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Faecal coliforms in Domestic Water Supply in Mubi North Local Government, Nigeria

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ABSTRACT

The study examines the faecal coliforms in domestic water supply in Mubi North Local Government Area, Nigeria. Coliscan Gel Method - Apparatus, calibrated dropper, sample bottle, petri dish, incubator, and pipette used to analyze water quality. The reagents used are sterilizer, liquid coliscan and ice. A sterile calibrated dropper is used to collect 1 milliliter of water sample and deposited the sampled water into the bottle containing liquid coliscan medium. Coliscan water pours into a pretreated petri dish and smears to cover the entire bottle of the Petri dishes. Petri dishes containing the coliscan water mix in a warm place and incubate for 24-48 hours (the incubator holds a temperature range of 850-950^{o}F). Purple colonies in the Petri dishes count faecal coliform (E.Coli). The general assessment of the catchment areas shows that some deep and shallow wells are safe, others are contaminated by fewer pools and spillage from a waste of soak-away in a congested settlement like the Shuware community. The River Yadzaram accommodates a lot of waste from the flash runoff, particularly at the approach of every rainy season. Bacteria microbes from agricultural and storm runoff, carrying wastes from birds, mammals, and human sewage discharged into the river.

Keywords: *domestic water supply, faecal coliforms,*

INTRODUCTION

Water is essential component of life. Water is of fundamental importance to human life, animals, and plants (Osunkiyesi 2012). It is of equal importance with the air we breathe in maintaining the vital processes of life, and it makes up 60% of body weight in the human body (Bonjoch *et al*., 2004). Water is one of the substances that help in sustaining life on earth; life sustenance becomes difficult without it (Simon-Oke *et al.,* 2020). Water is indispensable for life. However,

water is a source of acquiring pathogenic agents such as bacteria, viruses, and parasites. Despite its importance in the sustenance of life and livelihood, it is the cause of morbidity and mortality because of limitations in access and quality (Andrew, 1998 and USAID, 1992). Water-borne infections threaten public health, especially in developing countries (Oyedeji *et al.*, 2010).

Water-borne diseases are contacted through the consumption of polluted water containing human and animal faecal matter from patients or healthy carriers (Chigor *et al.,* 2012). Water quality problems and massive contamination remain unsolved to the transmission of various water-borne diseases (Simon-Oke *et al*., 2020). According to Franco *et al*. (2012), food and water-borne infectious diseases currently infect 3.5 billion people in developing countries and cause about 160,000 deaths yearly; 80% of these happen to children (Abdullahi *et al*., 2018). Good quality water to human physiology and its continued existence depends very much on its availability (Okonko *et al.*, 2008).

According to Simon-Oke *et al.* (2020), domestic water is from sources like boreholes, tap water, well water, dams, rivers, streams, lakes, municipal water, and rainwater. Surface water is the main source of domestic water in rural areas (Sudi *et al.*, 2017). Local water sources such as wells, boreholes, ponds, and streams need protection from pollution and contamination by potential parasites and harmful chemical substances (Chollom *et al.,* 2013). Groundwater is the water that exists in the pore spaces and fractures in rock and sediments beneath the earth's surface (Sudi *et al.,* 2017). Groundwater ought to be physically, chemically, and microbiologically non-polluted; thus safe for domestic, agricultural or industrial uses (Santra, 2005). The two common types of groundwater are borehole and hand-dug wells. The main problem encountered by the public is groundwater contamination. Groundwater contamination with toxic metals takes place due to leaching from toxic waste dumps or crustal layer of the earth through biotransformation, agricultural chemicals, industries, abattoir activities, pesticides use, and from animal faecal discharges into surface and groundwater due to washing by rainfall (Tijani *et al.*, 2004; Santra, 2005; Iornumbe and Onah, 2008; Odewande and Abimbola, 2008; Oko, 2008; Makinde, 2008; Laniyan *et al.,* 2013).

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Quality water should be free from chemical and biological contaminations and must be acceptable in terms of colour, taste, odour, and organic and inorganic matter (Chollom *et al.*, 2013). Pollution of groundwater with pathogenic microorganisms results from migration or the introduction of faecal material from humans and animals into the subsurface (Simon-Oke *et al.*, 2020). Faecal pollution can reach groundwater from many concentrated pond sources such as cesspools, landfills, leaking sewer lines, and filled septic systems (Sadallah and Al-Najar, 2014). Faecal oral route is the transmission of parasitic infections to humans via poor personal hygiene and environmental conditions like contamination of soil and water sources with human faeces (Okojokwu and Inabo, 2012). Excreta-related communicable diseases have become a problem in areas where untreated human faeces are manure (Alli *et al*., 2011). The human faecal wastes deposited in the environment are regularly washed into the communities' water bodies to pollute the water and threaten public health (Assafa *et al.,* 2004). World Health Organization (WHO) (2010) reports that more than 80 infectious diseases are from water (Ayaz *et al.*, 2011). UNICEF (2008) estimated that 1.1 billion people lack access to an improved water source and more than three million people die annually from water-related diseases. The greatest danger associated with drinking polluted water is the ingestion of dangerous pathogens and toxic compounds (Todd, 1959). Sudi *et al*. (2017) argue that the effects of water pollution on human health could probably be responsible for more illnesses in humans than any other environmental influence.

Mubi North faces a rapidly growing population with unplanned urban settlements and traffic congestion. However, Old Market-Motor Parks and New Market-Motor Parks are in Mubi north. The communities live around the rive catchment and tributaries. Most of the communities are set-ups of hoodlums and slums. Irrigation farming and rain-fed agricultural activities are common and continuous throughout the year. Most of the predominant primary and secondary schools and tertiary institutions are in the area. Several cases of water wash and water-borne diseases are common and frequent occurrences.

Mubi North situates on longitude 10'97oN and Latitude 13'16oE flanks by the Mandara Mountains. River Yadzaram crosses Mubi Town transverses from the South region to the Mubi North region and flows northeast into Lake

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Chad. Mubi town is on basement rock beneath the earth's crest. The soil structure is sandy loamy. The population of Mubi North as a town is 300,000 people. It is a cosmopolitan centre. Most of the domestic water supply of Mubi depends on water vendors. The water vendors comprise water pushers and commercial and organizational water tanks that supply domestic water. Mubi water board is not functioning for the past 30 years because of the attitude of the past poor administrators with corrupt political administrators who crumbled and vandalized the water board equipment. The experimental samples of coliforms were in the Mubi North Local Government Area of Adamawa State. These samples of domestic drinking water were collected and analyzed in the laboratory.

The study examines faecal coliforms in the quality of domestic water supply in the Mubi North Local Government Area. Specifically, the objective is to test the human faecal coliforms in the quality of domestic water supply in the Mubi North Local Government Area.

MATERIALS AND METHOD

Testing Apparatus

Coliscan Gel Method was used for the detection of the faecal coliforms in domestic water. The apparatus used are calibrated dropper, sample bottle, Petri-dishes, incubator, and pipette. The reagents used are sterilizer, liquid coliscan and ice.

Sample Collection

The stoppers or caps of the sampled bottles should be removed. The inside cap should not be touched before the water sample into the bottle. When samplings, use long hand gloves and hold the bottle near its bottom base, and plunge it (opening down ward) below the water surface. Then emerge the bottle underwater into the water current away from you. Avoid sampling the water surface because the surface phylum is often bacteria, the representative of the river. Also, avoid sampling the sediment for the same precaution unless it is

intentional when collecting samples; allow some space in the sample containers to mix the water before pipetting. Several samples should be collected from a single location to minimize the variability that arises with sampling bacteria. Sterilization should occur between sampling sites. Samples should be tested within one hour of collection. If it is not possible, the sample bottle should be placed on ice and tested within six (6) hours.

Testing Procedure

i. Use a sterilized calibrated dropper to collect 1 milliliter of water sample and deposited the sample into a bottle containing liquid coliscan medium.
ii. Pour the Petri dishes containing the coliscan water mix into a warm place and incubate for 24-48 hours (the incubator holds a temperature range of 850-950^{o}F.
iii. Pour the coliscan water into pretreated Petri dishes and smear to cover the entire bottom of the Petri dishes.
iv. Place the Petri dishes containing the coliscan water mix in a warm place and incubate for 24-48 hours (the incubator holds a temperature range of 850-950^{o}F.
v. Finally, count the purple colonies in the Petri dishes as faecal coliform (E-Coli). Other colonies may be noted but not classified as faecal colonies.

Determination of E.Coli Colonies

In the final experimental analysis, the presence of purple colonies in the Petri dishes is as faecal coliform (E.Coli). Other colonies may be noted but not classified as faecal colonies.

RESULTS AND DISCUSSION

Observable parameters show that the totality of the residents in the Mubi North obtained water from different sources. The community has been in and under the danger of drinking water from contaminated sources supplied by the water vendor. That was why in the past, hospital records have shown several cases of

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the epidemic of water wash and water-borne diseases, with a high mortality rate in 2016, an outbreak of cholera epidemics.

Table 1: Faecal Oral Transmitted Disease (FOTD)

Causative Organism	Diseases	Mode of Transmission	Host	Major Symptoms
i. Hepatitis Virus	Infection	Water	Man	Swollen liver, fever, headache and jaundice
ii. Poliomalysis Virus	Infant paralysis	Water	Children	High fever, headache, stiffness of limbs
iii. Typhadrus bacteria	Typhoid fever	Food and water	Man	High temperature with diarrhea
iv. Salmonella Spp.	Food poisoning	Infected food	Man	Headache, restlessness abdominal pain and diarrhea
v. Typhamoabic dysentery	Amoebic dysentery	Food and water	Man	Abdominal pain, heavy vomiting and diarrhea
vi. Shigella dysentery	Bacilli dysentery	Food and water	Man	Fever, abdominal pain and diarrhea
vii. E.coli	Intestinal wound infection	Water	Man	

Source: Laboratory Water Quality Analysis, 2021.

Table 2: Kolere Ward, Water Sample Analysis

S/N	Sample Name	Tested Parameters	Results	WHO Standard	Remarks
1	Sample A Kolere Borehole Water, Anguwan Remi	Faecal coliform	0FC	0-1FC	Excellent Water category
2	Sample B Kolere River, Yadzaram embankment	Faecal coliform	3FC	0-1FC	Not accepted safe water
3	Sample C Kolere Centre Well Water	Faecal coliform	0FC	0-1FC	Excellent Water Category

Source: Laboratory Water Quality Analysis, 2021.

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Table 3: Shuware Ward Water Sample Analysis

S/N	Sample Name	Tested Parameters	Results	WHO Standard	Remarks
1	Sample A Shuware Borehole Water, Anguwan Remi	Faecal coliform	0FC	0-1FC	Excellent Water category
2	Sample B Shuware Borehole Water	Faecal coliform	0FC	0-1FC	Excellent Water Category
3	Sample C Shuware Well Water, River Yadzaram embankment				

Source: Laboratory Water Quality Analysis, 2021.

Table 4: Yelwa Ward Water Sample Analysis

S/N	**Sample Name**	**Tested Parameters**	**Results**	**WHO Standard**	**Remarks**
1	Sample A New Market Borehole Water	Faecal Coliform	0FC	0-1FC	Excellent Water category
2	Sample B Yelwa Central Well Water	Faecal Coliform	1FC	0-1FC	Accepted Water Category
3	Sample C Yelwa Well Behind Abattour, Stream Water	Faecal Coliform	220FC	0-1FC	Poor unsafe Water Category

Source: Laboratory Water Quality Analysis, 2021.

Table 5: Wuro-Gude Ward Water Sample Analysis

S/N	**Sample Name**	**Tested Parameters**	**Results**	**WHO Standard**	**Remarks**
1	Sample A Wuro-Gude Borehole Water materials	Faecal Coliform	0FC	0-1FC	Excellent Water category
2	Sample B Wuro-Gude Well Water Boma Inn	Faecal Coliform	0FC	0-1FC	Excellent Water Category
3	Sample C Wuro-Gude River Water Yadzaram down stream	Faecal Coliform	245FC	0-1FC	Dangerous Water Category

Source: Laboratory Water Quality Analysis, 2021.

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Water Quality Analysis Coliforms based on the World Health Organization Standard (in colonies 100 milliliters)

	Parameter
1. Drinking water	0-1FC
2. Total body contact (swimming pool etc)	200FC
3. Rental body contact	1000FC
4. Treated sewage effluent not to exceed	200FC

The general assessment from the study area shows that many boreholes (deep wells) are provided by Non-governmental Organisations (NGOs). These wells are the safe and conventional source for domestic water consumption in Mubi North local government area. The boreholes were few and covered only a few households within the communities. Some shallow wells-water are safe while others are contaminated by fewer pools and spillage from the waste of soak-away in congested settlements, especially Shuware and Yelwa communities.

The River Yadzaram accommodated a lot of waste and fresh runoff, particularly at the sets of every rainy season. That is why there are epidemic cases almost every year. Direct domestic use of the Yadzaram water and shallow wells in the river's natural embankment is at the danger of faecal contamination by human toiletries and animals.

Spillage is beneath the water table or aquifer. Bacteria and microbes can enter the river directly or from agricultural activities and storm runoff, carrying wastes from birds, mammals, and human sewage into the water. Faecal coliforms by themselves are not dangerous (pathogenic) organisms.

Faecal coliform bacteria naturally occur in the human digestive tract and aids in the digestion of food. In infected individuals, pathogenic organisms were along with faecal coliform bacteria. However, if faecal coliform counts are higher (over 200 calories per 100 milliliters of water sample) in the river, there is a greater chance to obtain sock from swallowing diseases causing organisms or pathogens entering the body through cuts on the skins, the nose, mouth or the ears. Diseases and illnesses – such as typhoid fever, hepatitis, gastroenteritis, amoeboid dysentery, and ear infections are in waters with high faecal counts. Pathogens are relatively scarce in water, making them difficult and time-

consuming to monitor directly. Faecal coliforms level (detector organisms) is because of the correlation between faecal coliforms counts and the probability of contracting a disease from the water.

CONCLUSION

This study examined faecal coliforms in the quality of domestic water supply in the Mubi North Local Government Area. The specific purpose was to test the human faecal coliforms in the quality of domestic water supply in the Mubi North Local Government Area. The justification was to assess the quality of domestic water supply in Mubi North for human faecal coliforms in the water sources available.

Consequently, faecal coliform bacteria naturally occur in the human digestive tract and aids in the digestion of food. In infected individuals, pathogenic organisms were along with faecal coliform bacteria. However, if faecal coliform counts are higher (over 200 calories per 100 milliliters of water sample) in the river, there is a greater chance to obtain sock from swallowing diseases causing organisms or pathogens entering the body through cuts on the skins, the nose, mouth or the ears. Diseases and illnesses – such as typhoid fever, hepatitis, gastroenteritis, amoeboid dysentery, and ear infections are in waters with high faecal counts. Pathogens are relatively scarce in water, making them difficult and time-consuming to monitor directly. Faecal coliforms level (detector organisms) is because of the correlation between faecal coliforms counts and the probability of contracting a disease from the water.

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