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Bacteriological Assessment and Physico-chemical Properties of Ogun River Located along Iseyin-Ibadan Road, Oyo State, Nigeria.

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Abstract

Water is the most vital element among the natural resources and the most indispensable need for existence of all living things. This study was carried out to investigate bacteriological analysis and physico-chemical parameters of water samples collected from Ogun river located along Iseyin-Ibadan road, Oyo State. Water samples were collected from three stations on the river. The physico-chemical parameters were determined using Standard Analytical Method and bacteriological assessment were determined by using digital colony counter model SUNTEX colony counter 570 and expressed as a colony-forming unit (CFU/ml). Results revealed that pH, Conductivity, TDS, DO, and BOD values from all the stations were within WHO and SON permissible limits while Temperature ranges between (32.5 - 33.1^{o}C), COD (5.63 -5.95 mg/L) and Turbidity (6.06 -8.32 Ntu) values were above WHO and SON permissible limits. Six pathogenic bacteria were isolated from the water samples namely: *Corynebacterium kutsceri, Staphylococcus aureus, Corynebacterium xerosis, Clostridium spp, Escherichia coli, Salmonella* spp. This is an indication of some contamination of the Ogun river water. This study on ogun river water from sample A-C has revealed variation in water quality parameter, however few physicochemical parameters were above WHO and SON limit which is an indication of water pollution while the presence of some

pathogenic bacteria isolated may leads to water borne disease or an outbreak of disease such as cholera, pneumonia, joint infection, typhoid, polio, diarrhea and so on. Therefore, the water needs to be treated before drinking.

Keywords: Water quality, Parameter Assessment, Bacteria count, Water, TDS, Temperature.

Introduction

Water performs a crucial role in human growth and development and also for their continuous existence, even though human activities have impacted its quality (Eletta, 2012). Establishment of industries and wide expansion of human abode due to increase in population has led to the pollution of surface and groundwater sources (Adeniyi and Ighalo, 2019). According to the research conducted by Ekere *et al.* (2019), about 1 billion people across world have no access to a safe drinking water. About 2.2 billion people died yearly in developing countries due to water associated diseases (Olukanni *et al.,* 2014). In order to achieve a sustainable ecosystem, pollution of water bodies must be reduced to the barest minimum (Eletta *et al.,* 2005). Nigeria has highest population of about 199 million people among the other black nations (Seyi-Olajide and Amey, 2020), as big as her population is, the major sources of drinking water available to her rural and urban communities are rainwater, surface water and ground water, whereas, surface water in particular have been receiving effluents as a result of human activities such as runoff of pesticides and fertilizers from agricultural fields, detergents input due to clothes washing. Therefore, Nigeria has had a long history of water pollution which dated back to her inception in 1960 (Adelegan 2004; Omole and Isiorho, 2011). The quality of water influences the health status of any population, hence, analysis of physical, biological and chemical properties are very important for public health studies (Shalom *et al*., 2011).The health of a population, depends on the quality of water within their domain, which is of great environmental concern (Taiwo *et al.*, 2014). The most important characteristic of good quality water is obviously absence of pathogenic organisms (Richard *et al*., 1977). The importance of high quality water cannot be over-emphasized as it sustains human life and maintains health. Most waters, before they reach the consumer, have been exposed to greater or lesser amount of contamination, but in the majority of

case, they have also undergone a more or less complete purification by natural agencies (Taylor and Green, 1992*)*.

Water must be substantially free of dissolved salts, plant, animal wastes and bacterial contamination in order to be suitable for human consumption. Ideally water for drinking should be clear, free of odour and compound that can cause colour or taste. Infact, about 66.3 million Nigerians do not have access to potable water (Akinde *et al.,* 2019). This is due to Nigeria water sources being polluted by exploration of oil, Agricultural and minning activities, commercial slaughter-houses/abattoir, domestic and industrial activities (Seiyaboh *et al.,* 2017; Izah and Srivastav, 2015; Bello and Oyedemi, 2009). Deterioration of water quality can be detected by examining biological assemblage, physical and chemical parameters of the water bodies which can explain the status of the water at a particular period of time. The presence of faecal coliforms in a water sample indicates the possible presence of other pathogenic bacteria such as *Salmonella* spp*, Shigella* spp, pathogenic *E. coli, V. cholera*, *Klebsiella* spp and *Campylobacter* spp associated with waterborne diseases (Uzoigwe and Agwa, 2012). These pathogens and opportunistic microorganisms could cause diseases such as gastroenteritis, dysentery, cholera, typhoid fever and salmonellosis to consumers. In particular, individuals who suffer from HIV/AIDS related complications are more at risk of being infected by these microorganisms (Adogo *et al.,* 2016). Arun *et al*. (2017) reported that the results of the water analysis from three different water sources in Baddi drinking water was contaminated with coliforms bacteria. Biochemical tests also revealed the existence of coliform bacteria in Baddi drinking water. Olshansky and Velz (1997) reported that waterborne illnesses are global public health problem and faecal contamination of water plays an important role in these outbreaks. Water related diseases present a human tragedy thus killing millions of people each year.

The provision of potable water to both the rural and urban population is necessary to prevent public health hazards such as the emergence and spread of waterborne pathogens. (Josiah *et al*., 2014; Olajubu *et al*., 2014). *Escherichia coli* has been recognized as the most appropriate bacteriological indicator of water pollution by human excrement, and the most probable number (MPN) of coliform group has been universally used as an indicator (Godd, 1998).

Therefore, This study was designed to examine the pollution status of the water bodies located in the human settlement villages along the Ogun river banks by combining

bacteria load and physico-chemical properties of the water samples to ascertain its pollution levels.

Materials and Methods

Description of the Sampling Sites

Ogun river is in the derived savannah zone of 7^{o} 15$^{'}$ North and 3^{o} 30$^{'}$ East of the equator with an average annual rainfall of 1278 mm and an annual temperature of 27^{o}C. Ogun river is located along Iseyin-Ibadan road in Oyo State. Ogun river catchment area is located in South West Nigeria, bordered geographically by latitude 6° 26$^{'}$ N and 9° 10$^{'}$ N and longitude 2° 28$^{'}$ E and 4° 4$^{'}$ E. This river originates in Sepeteri Oyo State. The River is a perennial river in Nigeria, which has the coordinates of 3° 28$^{'}$ E and 8° 41$^{'}$ N from its source in Oyo State to 3° 25$^{'}$ E and 6° 35$^{'}$ N in Lagos state where it enters Lagos Lagoon. The dry season is between November to March while the wet season spanned through April to October. The annual rainfall ranges from 900 mm in the North of the River to 200 mm towards the South. Total annual potential evapotranspiration was 1600 mm and 190 mm. The river is 300km long.

Vegetation of the river is an evergreen and interspersed with grasses and trees all around. Some of the predominant trees around the river are Aquatic tree like Buttonbush *(Cephalanthus occidentalis*), Black willow *(Salix nigra)*, Bladderwort (*Utricularia macrorhiza*), Berry bushes (*Sambucus mexicana*), Dwarf Spikerush (*Eleocharisparvula*), Hyrillia (*Hydrilla verticillata*), Vigorous tress (*Salix babylonica*). Aquatic birds like Eagle, Eagrets, Heron, Ducks, and Penguin do visits the river on daily basis. Fish fauna found in the river includes Tilapia, Catfish, Shrimp, Salmon, and so on. Possibly worms that are found in the river are earthworm (*Oligochaeta*), Leeches (Class *Hirudinea*), *Branchiobdellidae* (Order *Branchiobdellida*), Liver flukes (*Fasciola hepatica*), *Schistosomiasis*, *planaria*.

Sample Collection: The water samples were collected from 3 different station in Ogun river. The samples were collected in the morning around 7:00 am into plain bottles which were treated with HNO_3 and rinsed with distilled water. After collecting each sample, the temperature and pH were measured *in-situ* and the collected samples were packed into a cleaned plastic which have been labelled according to the station numbers from which they are collected and were taken to the Laboratory for further analysis.

Station A: This station had few residential buildings compared to station B and C. The station is mainly surrounded by aquatic vegetation and void of refuse dumps. The water here was clear, the water depth was shallow to a point of seeing its substratum and is fast flowing.

Station B: This station was located about 200 meters away from station A. This station was located close to the nearby village. The station is dominated by human activities such as farming, horticulture, and residential buildings all of which they always emptied their wastes into the River.

Station C: This station was located about 200 meters away from station B. The station was composed of small settlement buildings but not as populated as station A and B. Rearing of animals like cows and cattle and the flow of water here was slow compared to the station A due to the activities of herds men such as cow defecation which make the water turbid. The water was dark in colour and loaded with a lot of refuse dumped and sewage discharge.

Bacteriological Assessment of the Water Samples

Media Preparation : Nutrient agar (NA) and MacConkey agar was prepared. A clean spatula was used to measure 2.8g of nutrient agar powder in a weighing balance and dissolved in 100ml of distilled water and allowed to boil to dissolve completely. It was sterilized by autoclaving at 121^{o}C for 15 minutes to remove suspension and bacteria by plugging with cotton and covering with aluminium foils. About 4.9 grams of MacConkey agar powder was suspended into 100ml of distilled water and allowed to boil to dissolve completely. It was sterilized by autoclaving at 121^{o}C for 15 minutes and cooled to 45^{o}C (Cheesebrough, 2006).

Procedure for Isolation of Pure Bacterial Culture: The stock solution of sample collected at each station was prepared by measuring 10mls of the water samples and diluting it with 90mls of sterile distilled water. Serial dilution of 10^{9} by pipetting 10mls of the stock into 90mls of sterile distilled water to give serial dilution of 10^{1}. Same sample was repeated until 10^{9} serially diluted sample was obtained. The fifth, seventh and ninth tube of each sample was duplicated. The water samples from different sites were handled separately by labelling on the petri dishes. The culture techniques were adopted from Cheesebrough (2006). Water culture samples were prepared by streak and spread plate techniques was used. A sterile wire loop was used to collect a loop full of each diluted water sample and inoculated on the surface of nutrient agar and MacConkey agar respectively and incubated at 37^{o}C for 24 hours for bacterial. The inoculated culture was sub-cultured on fresh nutrient agar and MacConkey agar plates to obtain pure cultures which were used to further study their morphological and biochemical characteristics. The pure culture isolates were sub-cultured in nutrient agar and incubated at 37^{o}C for 24 hours for bacterial enumeration.

Morphological Growth and Identification of Bacteria Isolates on Media

The cultural characteristics of the isolates on different solid agar were examined. The growth patterns, colony size, edge, elevation on the plates were recorded after 48 hours of incubation at 37°C. Gram staining technique was carried out for the identification

and differentiation of each isolated bacteria. The size and arrangement of colonies into shapes (rods or round and chains) were also recorded (Ryan *et al.,* 2008). Microbial identification was performed using the keys provided in the Bergey's Manual of Determinative Bacteriology (Vaishali and Punita, 2013).

Physico-Chemical Properties Analysis

Physical and chemical characteristics of water such as temperature and Hydrogen ion Concentration (pH) were examined *in-situ* following the procedures of Ikeme (2014) and Ademoroti (1996). Other parameters like Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Turbidity, Total Dissolved Solid (TDS), Conductivity, Chemical Oxygen Demand (COD) were measured following the standard procedures of Olajubu *et al.*, 2014, Eze and Madumere (2012), Josiah *et al*., 2014 and Olajubu and Ogunika, 2014 respectively.

Results

Table 1: Physicochemical Properties of Water Samples from Selected Stations of Ogun River Along Iseyin/Ibadan Road

Physicochemical Parameter	Station A	Station B	Station C	WHO permissible (2020)	SON Standard (2020)
pH (mg/L)	6.95	6.80	6.66	6.5 - 8.5	6.5 – 8.5
Temperature °C	32.5	32.8	33.1	23 – 30	-
Turbidity (NTU)	6.04	7.30	8.32	0 – 5	0 – 5
Conductivity (µs/cm)	335	319	331	2500	1000
Total Dissolved Solid (mg/L)	198.5	191.9	201	500	500
Chemical Oxygen Demand (mg/L)	5.63	5.78	5.95	Above 0.250	-
Dissolved Oxygen (mg/L)	3.04	3.56	2.40	6	4 – 10
Biochemical Oxygen Demand (mg/L)	2.35	2.04	2.50	4 -6	2 – 8

Keys:

WHO- World Health Organization, **SON-** Standard Organization of Nigeria

Table 2: Total Coliform Count (CFU/ml) for Nutrient Agar

S/N	Isolate	Total Coliform Count
1	A_1N10^5	6.0×10^5
2	A_1N10^7	1.0×10^7
3	A_1N10^9	NIL
4	B_1N10^5	4.0×10^5
5	B_1N10^7	1.0×10^7
6	B_1N10^9	4.0×10^9
7	C_1N10^5	1.0×10^5
8	C_1N10^7	7.0×10^7

9	C_1N10^9	6.0×10^9
10	A_2N10^5	6.0×10^5
11	A_2N10^7	1.0×10^7
12	A_2N10^9	NIL
13	B_2N10^5	1.0×10^5
14	B_2N10^7	3.0×10^7
15	B_2N10^9	NIL
16	C_2N10^5	NIL
17	C_2N10^7	NIL
18	C_2N10^9	NIL

Table 3: Total Coliform Count (CFU/ml) for MacConkey Agar

S/N	Isolate	Total Coliform Count
1	A_1M10^5	5.3×10^5
2	A_1M10^7	NIL
3	A_1M10^9	NIL
4	B_1M10^5	NIL
5	B_1M10^7	NIL
6	B_1M10^9	NIL
7	C_1M10^5	21.2×10^5
8	C_1M10^7	NIL
9	C_1M10^9	NIL
10	A_2M10^5	NIL
11	A_2M10^7	NIL
12	A_2M10^9	NIL
13	B_2M10^5	NIL
14	B_2M10^7	NIL
15	B_2M10^9	NIL
16	C_2M10^5	NIL
17	C_2M10^7	NIL
18	C_2M10^9	NIL

Table 4: Colony Morphology of Bacteria for Nutrients Agar and macConkey Agar

S/N	ISOLATE	MARGIN	COLOUR	ELEVATION	TEXTURE	OPACITY	SHAPE
1	A_2N^52	Entire	Opaque	Flat	Moist	Opaque	Irregular
2	$A2N^51$	Entire	Opaque	Flat	Moist	Opaque	Irregular
3	A_2N^54	Entire	Opaque	Flat	Moist	Opaque	Irregular

4	B_2N^71	Entire	Opaque	Flat	Moist	Opaque	Irregular
5	A_2N^72	Lobate	Milky	Flat	Mucoid	Opaque	Irregular
6	A_1N^53	Entire	Milky	Convex	Moist	Translucent	Irregular
7	B_1N^91	Filamentous	Milky	Flat	Moist	Opaque	Irregular
8	B_1N^52	Entire	Opaque	Flat	Mucoid	Opaque	Irregular
9	B_1N^51	Undulate	Opaque	Convex	Moist	Opaque	Irregular
10	C_1M^51	Entire	Opaque	Flat	Moist	Translucent	Irregular
11	A_1M^55	Undulate	Red	Flat	Moist	Translucent	Irregular
12	A_1M^52	Entire	Opaque	Flat	Moist	Opaque	Irregular
13	C_1M^54	Entire	Brown	Flat	Mucoid	Opaque	Irregular
14	A_1M^53	Entire	Brown	Flat	Moist	Opaque	Irregular
15	B_2N^72	Undulate	Milky	Convex	Moist	Opaque	Irregular
16	A_1N^54	Lobate	Milky	Flat	Mucoid	Translucent	Irregular
17	A_2N^55	Erose	Milky	Flat	Moist	Opaque	Irregular
18	A_2N^71	Entire	Red	Flat	Moist	Opaque	Irregular
19	C_1N^51	Lobate	Red	Flat	Mucoid	Opaque	Irregular

Keys:

A= Station A, B= Station B, C= Station C,N= Nutrient Agar, M= MacConkey Agar

Table 5: Biochemical Test of the Isolates from the Water Samples

S/N	Isolates	Gram Stain	Spore formatn	Catalase	Oxdase	Mannitol	Yellow pigmnt	Glucose ferment	Starch Hdr	Fructose	Maltose	Lactose	Galactose	Strict Anaerobes	Methyl Red	Vogues	Citrate	Indole	Probable Numbers
1	A_2N^72	+C	-	+	-	-	-	-	-	-	+	+	+	-	-	-	-	-	*Staphylococcus aureus*
2	A2N^{9}1	+R	-	+	-	-	-	-	+	-	+	+	+	-	-	+	-	-	*Corynebacterium kutsceri*
3	A_2N^54	-R	-	-	-	-	-	-	-	+	S	+	+	-	-	-	+	+	*Citrobacter diversus*
4	B_2N^91	+R	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	*Corynebacterium xerosis*
5	A_2N^72	+R	+	+	-	-	-	-	-	+	-	+	+	+	-	-	-	-	*Clostridium spp*
6	A_2N^53	+R	-	+	-	-	-	-	+	+	+	-	+	-	-	+	-	-	*Corynebacterium kutsceri*
7	B_2N^91	+R	+	+	-	-	-	-	-	+	+	-	+	+	-	-	-	-	*Corynebacterium spp*
8	B_2N^72	+R	-	+	-	-	-	-	+	+	-	-	+	-	-	+	-	-	*Corynebacterium kutsceri*
9	B_2N^91	-R	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	*Salmonella spp*
10	C_1M^91	+R	-	+	-	-	-	-	+	-	+	+	+	-	-	+	-	-	*Corynebacterium kutsceri*
11	A_1M^55	+R	-	+	-	-	-	-	+	+	+	+	+	-	-	-	-	-	*Corynebacterium kutsceri*
12	A_1M^52	-R	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	+	*Escherichia coli*
13	C_1M^54	-R	-	-	-	-	-	-	-	+	-	+	+	-	-	-	+	+	*Citrobacter diversus*
14	A_1M^53	+R	-	+	-	-	-	-	-	+	+	-	+	-	-	+	-	-	*Corynebacterium kutsceri*
15	B_2N^72	-R	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	+	*Escherichia coli*
16	A_1N^54	+R	-	+	-	-	-	-	-	-	+	-	+	-	-	-	-	-	*Corynebacterium xerosis*
17	A_2N^55	+R	-	-	-	+	-	-	-	-	+	+	+	-	-	-	-	-	*Corynebacterium xerosis*
18	A_2N^71	+R	-	+	-	-	-	-	+	-	+	+	+	-	-	+	-	-	*Corynebacterium kutsceri*
19	C_1N^91	+R	-	+	-	-	-	-	+	+	+	+	+	-	-	+	-	-	*Corynebacterium kutsceri*

KEYS: GR= Gram Reaction, CAT= Catalase, OXI= Oxidase, LAC= Lactose, GLU= Glucose, SH= Shape, YP= Yellow Pigment, MAN= Mannitol, FRU= Fructose, GAL= Galactose, MAL= Malatose, IND= Indole, MR= Methyl Red and VP= Vogues- Praskauer test

Table 1 revealed physical and chemical parameters of the sample stations, station A has high pH value followed by B (6.80mg/L) and C (6.66mg/L). The pH values were acidic across stations and were within the standard values of drinking water. Highest temperature was recorded in station C (33.1^{o}C) while A (32.5^{o}C) B (32.8^{o}C). Turbidity values were high in all stations with the highest values in station C (8.32 Ntu). Low values of EC and TDS were recorded across the sampling stations. COD values were also higher across the stations with highest value in station C (5.95 mg/L). DO and BOD had values that were within the recommended limits for drinking water. Station A (6.0 X10^{5}) has high coliform count using NA while B(4.0 x 10^{5}), station C had higher values with NA with diluents 7and 9 which are 7.0 x10^{7} and 6.0 x 10^{9}, others were low. Aside station A with Mackonkey that revealed 5.3 x10^{3}, and C_1M10^{3} (21.2x10^{5}), all other samples showed no microbial growths. Morphological identification revealed elevation to be flat, moist, opaque and irregular shapes with some of the samples revealing mucoid texture and translucent (Table 2).

Biochemical tests showed that station A, had negative reaction with all the text except in maltose, lactose, Galactose in number 1&2 and the 3rd sample revealed positive to citrate and Indole tests. Probable organisms were *Staphylococcus aureus, Corynerbacterium kutsceri,Citrobacter diversus, Salmonella species,Clostridium spp., Corynerbacterium xerosis e.t.c.* Stations A and B (4,5,6,7,8,9) mostly revealed negative reactions for most parameters with the exception of some that showed positive reaction to Glucose, Galactose e.t.c.10-19 samples revealed positive reactions with the above parameters. Common probable organisms from this biochemical test was *Corynerbacterium kutsceri.*

Discussion

In Nigeria, majority of the rural populace depends on river, streams and well water because they do not have access to potable water for their domestic use. Overtime, accounts of natural water and other sources of water supply qualities in Nigeria have not been satisfactorily reported with microbial contamination exceeding permissible level and harbouring harmful genes (Esharegoma *et al*., 2018). In this study, the physicochemical parameters and bacteria analysis of Ogun river was investigated to establish its safety and domestic use. Results of the present study revealed unacceptable limits of most of the parameters investigated. The pH values indicated that the water was slightly acidic. Afrin *et al.* (2015) and Ahmed *et al.* (2016) observed that the pH values of the Turag River water were basically consistent with the values found in this study. According to the present result, the pH value variation was within the permissible limit for diverse uses such as irrigation, domestic purposes, and

recreational purposes. The normal range of pH for surface water systems is 6.5 to 8.5, and the optimum limit for irrigation and fish culture is from 6.5 to 8.0 (Doe, 1997). The temperature range of the present study is above limit of WHO and SON. Temperature is an important parameter for aquatic environment; it is governed by physical, chemical and biochemical properties. The temperature range gotten for the present study were more than the standard limits could be due to dry season in which the samples were taken and may affect the dissolved oxygen level in water and photosynthetic activities of aquatic plants with higher conductivity. Temperature variation in the Turag River water which is similar to the value obtained in the present study may act as a limiting factor for the survival of aquatic populations and the biotic community (Whitehead *et al*., 2009 and Islam *et al*., 2021). Infact, the present study indicated decomposition in the water samples and pollution due to increase in temperature and turbidity levels.

The highest turbidity level was obtained in station C due to the activities of herd's men who are moving their cows around for feeding in which they might release their faeces in the water while sample A and B could be due to lesser human activities and also surface run-offs. This is in line with the report of Kalua and Chipeta (2005) who reported highest level of turbidity in Arungbungbun river, Kebbi State.

The EC and TDS values that were within the standard limits may be associated with active ionic reaction of the water body. Tahmina *et al.* (2018) observation is similar to the present result, who reported that the average EC values of the Turag River water demonstrated relatively lower EC values. These differences might be due to the different sampling points, and the tidal effects.

Similar report of low TDS has been previously reported in Orogodo river and groundwater in Agbor, Delta State (Esharegoma *et al.,* 2018). Low concentrations of total solids can result in limited growth of aquatic organisms due to nutrient deficiencies and flat taste because it is devoid of many minerals which help maintain a healthy body.

The COD concentrations in the present study that were higher than that reported by Banu *et al.* (2013) (10.2 mg/L), might be due to the runoff from industrial and municipal discharge loads from Ibadan city. In the dry season, the water flow declines, and therefore the growth of microorganisms increases profoundly, providing another potential source of the high COD values which deteriorate the COD pollution in the river water.

The DO concentrations of the collected water samples at the three points varied from each other and were within the standard limits, this may be due to the trees surrounding the water body that supplies fresh air into the water body. The present study is related

to the observed DO concentration in the Turag River for the summer season. The study shows that as the dissolve oxygen decreases, the biochemical oxygen demand also decrease., The decrease in DO in station B might result from the industrial wastewater discharged as well as the municipal waste loads, which require a higher level of oxygen for chemical oxidation and decomposition. This generates elevated anoxic conditions (reduced supply of oxygen), a deficiency of nutrient availability, and an increase of organic substances loading and pathogens in water (Uddin and Jeong, 2021).

The BOD values for the Ogun River water were within the permissible limits reported in terms of drinking water. Tahmina *et al.* (2018) reported that BOD values were also within the recommended limits in the Turag River water.

The range of total bacterial count for all the samples evaluated in this study was between 1 x 10^5 and 21.2 x 10^5 (cfu/ml), the values obtained exceeded the normal acceptable limits of 0/100ml (cfu/ml) recommended by the WHO. High bacterial count in this study suggests high pollution of the water body and the surrounding soil by municipal waste. It appears most results obtained are always above the WHO recommended limit hence suggesting high prevalence of poor water quality among the investigated stations, of which if consumed or used for domestic purpose may lead to waterborne disease infection or an outbreak of disease such as cholera, pneumonia, joint infection, diarrhoea, dysentery, typhoid, polio and so on. This agrees with the work of Ewa *et al.* (2011) who reported that faecal coliform can be found in water contaminated by human and animal waste. The presence of enteric organisms (*Enterobacteriaceae*) indicates faecal contaminations by human and other animals. The occurrence of high coliform counts increases the probability of other pathogenic organisms such as *Cryptosporidium* species which has the greatest occurrence of about 42.1% (USEPA, 2012) and other dangerous microorganisms. The presence of *E. coli* is also used as an indicator to monitor the possible presence of other harmful microbes such as *Citrobacter diversus, Staphylococcu aureus Salmonella* spp and *Clostrium* spp. The result also agrees with the work of Shafi *et al.* (2018) whose work on river water sources in Venda communities, showed high bacterial counts as a result of pollution. They found elevated levels of faecal coliforms and *E. coli* in the rivers which are above the WHO permissible limits.

The very high contamination may be due to the non-hygienic disposal of faecal waste and anthropogenic activities in water bodies as well as the period of the study which are months of dry season, as a result water may be contaminated. This result compared favourably with the report of Ibiene *et al.* (2012) which indicated that the presence of bushes and shrubs makes it possible for smaller mammals to come around these water bodies to drink water, thereby passing out faeces into and around water bodies.

The high *E. coli* count is unacceptable as well as other pathogenic organisms by the WHO (2006) standard guideline which is supposed to be less than 10 Cfu/ml. However, *E. coli* observed was about 10.5%, which is above WHO permissible standard of zero. *Escherichia coli* count is used extensively as a basis for regulating the microbial quality of drinking water. Its presence in drinking water pose serious threat to health of consumers since it's an intestinal parasite indicating faecal contamination (Rose *et al*., 1993). The organism also poses ecological hazard in rivers where it increases the dissolved oxygen demand and biochemical oxygen demand (Olayinka *et al*., 2013).

Conclusion

Water quality is one of the main issues in the water sector all over the world and its improvement is a major concern. This study revealed that Ogun River along Iseyin-Ibadan was polluted from different waste discharge, open defecation and washing of clothes in the areas. Station C has revealed large number of pathogenic organisms like *Citrobacter diversus, Staphylococcus aureus Salmonella spp* and *Clostridium spp* compared to other stations due to herds men activities. From these water samples, some selected physico-chemical parameters (pH, turbidity, EC, TDS, temperature, COD, DO, and BOD) were analyzed to examine the water quality status. From the analysis of the water samples examined, most of the physico-chemical parameters values were within the limit of WHO and SON drinking water guidelines while temperature, COD, and turbidity were above the WHO and SON limit. As a result of high temperature there is high decomposition of organic material which may leads to high floating of materials and also responsible for the increase of COD value. So, this water should be monitored by the government. However, the microbial assemblage from this river indicated that there may be outbreak of waterborne disease infections such as cholera, pneumonia, joint infection, diarrhea, dysentery, typhoid, polio and so on.

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