the same community suggested the use of a mixture of salt solution and soot as a first aid measure against cholera. An individual from Aduasa ascribed cholera transmission to eating food that is not properly cooked. In the Quarters, somebody recommended the drinking of a little traditional brew or alcohol (known locally as “akpeteshie”) as a first aid measure against cholera.

Figure 10

Table 2: Opinions of respondents on cholera transmission and control

	Old-town	Aduasa	Quarters
Causes	Insanitary conditions, *eating unfamiliar food*, eating food infested with flies	Insanitary conditions, poor personal and food hygiene, drinking unsafe water, *eating food that is not properly cooked*	Insanitary conditions, eating food contaminated with flies, poor personal and environmental hygiene practices, germs
Interventions	Vaccination, use of disinfectants to clean the house of an infected person, isolation of an infected individual from healthy populations, good personal, food and environmental hygiene practices, seeking immediate medical care when one is infected	Use of disinfectants, spraying flies, health education, good personal, food and environmental hygiene practices, isolation, seeking immediate medical care when infected, drinking only safe water	Isolation, burying the vomitus and stool of an infected person, proper handling of an infected person, seeking immediate medical care upon infection, good personal, food and environmental hygiene practices, drinking only safe water, use of disinfectants
Control	Administering trisilicate tablets, oral rehydration salt (ORS), coconut water, *a mixture of salt solution and soot*	Administering ORS, sugar and salt solution, *any drug for stomach-ache*, ice kenkey, tetracycline capsules, *herbal medicine*	Administering ORS, salt and hot water solution, trisilicate tablets, *taking a little of local brew"akpeteshie"*

DISCUSSION

Cholera is diagnosed clinically and it is subsequently confirmed by bacteriological (laboratory) examination. [2,14,15] The laboratory diagnosis is based on demonstration of V. cholerae in the stool specimen and therefore becomes a more reliable diagnostic tool. For example, as seen in the survey conducted, only two of the eight individuals suspected to have cholera actually had V. cholerae (inaba) isolated, when their rectal swab were tested.

The high prevalence of diarrhoeal diseases in the Akim Oda area in August 1998 is attributable to the fact that the infectious agents are able to spread very rapidly from one person to another, especially among individuals living under overcrowding conditions where the epidemic had occurred. The reduction in the number of diarrhoeal cases for the succeeding month may be due to the intervention programme by the environmental health workers who embarked on health education to residents on diarrhoeal disease transmission and prevention. Despite this effort, the health education team could not reach all residents, especially those in distant areas from Akim Oda town and the nearby villages due to lack of enough health educators. This might have accounted for the more cases of diarrhoea and vomiting registered from all the hospitals outside Akim Oda, as compared to the few number of cases reported at the Oda Government hospital.

Cholera, like most diarrhoeal diseases, becomes difficult to treat when it is not diagnosed early enough. As large amounts of fluids are lost from the body, the patient becomes weak and cold and unless the person is given proper treatment, death may occur. [6,10] The eight deaths that resulted from the 107 diarrhoea and vomiting cases reported at the government hospital could be attributable to external dehydration and loss of electrolytes from the body of the patients.

Contaminated water and unwashed contaminated food are among the key mechanisms for the transmission of cholera. [4] Furthermore poverty, lack of development, high population density, low education, lack of previous exposure, low hygiene and sanitation services (potable water, latrines etc.) are among the major risk factors for cholera outbreak. [3,4,16] The current study has established that diarrhoeal diasease transmission is not affected by one's gender but rather low standard of hygiene and low social class among individuals was a major causative factor in the epidemic as it increases one's exposure or risk to the disease agent. For instance, interviewees from Old town and Aduasa generally belonged to a low social class as reflected by their high illiteracy levels, unemployment rates leading to increased poverty. This was revealed in their generally low personal and environmental hygiene standards. For example, the inhabitants in these deprived areas had access to only public latrines which were under pressure and poorly managed. Hence, the surroundings were fouled with human excreta which were at the mercy of houseflies and vultures, thus facilitating the mechanical transmission of the pathogens that caused the diarrhoea and cholera epidemic.

These houseflies pick up the pathogens on their tarsi or on other parts of their body when feeding on the faecal material and they may ingest the pathogens as well. Later, they contaminate food when they feed on it. The flies have the habit of regurgitating materials that were previously eaten, particularly on foods that are solid or semi-solid, which may be for human consumption. These flies also upon settling on the vomitus or stool of an infected cholera person may carry the germ to a healthy person either by contaminating his food or water that is eaten or drunk directly. This was evident as most of the respondents do not even wash their hands after attending to nature's call. Again, most of them refused to wash either their fruits or vegetables before eating. All these habits might have increased their susceptibility to the diarrhoea and cholera epidemic. Another contributing factor was the overcrowding conditions of the residents due to poverty. The poor sanitary conditions coupled with their high population density allowed the disease agents to flourish and to spread the infection due to greater exposure. Lack of treated water and total dependence of residents on unsafe water sources might have contributed to the epidemic.

Contrarily, respondents from Quarters area, which is a residential area, belonged to a high social class as reflected in their high levels of literacy, employment rates and income. Thus, they practised good personal and environmental hygiene. For example they had access to water closet toilet facilities that is well maintained, disposal of garbage in covered containers that were periodically emptied by big trucks for proper disposal. These hygienic conditions do not create favourable conditions for breeding of vectors and flies that act as mechanical transmitters of diarrhoea. They also had access to pipe-borne treated water for drinking and other domestic activities. The few, who used water from wells, had these wells properly covered and

maintained. Most of them boiled the well water before drinking. The residents here washed their hands thoroughly with soup after attending to nature's call. Fruits and vegetables were also washed thoroughly before they were eaten.

The survey indicated that most of the interviewees from the three study areas had fair knowledge about cholera and its transmission. This unexpected observation was due to an earlier intervention by the health education team who taught most of the residents about diarrhoeal diseases transmission, control and prevention. As a result, as at the time of the interview, residents were adequately informed about cholera. The education was enhanced by the use of the local Frequency Modulator (FM) station, radio BIYAC (Birim Youth in Action). Despite the effort from the health educators, a few of the residents had no knowledge about cholera. This reiterates the fact that continuous health education is essential so as to create more awareness among residents. Furthermore, there is need to strengthen the environmental health education unit with more health personnel, health delivery and garbage collection equipments, proper disposal sites for garbage, construction of improved latrines, and provision of treated pipe-borne water among the deprived communities.

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CORRESPONDENCE TO

Ken O. Fening, Commercial Insects Programme, icipe-African Insect Science for Food and Health, P. O. Box 30772-00100, GPO, Nairobi, Kenya Fax. +254-2-8632001, Mobile: +254726880055, e-mail: fokwae@icipe.org or Kenof2@yahoo.com

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Author Information

K.O. Fening
Department of Zoology, University of Ghana

Dominic A. Edoh, Ph.D.
Department of Zoology, University of Ghana