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PERSISTENCE OF *Escherichia coli* and *Salmonella typhi* IN STREAMS AROUND EPIDEMIC ENVIRONMENT IN ADO EKITI

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ABSTRACT: The persistence of *Escherichia coli* and *Salmonella typhi* in streams around epidemic environment was investigated. Water samples were collected from 15 streams viz; Abe koko, Abe mango Adele, Afo, Asin, Bank road, Fajuyi, Falegan, Fiyinfolu, Housing estate, Ilawe road, Odo Ado, Odo arin, Odofumi and Omisanjana; all in Ado- Ekiti. From the water sample tested Adele and Ilawe road were found to have the highest microbial load of $112x10^3$cfu/mL and $104x10^3$cfu/ml respectively while Odo Arin was found to have the lowest microbial load of $34x10^3$cfu/mL. Biochemical teste were also performed in order to certify the organism isolated. These organisms are *Escherichia coli* and *Salmonella* spp. The streams examined in Ado-Ekiti metropolis had unsatisfactory levels of contamination with *E.coli*, and other pathogenic microorganisms which render the water from the streams unsuitable for human use. The results show that the occupants of these environments are unhygienic and disposal activities are below standard.

KEYWORDS: Persistence, *Escherichia coli*, *Salmonella typhi*, Epidemic environment.

1 INTRODUCTION

Quality of portable water is germane to human physiology and also indispensable to man's continued existence/ survival. Potable water is defined as water that is free from pathogens and chemical substances, which are deleterious to health. It is generally believed that water is ''elixir of life'' it is imperative to consider its contamination because this is always associated with health and wellbeing of man and other living things in the environment [14], [16]. There are different sources of water, which include lake, river and stream. These water bodies (surface water) are likely to be contaminated by bacteria from infections which may have been thought to be previously treated [9], thus they might not be safe for consumption.

The most common agents associated with water borne gastrointestinal illness are *Shigella, Salmonella, Toxoplasma, Campylobacter, Cryptosporidium, Giardia, Pathogenic Escherichia coli* and *Klebsiella pneumonia* [5], [10], [11], [15], [19]. There are some microorganisms that are named indicator organisms that are used to assess microbiological quality of surface water; these include faecal coliforms that are the most commonly used bacterial indicator for estimating faecal contamination [18], [19].

Portable water must not contain *E. coli* or thermo-tolerant coliform bacteria [20] because the presence of coliform is indicative of unhygienic quality of the water. Coliforms are indicative of the general hygienic quality of the water and potential risks of infection. The bacteriological quality of most surface water in many locations in Nigeria is worrisome [18], [19]. Interestingly, water borne illnesses like typhoid fever, amoebic and bacillary dysentery, cholera, meningitis and diarrhea caused by some pathogenic bacteria can be attributed to faecal contamination of surface water [2]. This is because studies have shown that the act of disposing faecal wastes and untreated effluents in rivers and streams are still common in some areas in Nigeria [3], [4]. Streams and rivers in areas where epidemics are just been curtailed are monitored and assessed for the presence of microorganisms which are etiologic agents of water-borne diseases. It is thus imperative to always take into consideration the bacteriological analysis of water used by man in order to forestall the spread of water borne illness in

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Nigeria. This study is designed to enumerate the prevalence of Pathogenic *E. coli* and *Salmonella* in some streams found in areas where epidemics have been recently surmounted in Ado-Ekiti metropolis. This will serve as baseline data on the quality of streams and hygienic activities of occupants in Ado-Ekiti Nigeria.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The study was carried out in Ado-Ekiti Metropolis, Ekiti State in southwestern Nigeria. It is located between latitude 7° 37′ and 16′′ North and longitude 5° 13′ and 17′′ East. The State enjoys tropical climate with two distinct seasons. These are the rainy season (April–October) and the dry season (November–March). Temperature ranges between 21° and 28 °C with high humidity. The southwesterly wind and the northeast trade winds blow in the rainy and dry (Harmattan) seasons respectively. Tropical forest exists in the south, while savannah occupies the northern peripheries.

2.2 SAMPLE COLLECTION

Waters used for the study were sourced from different locations in Ado-Ekiti; they include Abe koko, Abe mango, Adele, Afo, Asin, Bank road, Fajuyi, Falegan, Fiyinfolu, Housing estate, Ilawe road, Odo Ado, Odo arin, Odofumi and Omosanjana. Water from these streams is being used directly in various households for different purposes. Water samples were placed in sterile sample bottles and placed on ice and transported to the laboratory for bacteriological examinations.

2.3 WATER SAMPLE ANALYSIS

The analyses of water sample were carried out within twenty-four hours of collection. Nutrient agar (Oxoid) was used to obtain viable bacterial count. Detection of coliform was achieved using a lactose medium MacConkey Broth (Oxoid) inoculated with 10^3 dilution of the sample. The appearance of acid and gas after 24 hours at 37^OC was taken as positive indication of the presence of coliform bacteria. Results were expressed as number of colonies per 100 ml. As a confirmation for bacteria, tubes were subculture appropriately in fresh medium for 24 hours at 44^OC.

2.4 STATISTICAL ANALYSES

A computer program SPSS (Statistics program for social sciences) was used for data analysis. One-way ANOVA was used to analyze difference in number of microorganisms from streams used for the study. The 5% level of significance was considered.

3 RESULTS AND DISCUSSION

The result of the microbiological analysis of water from streams in Ado-Ekiti Ekiti state, Nigeria revealed that all stream sampled had high microbial load with mean colony forming units (CFU) ranging from 34.00±2.00 to > 112.00±1.41 CFU/100 mL while the Coliform count was between 34 to 112 CFU/100 mL. The results are shown in the Tables below;

Table 1: Microbial load of water sample

S/N	Sample location	Bacterial load
1	Abe koko	56.00 ± 1.41^{e}
2	Abe mango	69.00 ± 0.00^{f}
3	Adele	112.00 ± 1.41^{o}
4	Afo	84.00 ± 1.41^{i}
5	Asin	93.00 ± 0.00^{l}
6	Bank road	79.00 ± 0.00^{h}
7	Fajuyi	73.00 ± 1.41^{g}
8	Falegan	91.00 ± 0.71^{k}
9	Fiyinfolu	43.00 ± 0.71^{c}
10	Housing	81.00 ± 0.71^{g}
11	Ilawe road	104.00 ± 0.71^{m}
12	Odo Ado	38.00 ± 0.71^{b}
13	Odo Arin	34.00 ± 2.00^{a}
14	Odofumi	48.00 ± 0.71^{d}
15	Omisanjana	87.00 ± 1.41^{k}

Values are mean of duplicates ± standard deviation. Mean within the column caring the same superscripts are not significantly different at P≤0.05.

Table 2: colony counts and percentage of E.coli isolated from the samples

S/N	Samples location	Coliform counts ($x10^3$cfu/mL)	gas(n%)	acid(n%)
1	Abe koko	56	30(53)	30(53)
2	Abe mango	69	60(86)	60(86)
3	Adele	112	100(89)	100(89)
4	Afo	84	82(97)	81(96)
5	Asin	93	90(96)	90(96)
6	Bank road	79	75(94)	75(94)
7	Fajuyi	73	70(95)	70(95)
8	Falegan	91	90(98)	90(98)
9	Fiyinfolu	43	40(93)	40(93)
10	Housing	81	81(100)	81(100)
11	Ilawe road	104	101(97)	101(97)
12	Odo Ado	38	35(92)	35(92)
13	Odo Arin	34	30(90)	30(90)
14	Odofumi	48	45(95)	45(95)
15	Omisanjana	87	84(98)	84(98)

Table 3: Incidence of E. coli and Salmonella spp. in the different locations

Location	*E. coli*	*Salmonella* spp.
Abe koko	30.00 ±1.41[a]	72.00 ±1.41[e]
Abe mango	61.00±0.71[e]	62.00±1.41[d]
Adele	89.00±2.00[i]	79.00 ±1.41[f]
Afo	82.00±2.00[h]	82.00±1.41[f]
Asin	90.00±1.41[i]	89.00±2.00[h]
Bank road	75.00±0.71[g]	85.00±0.71[g]
Fajuyi	70.00±1.41[f]	89.00±1.41[h]
Falegan	90.00±1.41[i]	86.00±2.00[g]
Fiyinfolu	40.00±1.41[c]	92.00±1.41[h]
Housing	81.00±0.71[h]	40.00±1.41[b]
Ilawe road	102.00±1.41[j]	69.00±1.41[e]
Odo Ado	30.00±0.70[b]	42.00±0.71[b]
Odo Arin	30.00±0.71[a]	32.00±0.71[a]
Odofumi	45.00±0.71[d]	48.00±2.00[c]
Omisanjana	84.00±0.71[h]	92.00±2.00[h]

Values are mean of duplicates ± standard deviation. Mean within the column caring the same superscripts are not significantly different at P≤0.05.

Table 4: Odd ratio for incidence of Escherichia coli and Salmonella spp

s/n	Locations	*E. coli*	*Salmonella* spp,
1	Abe koko	0.07	0.04
2	Abe mango	0.1	0.1
3	Adele	0.24	0.05
4	Afo	0.02	0.02
5	Asin	0.03	0.02
6	Bank road	0.04	0.28
7	Fajuyi	0.03	0.25
8	Falegan	0.01	0.05
9	Fiyinfolu	0.1	0.07
10	Housing	0.24	0.05
11	Ilawe road	0.02	0.02
12	Odo Ado	0.03	0.22
13	Odo Arin	0.04	0.04
14	Odofumi	0.03	0.05
15	Omisanjana	0.03	0.02

4 DISCUSSION

Bacteria isolated from streams in this study usually live in human and animal gastrointestinal track thus spread from human and animal wastes. Their presence signifies water contamination. High level of contamination by *E. coli* and *Salmonella* in Ado metropolis as seen in the results correlates with the study of high level of contamination by *E. coli* and *Salmonella* of rural water supply in Guma Local Government Area of Benue state. That was attributable to poor hygiene and overcrowding. These findings as authenticated by WHO's, is a significant factor in the persistence and resistance of enteric bacterial isolated from these sources [7].

Recent study in Tijuca National Park located entirely within the urban area of Rio de Janeiro Brazil revealed that 100% of the samples from stream had total coliforms, *Escherichia coli* and *Salmonella* sp [10]. This study also corroborates a 100% of total coliforms, *Escherichia coli* and *Salmonella* sp in the samples obtained within Ado-Ekiti in areas where epidemics had just been curtailed. Re-isolation of these bacterial posed reoccurrence of the disease in the environment.

Fecal coliforms and *E. coli* are bacteria that are associated with human or animal wastes. They usually live in human or animal intestinal tracts, and thus spread from human and animal wastes. Their presence in drinking water is a strong indication of recent sewage or human/animal waste contamination [12], [17]. During rainfalls and other types of precipitation, faecal materials from infected persons may be washed into creeks, rivers, streams, lakes, or ground water [6]. When these waters are used as sources of drinking waters without adequate treatment *Salmonella* spp and *E. coli* may end up in drinking water and exhibits infectious cycle [6]. These pathogens may pose a special health risk for infants, young children, and people inhabiting such environment with eventual infections like diarrhea and typhoid. This brings about reoccurrence of the disease. *E. coli* are known to be associated with severe disease in human.

Salmonella spp has been reported as an emerging cause of invasive salmonellosis [8]. This persistence and reoccurrence of these diseases can only be surmounted if appropriate sewage disposal systems and adequate water treatment are put in place. The significant of surveillance should be stressed to enable proper enlightenment of the populace and also, in areas of medication. If a particular infection is not adequately treated the etiologic agent of such infection could build up resistance these might make the disease untreatable. Proper hygienic activities should be encouraged [19].

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