**ASSESSMENT OF PHYSICO-CHEMICAL AND MICROBIOLOGICAL QUALITY LASENA ALKALINE WATER AND ZAMZAM WATER AND THEIR INHIBITORY ACTIVITIES AGAINST MICROORGANISMS**

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**ABSTRACT**

Water is the most indispensable required element to healthiness. Water needs to be checked periodically to ascertain their fitness for human consumption. This study was aimed at checking efficacy of Alkaline water for inhibitory activities against microorganisms. It was also done to determine the significance of alkaline water on human health. Four litres of Zamzam water was obtained through Hajj immigrants from Mecca and Lasena mineral water was recovered from Opic, in Nigeria. The waters were analysed for physicochemical parameters, antimicrobial activities and antimicrobial tests was carried out. Results obtained from this study revealed that Zamzam water has higher conductivity value of 2799µS/cm as compared to the Artesian mineral water value of 670µS/cm. Iron in the samples was within the specification standard, Lead was not detected in Lasena Alkaline water and of no significance in Zamzam water. Furthermore, Zamzam water and Artesian mineral water were observed to have a unique antibacterial activity on *Helicobacter pylori*y and showed antifungal activities. However, the folklore claims of anti-peptic ulcer of Zamzam water and Artesian mineral water against *Helicobacter pylori* and Fungi. It was concluded that Zamzam water and Artesian mineral water are rich in essential mineral profile, antibacterial and antifungal properties.

**Keywords**: Physicochemical, Microbiological quality, Lasena water, Inhibitory activity, Microorganisms, ZamZam water

**1.0 INTRODUCTION**

Water is largely needed for survival by all living things for both large and small. Water sustains life, but pure water guarantees life (Svagzdiene *et al.* 2010; Onajobi *et al.* 2019; Onajobi *et al.,* 2021). Water can neither be created nor destroyed, and to uphold this basic rule, everything returns its fair share of water to the central pool when they have expired. Good water must be clean for better value (Nuaman, 2013; Omoni *et al.* 2019). For human survival and even lower animals, water is required essentially for metabolic functions and homeostasis (Shomar, 2012).

The body of humans consist of 69% water (adult males), (females 50%) and 70% by weight in new born young babies. Nutritional water requirement in person is approximately estimated to be two litres in an average adult per day (EFAS, 2010). Required volume amount of water is needed for good wellbeing and healthy balance (Ghrefat, 2013; Onajobi *et al.,* 2021).

The physicochemical and microbiological parameters of a potable drinking water must be maintained as well is safety and quality. This is to make sure that it is not deleterious to consumption by the person taking it. Potable water consumption must be free of unwanted pollutants that are harmful, such as pathogens, toxins, physico-chemical residues, and also objectionable properties including odour, colour, and taste (David *et al.* 2011; Onajobi *et al.* 2019).

Raw and unaffected water source is the substance collated instantly via ground and untouched location stratum which is protected from possible contamination (Madina and Koko, 2010; Omoni *et al.* 2019). It has characteristics of contained definite mineral salts and their relative proportions and by constancy of its composition. This water should be suitable for direct consumption without any further treatment and may be filled in suitable containers made up of recommended materials or in sterile glass bottles and properly sealed (Omoni *et al.* 2019). It is important to know that raw and unaffected mineral water have to be tested from various channels of supply in line with its physical information, that checkmate a well comprehensive analysis of the formation site, considering and taking cognizance to the raw nature of the land (Nouri and Abdulkarium, 2014).

To decide the nature of water, a few boundaries should be inspected. Among the key boundaries recorded by World Health Organization (WHO) and Nigeria Industrial Standard (NIS) for the assurance of water quality are conductivity, broken up oxygen (DO), pH, shade of water, taste and odour, turbidity, complete suspended solids (TSS), synthetic oxygen interest (COD), biochemical oxygen interest (BOD) (NIS, 2017; WHO, 2017), miniature creatures, for example, waste coliform microbes (*Escherichia coli*), *Cryptosporidium* and *Giardia lamblia*; supplements (manures), disintegrated metals and metalloids (lead, mercury, arsenic and soon) and disintegrated organics (WHO, 2011; Mohammed, 2015).

An Artesian aquifer is a geologic layer of porous and permeable material such as sand and gravel, limestone, or sandstone, through which water flows and is stored. An artesian aquifer is aconfined aquifer containing ground water under positive pressure. This pressure enhances the water level to be raised to the point where hydrostatic equilibrium can be reached and it is called an artesian well. If the water, as propelled, reaches the ground surface under such natural pressure, it is referred to as a flowing artesian well (Albertini *et al.* 2010).

Alkaline water is water that has a pH value higher than 7. Natural alkaline water bodies are usually springs whose water has passed through rocks and has thereby dissolved basic minerals such as calcium, magnesium, bicarbonate, etc. The rock structure holding the water may have basic minerals, such as calcium or limestone, that leak into the water, increasing the pH. Some companies, such as Poland Springs, have their own springs that they bottle water from. The Mommoth Hot Spring in Yellowstone National Park are examples of alkaline springs (Joshua *et al.,* 2014).

The coliform gathering of microscopic organisms has been utilized for quite a long time as a pointer of water quality with the reasoning that the shortfall of these microbes in a water framework is a proof of water liberated from waterborne microorganisms (Nouri and Abdulkarium, 2014). As coliforms are available in enormous numbers in the typical digestive greenery of human and warm blooded creatures, they are a pointer of the presence of pathogenic gastrointestinal microorganisms from contaminated people. Notwithstanding, the general obstruction of different pathogenic miniature creatures is wide running and ward on natural conditions like temperature, inactivating factors, water medicines and others(Joshua *et al.,* 2014; Onajobi *et al.*, 2020).

An artesian aquifer is confined between impermeable rocks or clay which causes this positive pressure. The recharging of aquifers happens when water table at its recharge zone is at a higher elevation than the head of the well. Water from the source may not be different, but it reaches the earth surface in a different manner (Mohammed and Al-Sualaiman, 2015). This study was aimed at analyzing the physicochemical parameters, Heavy metal contaminations and checking efficacy of Alkaline water for inhibitory activities against pathogenic microorganisms and also to determine the significance of alkaline water on human health.

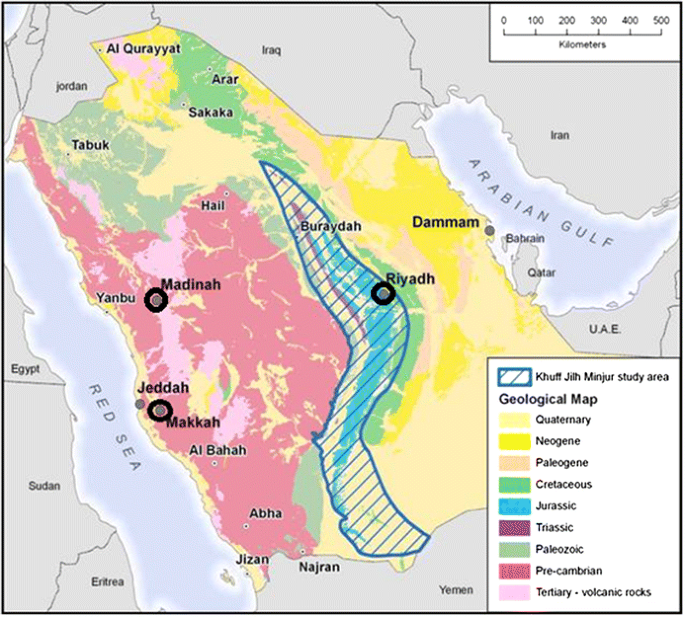
**2.0 Material and Methods**

**2.1 Study Area**

“Zamzam” a water well in the valley of Abraham, Mecca city, Saudi Arabia, the Arabian Peninsula, Asia. Mecca city is located in the western region of Saudi Arabia and is known by “Masjid al-Haram” which is the sacred Mosque of Muslims.  It is 20 m (66 ft) east of the [Kaaba](https://en.wikipedia.org/wiki/Kaaba), the holiest place in [Islam](https://en.wikipedia.org/wiki/Islam). The Zamzam well was excavated by hand, and is about 30 m (100 ft) deep and 1.08 to 2.66 m (3 ft 7 in to 8 ft 9 in) in diameter as shown in figure 1 below (Hussain and Al-Fatlawi, 2020). Lasena water is located high above a pristine, serene and hygienic mangrove rain forest region of West Africa, tropical rain clouds begin to form. The water is located in Opic, Isheri North Local Government Area, Ogun state, Nigeria, south western geopolitical zone of Nigeria as shown in figure 2 below.  The tropical rain falls on this majestic pristine rain forest, slowly filtered by 16 layers of soil formation mainly clay, with each drop, it slowly gathers natural minerals and electrolytes that creates the clean, crisp, refreshing, and soft smooth texture of Lasena Water. Lasena Water settles 522 meters below the earth crust in a natural artesian thermal aquifer with a natural temperature of 70 degrees Celsius protected and preserved from external elements. It is a known that no disease can survive in an alkaline environment.

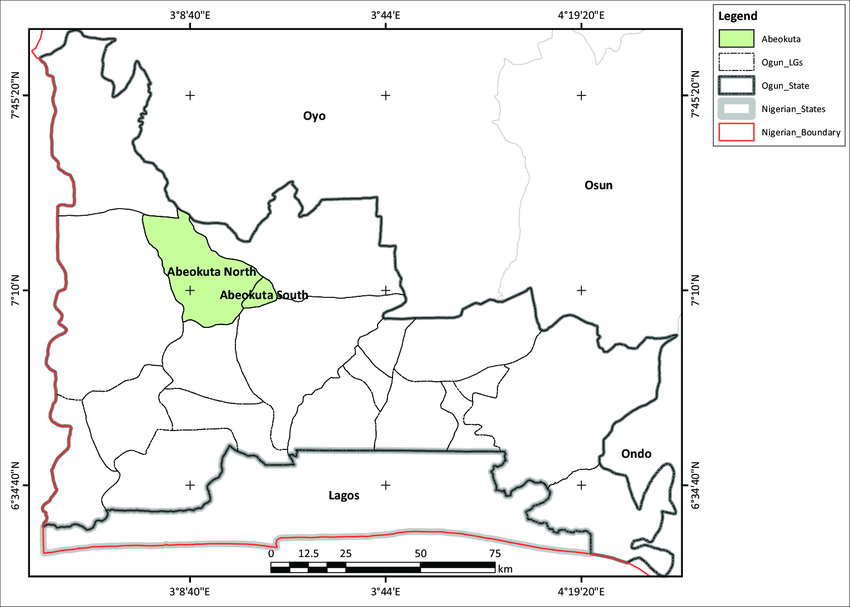
**2.2 Sample Collection**

Samples of Zamzam water was obtained from Saudi Arabia (Mecca) and while Artesian Mineral Water (Lasena Artesian Water) from Opic in Ogun State Nigeria. The Zamzam Water is a [well](https://en.wikipedia.org/wiki/Water_well) located within the [Masjid al-Haram](https://en.wikipedia.org/wiki/Masjid_al-Haram) in [Mecca](https://en.wikipedia.org/wiki/Mecca), [Saudi Arabia](https://en.wikipedia.org/wiki/Saudi_Arabia), 20 m (66 ft) east of the  (Nuaman, 2013). None of the samples where neither treated with any chemical nor with procedure. The analyses were carried out at the Faculty of Science, Department of Microbiology Olabisi Onabanjo University Ago-Iwoye, Ogun State, Nigeria. All glass wares used were properly washed and drain-dried. Media were prepared according to the manufacturer instruction under aseptic conditions. At the end of the sterilization period, media were cooled to 45oC in water bath. The physico-chemical parameters and microbiological assessment were determined according to standard procedures.



**Figure 1: Geological map of Saudi Arabia showing the locations of sampling Zamzam waters in Makkah (Mecca) Alocarama, Madinah Almoawara, and Riyadh city (The original well is located in Mecca)**

**Source: https://www.google.com/url?sa=i&url=https%3A%2F%2Flink.springer.com-**



**Source:** Baloye and Palamuleni, (2016)

**Figure 2: Geographic map of Lasena mineral water**

**2.3 Physicochemical Analysis of Water samples**

The physicochemical analysis of the water samples were carried out using standard analytical methods. Parameters such as temperature and pH were determined on the field using thermometer and pH meters respectively. Turbidity, Electric conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Dissolved oxygen (DO) were determined according to the procedures of Olutayo *et al*., (2018). Heavy metal analysis including Lead(Pb), Zinc (Zn), Iron (Fe), Manganese (Mn), Cromium (Cr), Vandanium (V), Pottasium (K), Magnesium (Mg), Calcium (Ca) and Sodium (Na) were also determined at the Federal Institute of Industrial Research, Oshodi (FIIRO) Lagos state using standard methods (Olutayo *et al*., 2018).

**2.3.1 Hydrogen ion concentration (pH):**

The pH is the measure of the intensity of acidity or alkalinity and the concentration of hydrogen ions. H indicates the intensity of acidic or basic character at a given temperature. Water pH is a measure of how acidic or base the water is and is therefore a very essential sign of water which turns chemically. The hydrogen ion (pH) determines solubility and biological availability of chemical constituent such as nutrients and heavy metals. It is measured on a scale from 0-14. pH of 7 is neutral; pH less than 7 is acidic while pH significant over 7 is basic. The closer pH gets to 1, the more acidic while the closer pH gets to 14, the more basic (Ugwu *et al.,* 2016).

**2.3.2 Electrical Conductivity (EC)**

Electrical conductivity is the measure of the capability of an aqueous solution to carry an electric current. It depends on the presence of ions, on their total concentration, mobility and temperature of measurement. High value of conductivity shows high concentration of dissolved ions(Ugwu *et al.,* 2016).

**2.3.3 Turbidity**

Turbidity, a key water quality test, is the cloudiness of the water which is an indication of the presence of suspended materials including clay, silt, finely divided organic material, plankton, and other organic and inorganic materials (Ugwu *et al.,* 2016).

**2.3.4 Dissolved oxygen (DO)**

Dissolved oxygen is an essential water quality parameter indicating the standard of water (Ugwu *et al.,* 2016).

**2.3.5 Biochemical Oxygen Demand (BOD)**

Chemical parameters include the presence of major cations and anions, arsenic, heavy metals (chromium, lead, cadmium, etc) and trace organic compounds (animal wastes) and poly atomic ions (nitrates, sulphates, carbonates, etc). These tend to pose chronic health risks through build up, some causing fatalities (Ugwu *et al.,* 2016). The most common Biological parameters are from pathogens like bacteria, viruses, fungi, protozoa and helminth. When these compositions are altered beyond the permissible levels directly or indirectly by human activities, the water is said to be polluted restricting the potential uses of the water. Polluted water sources may become the source of undesirable substances, which are dangerous for human health causing various cancers, cardiovascular or neurological diseases (Galušková *et al*., 2010).

**2.4 Microbiological Examination of Zamzam and Lasena Water Sample**

Selective and differential agar was employed for the isolation of microorganisms from the water sample. Nutrient agar for the Total Plate Count (TPC)/ Total Viable Count (TVC)/ Total Bacteria Count (TBC), Eosin Methylene Blue Agar (EMB) and MacConkeyAgar for Coliform and *Escherichia coli*. Salmonella Shigella (SS) Agar for the selective identification *Salmonella and Shigella*. Cetrimide agar used for the selective isolation of the gram-negative bacterium *Pseudomonas aeruginosa.*Thiosulfate Citrate Bile Salts Sucrose (TCBS) agar is the selective agar medium of choice for isolating *V. cholera*. Potatoes Dextrose Agar (PDA) for the isolation of mould and Yeast (Cheesebrough, 2010). All media are prepared by instruction guideline. 1.0ml water samples were dispensed into different sterile petri dishes for a pour plate aseptic technique. For bacterial organisms, plates was incubated at 37oc for 18-24 hours and For fungal organisms, plates was incubated at 30oc for 48-72 hours and results was accurately read and documented (Omojasola *et al.,* 2015; Onajobi *et al.,* 2020; Onajobi *et al.,* 2021). The water samples were analysed immediately after collection for Heterotrophic Plate count presence of *Clostridium perfringes*, *Chromo bacterium violaceum*, *E.coli*, *Klebsiella aerogens*, *Staphyllococcus aureus*, Yeast, Mould, Group of Streptococci, *Pseudomonas aeruginosa* and *Salmonella typhi* on their selective media respectively (Onajobi *et al.,* 2013a).

**2.5 Antimicrobial Activity of Lasena Alkaline Mineral and Zamzam Water sample**

The microbes used were isolated from unhealthy patients from the University College Hospital, Ibadan, Oyo state, Nigeria.The artesian water used was collected from the flowing Lasena Alkaline mineral Water thermal aquifer in Opic, Isheri North Local Government Area, Ogun state, Nigeria and Zamzam water from Mecca Saudi Arabia (Baroni *et al*., 2017). The antimicrobial effect of Lasena Alkaline mineral and ZamZam water were done using a selective media called Columbia Blood agar was prepared according to specification which was inoculated with *Helicobacter pylori*, the seeded media was bore with cork borer and each sample of alkaline water was poured into each bored hole and same procedure was done without a bore hole and a standard sensitivity disc was placed on the plate with inoculated *Helicobacter pylori* and the zone of inhibition for each sample was measured and compared according to Onajobi *et al.* (2020).

**3.0 Results**

**Physicochemical and Microbiological Properties of the Water Samples**

Zamzam water was found to have a higher conductivity value of 2799 µS/cm when compared to Lasena alkaline water mineral water value of 670µS/cm. The Standard Organization of Nigeria (SON) gave a standard limit of 1000µS/cm. Zamzam and Artesian Alkaline water have pH values of 7.73 and 7.80 respectively depicting alkalinity. The total alkalinity however, varied with alkaline mineral water having a higher alkalinity value. Total hardness value of 125mg/L was reported in ZamZam water, a value higher than the standard of 100mg/l set by SON. Calcium hardness values of both water samples however, were within standard range. Total dissolved solids value of 336mg/L and 71.56mg/L were reported for Lasena Alkaline water and ZamZam water samples respectively. The presence of noticeable bicarbonate of 163.3 and 263.3 which also enhance the therapeutic effect of these mineral water acting as an electrolyte that balances the blood pH. Chloride and Fluoride result values for ZamZam water, 161.28mg/L and 1.24mg/L respectively, were reported to be higher than the required standard. More so chloride in the samples as well as its content of copper 0.01mg/l and 0.02mg/l significantly account for the unique antibacterial and antifungal activity of the samples respectively. Also according to the figures below, with exception to magnesium, the metal components results for both water samples were found to be within SON standard specification, while a magnesium value of 14.4mg/L was reported for the Alkaline mineral water sample which was higher than the required limit.

**Table 1: Physico-Chemical Analysis Result of Zam Zam Water And Lasena Mineral Water**

|  |  |  |  |
| --- | --- | --- | --- |
| PARAMETERS | ZAM ZAM RESULTS | ALKALINE MINERAL WATER (LASENA) | SON STANDARD (NIS 306: 2008) |
| Appearance | Colourless & Clear | Colourless & clear | Colourless & Clear |
| Conductivity (µS/cm) | 2,799.0 | 670.0 | 1000 |
| pH | 7.73 | 7.80 | 6.5 – 8.5 |
| Alkalinity (mg/L) | 190.0 | 618.00 | - |
| Bicarbonate (mg/L) | 163.30 | 263.3 | - |
| Total Hardness (mg/L) | 125.0 | 49.99 | 100 |
| Calcium Hardness (mg/L) | 71.56 | 39.05 | - |
| Total Suspended Solids (mg/L) | 0.0 | 0.0 | - |
| Total Dissolved Solids (mg/L) | 71.56 | 336.0 | 500.0 |
| Phosphate (mg/L) | 0.02 | ND | - |
| Nitrite (mg/L) | 0.01 | 0.01 | 0.10 |
| Nitrate (mg/L) | 0.15 | 0.95 | 10.0 |
| Sulphate (mg/L) | 13.40 | 19.50 | 100.00 |
| Chloride (mg/L) | **161.28** | 47.87 | 100.00 |
| Flouride (mg/L) | **1.24** | 1.05 | 1.0 |
| Silica (mg/L) | 20.30 | 17.8 | - |
| Sulphide (mg/L) | <0.01 | ND | 0.01 |
| Phenol (mg/L) | <0.01 | ND | 0.001 |

**Table 2: Microbiological Analysis of of Zam Zam Water and Lasena Mineral Water**

|  |  |  |  |
| --- | --- | --- | --- |
| Microbial Groups/ Organisms | ZAM ZAM RESULTS | ALKALINE MINERAL WATER (LASENA) | SON STANDARD (NIS 977: 2017) |
| Total Plate Count (cfu/ml) | NIL | Nil | 100 |
| *Clostridium perfringens* (cfu/100ml) | Nil | Nil | Nil |
| *Chromobacterium violaceum* (cfu/100ml) | Nil | Nil | Nil |
| *E. coli* (Coliform) (cfu/100ml) | Nil | Nil | Nil |
| *Klebsiella aerogenes* (cfu/100ml) | Nil | Nil | Nil |
| *S. aeurus* (cfu/100ml) | Nil | Nil | Nil |
| *Yeast/Mould* (cfu/100ml) | Nil | Nil | Nil |
| Group of *Streptococci* | Nil | Nil | Nil |
| *Pseudomonas aeruginosa* | Nil | Nil | Nil |
| *Salmonella typhi* | Nil | Nil | Nil |

**Note: Nil = No Significant Bacteria growth**

**Table 3: Heavy Metals of Zam Zam Water And Lasena Mineral Water (mg/L)**

|  |  |  |  |
| --- | --- | --- | --- |
| PARAMETERS | ZAM ZAM RESULTS | ALKALINE MINERAL WATER (LASENA) | SON STANDARD (NIS 977: 2017) |
| Iron | 0.02 | 0.03 | 0.3 |
| Lead | <0.01 | ND | 0.01 |
| Copper | 0.01 | 0.02 | 1.00 |
| Cadmium | <0.01 | ND | 0.003 |
| Sodium | 6.65 | - | 100 |
| Zinc | 0.25 | 0.3 | 5.00 |
| Potassium | 1.20 | - | - |
| Manganese | 0.02 | 0.02 | 0.05 |
| Arsenic | <0.01 | ND | 0.01 |
| Barium | <0.01 | ND | 0.05 |
| Mercury | <0.01 | ND | 0.001 |
| Magnesium | 0.03 | **14.4** | 2.0 |
| Calcium | 18.30 | 39.7 | - |

Figure 3: Physico-chemical characterizations of Zamzam and Lasena Alkaline Waters

**Figure 4: Metals ion concentration of Zamzam and Lasena waters**

**Table 4: Antibacterial Properties of Lasena and Zamzam Water**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Organisms** | **Lasena Water** | **CIP** | **GEN** | **Zamzam water** | **CIP** | **GEN** | **Tap Water** | **Distilled Water** |
|  |  |  |  |  |  |  |  |  |
| *Helicobacter pylori* | 16.2mm  (M.S) | 5.3 mm  (R) | 1.6 mm  (R) | 16.66 mm  (M.S) | 6.0 mm  (R) | 2.0 mm  (R) | -  - | -  - |
| *Bacillus subtilis* | - | - | 0.4 mm  (M.S) | - | - | 0.4 mm  (M.S) | - | - |
| *Staphylococcus aureus* | - | - | 0.6 mm  (M.S) | - | - | 0.6 mm  (M.S) | - | - |
| *Escherichia coli* | - |  | 1.0 mm  (M.S) | - | - | 1.0 mm  (M.S) | - | - |
| *Pseudmonas aeruginosa* | - |  | 0.5 mm  (M.S | - | - | 0.5 mm  (M.S | - | - |

|  |
| --- |
|  |

**Keys: MS = Moderately Sensitive, CIP= Ciprofloxacin, R = Resistant, GEN= Gentamicin, N.A= No Activity,Tap Water=Control, Distilled Water= Control**

**Table 5: Antifungal Properties of “Artesian mineraland Zamzam” waters and Ticonazole**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Lasena Water** | **Zamzam Water** | **Ticonazole** |
| *Candida albicans* | 16.5 mm  S | 16.1mm  S | 14.5 mm  MS |
| *Candida krusei* | 16.2mm  S | 16.0mm  S | 14 mm  MS |
| *Aspergillus niger* | 17,.0mm  S | 16.0mm  S | 6 mm  WS |
| *Candida glabrata* | 16.0mm  S | 16.2mm  S | 16mm  S |

**Keys: N.A. = No Activity, N.D. = Not Done, S = SENSITIVE, MS = Moderately Sensitive, WS= Weakly Sensitive: Ticonazole = Antibiotic Sensitive Discs**

**4.0 DISCUSSION**

The aim of this study was to access the antimicrobial properties of Lasena Alkaline mineral Water and Zamzam Alkaline water with their mineral constituents which are important for our body and control different biochemical processes in body system. Zamzam water and Lasena Alkaline Mineral water appear to have a unique anti-*Helicobacter pylori* activity due to the presence of chemical elements at different levels, namely; CaCO3, Chloride, Copper and Sulphite. Ciprofloxacin and Gentamicin had negligible activity.

The higher levels of calcium carbonated and chloride in both water samples as well as its content of copper (0.01mg/L and 0.02mg/L) respectively, could partly account for the unique antibacterial and antifungal properties of each sample and corroborates with the work of Shomar (2012) that got similar results. The antifungal properties of both water shows significant sensitivity against tested organisms and while a standard Ciprofloxin moderately shows sensitive against tested organisms except in *Candida glabrata* which shows significant sensitivity (Onajobi *et al.,* 2013a).

Considering calcium as an important component of bone and hence, its role in bone formation presence of calcium in both samples is of health significance. Magnesium is important mineral in the body of human, which contain over 300 biomolecules existing in the body of man resulting a large number of Magnesium to be a dimeric and the component report to be extremely essential in usual heart attack physiology (Han *et al.,* 2016). Both calcium and magnesium are of physiological importance in the body (Onajobi *et al.,* 2020).

|The result of the iron analysis, revealed the iron content of the samples were within the specification standard, Lead was not detected in Lasena Alkaline Mineral water and of no significance in Zamzam water. Copper had little appreciable amount in both water samples which could be one of factors inhibitory compound in controlling the growth of algal and undesirable organisms. Calcium in trace of less than the standard was detected in ZamZam water and not detected in Lasena Akaline mineral water. However found some little difference in the result of Cation and Anion analysis in Zamzam water compared with those reported by Shomar (2012). This dissimilarity is most possibly related to the timing and type of samples.

From the results obtained in this study, it can be concluded that Alkaline nature of water is associated with the richness of aquifers with certain elements like magnesium and the alkaline nature leaches certain elements from the soil or rocks through which aquifers stream and this was in correlation with study carried out by Onajobi *et al.* (2021). Increasing demand for antibiotics continues to grow due to the rapid increase in pathogen causing diseases. Hence it is very essential to search for new use of other alternative in the use of alkaline water as antimicrobial therapy in replacement of certain antibiotics to combat the increasing population of antibiotic-resistance bacteria. Alkaline water drinking treatments consists of administering alkaline water, especially oligo-mineral and bicarbonate water, to treat a large number of disorders including problems connected with the liver, intestine and digestive system (Onajobi *et al.,* 2013a).

Present research comparison of both mineral water named Lasena Alkaline mineral Water and Zamzam water, Cation and Anions analysis shows a unique one. Apparently the quality parameters and limits for both mineral are quite different in their cation and anions confirming the study of Dias *et al.* (2013) and Han *et al.* (2016). The suppose health promoting value of the two analysed water samples are attributed to these balanced levels of the mineral content in them, and it will not be expected that conventional water will have any therapeutic benefits as for reflux like Zamzam water and Lasena Alkaline water. However, the folklore claim of anti-peptic ulcer of Zamzam water and Lasena Alkaline Water against *Helicobacter pylori and* Fungal.

**5.0 CONCLUSION**

This study confirms the impact and potentiality of an alkaline mineral water source as a means of killing pathogens in the human body system. The therapeutic use of water consumption, in accordance with the uses prescribed subsequent approach to a medical visit and is one of the most important forms of thermal treatment. Hence, it encourages and stimulates the metabolic balance and functional regeneration of the body, which is too often run down by the stress of modern living. Thermal waters have been used for hydrotherapeutic purposes. The study led to the conclusion that Zamzam water and Lasena Alkaline water Alkaline water are rich in essential mineral profile and antibacterial- antifungal properties and alkaline water may be a useful, not dangerous adjunctive treatment for reflux diseases.

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