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PARASITIC CONTAMINATION OF WELL WATER CONSUMED IN AWKA, ANAMBRA STATE, NIGERIA.

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ABSTRACT: *Contamination of water sources by infectious pathogens has been recognized as a global threat to public health especially in underdeveloped countries. This study was carried out to survey the parasitic load (eggs and cysts) of protozoan parasites found in well water sources in four different locations in Awka South Local Government area of Anambra state (Ifite-Awka, Amansea, Amaenyi and Temp site). A total of forty (40) well water samples were collected across the four locations and examined in the laboratory using centrifugation and sedimentation methods. Data obtained was analyzed using simple percentages and chi-square was used to test for differences in the parasites abundance in the different locations. A total abundance of 141 parasitic stages of Entamoeba histolytica, Giardia lamblia and Cryptosporidium parvum were found in the well water samples across the study locations. Among the study locations, Amansea recorded the highest prevalence of protozoa parasites 51(36.17%) while Amaenyi area revealed the least infection rate 23(16.31%). Giardia lamblia 72(51.06%) was more abundant in the well water samples examined followed by Entamoeba histolytica 64(45.39%) while Cryptosporidium parvum 5(3.55%) was the least abundant protozoa parasite. The result revealed that the highest abundance of parasites was recorded in Amansea 51(36.17%) followed by Temp site 38(26.95%) while Amaenyi had the least 23(16.31%). The results showed the extent of parasitic contamination of the well sources across the study areas and the susceptibility of the populace to water-borne diseases. Hence, water obtained from these wells should be properly boiled before drinking, to avoid being infected.*

KEYWORDS: Prevalence, Protozoa parasites, Abundance, Well water, Awka.

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INTRODUCTION

Water remains one of the most indispensable and natures greatest gifts to mankind. Water of good drinking quality is of basic importance to human physiology and continuous existence of all living creatures largely relies on its availability (Ani & Itiba 2015; Pam *et al*., 2018; Auta *et al*., 2017). Although one of the essential resources required by man, it becomes a reservoir of parasitic infections when not properly managed (Anyanwu *et al*., 2018). Water-related diseases are one of the major health problems in the world especially in countries with low socioeconomic status (Elmonir *et al*., 2020). Water performs very important functions in the human body, such as transportation, digestion, absorption, circulation of materials and maintenance of body temperature (Gyang *et al*., 2017). Unsafe water is a global public health threat, placing persons at risk of the diseases and chemical intoxication (Ekwunife *et al*., 2010; Hughes & Koplan, 2005). Protozoa, bacteria, helminths and fungi constitute the major causes of water borne diseases with varying degrees of insecurity, ranging from mild to life threatening illness (Okonkwo *et al*., 2009). A review conducted by the World Bank gives the evidence that incidence of certain water borne, water washed, water based and water sanitation associated diseases are related to the quality and quantity of water and sanitation available to users (Prasanna & Reddy, 2009). Clean and reasonably pure water when consumed nourishes the body (Egwari *et al*., 2005). Unfortunately, traditional water treatment methods like chlorination have not yielded desired results, hence improved and advanced methods such as ultra violet treatment will go a long way in purifying water sources before consumption.

One sixth of the world's population lack access to clean water and 2.6 billion people lack adequate sanitation (WHO, 2005; Hughes & Koplan, 2005; Okonkwo *et al*., 2008). This relative lack of potable water compels the average citizens to resort to wells and streams for their water which are often highly contaminated (Peter & Uzal, 2018; Adejuwon *et al*., 2011). Most often than not, contamination of community water-based sources is caused by animal droppings more than human feces, most especially in rural areas (Schriewer *et al*., 2015). It has also been reported that about 90 million Nigerians and over 130,000 children below 5 years die annually from water borne diseases that could otherwise have been prevented with much more zealous efforts by concerned health authorities (Odetoyin *et al*., 2022). In under-developed countries of the world, water-borne gastrointestinal parasitic pathogens such as *C. parvum, G. lamblia* and *E. histolytica* are frequently associated with morbidity, particularly in children (Bilal, 2003). As pathogens, these parasites cause severe medical conditions such as bloody diarrhea, constipation, despite the enormous health risk posed by these parasites, very little data exist on the level of parasitic loads in the studied areas. Hence, this study was carried out to ascertain the prevalence of parasitic contaminants of the well water sources from the various study locations.

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MATERIALS AND METHOD

Study Area

This study was conducted in four different locations including Amansea, Amaenyi, Ifite and Temp site, all in Awka metropolis. Awka is the capital of Anambra state and is located in the lowland rain forest zone of southern Nigeria. It is located on latitude 6°13'15.6" N and longitude 7°04'51.1" E. the city lies within an area with a tropical humid climate in the tropical zone of Nigeria and experiences two distinct seasons brought about by the two predominant winds that rule the area; southwestern monsoon winds from the Atlantic Ocean and the northeastern dry winds from across the Sahara Desert (Onyido *et al*., 2011).

Selection of Study Sites

Well water samples were collected randomly in four locations in Awka including Ifite, Amansea, Amaenyi and Nnamdi Azikiwe University temporary site. The water samples were labelled A1-A10, B1-B10, C1-C10 and D1-D10 respectively.

Sample Collection

Ten clean sterile bottles were used to collect water samples from 10 wells in each study location. A total of 40 well water samples were collected for the study and were labeled accordingly. The water samples were taken to the zoology laboratory of Nnamdi Azikiwe University, Awka for laboratory examination. The physico-chemical analysis of the well water samples was also done to ascertain pH, specific odor, color and presence of floating particles following standard WHO protocol.

Laboratory Analysis

The specimen bottle containing the well water samples was shaken vigorously to homogenize. After homogenization, 5ml of each water sample was poured into a test tube and centrifuge at 1500 rpm for 10 minutes. After centrifugation, the supernatant was discarded while the bottom of the tube was taped to resuspend and mix the sediments. A drop of the resuspended sediment was placed at the center of a glass slide, it was covered with a cover slip and viewed microscopically using 10x and 40x objective lenses (Cheesbrough, 2006).

Identification of Parasites

Identification of parasite stage(s) was done using parasitological atlases by Jeffery and Leach (1975) and Cheesbrough (2006). Physical count of parasite stages was done on microscopic films.

Data Analysis

Data obtained was summarized into relative abundance to determine the prevalence of parasites in relation to study sites and parasites species.

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RESULTS

From the four (4) well water sources sampled for this study, a total of 141 parasites were identified. The result revealed that the highest abundance of parasites was recorded in Amansea 51 (36.17%), followed by Temp site 38 (26.95) while Amaenyi had the least 23 (16.31%) as shown in Table 1.

Table 1: Relative Abundance of Parasite in Relation to Location.

Location	*Entamoeba histolytica*	*Cryptosporidium parvum*	*Giardia lamblia*	Total	Relative Abundance (%)
Ifite Awka	**9**	**0**	**20**	**29**	**20.57**
Amansea	**26**	**4**	**21**	**51**	**36.17**
Amaenyi	**10**	**1**	**12**	**23**	**16.31**
Temp Site	**19**	**0**	**19**	**38**	**26.95**
Total	**64**	**5**	**72**	**141**	**100**

The result of the parasite abundance revealed that Giardia lamblia was the most abundant protozoa parasite 72 (51.06%) found in the well water samples followed by Entamoeba histolytica 64 (45.39%) while *Cryptosporidium parvum* 5(3.55%) was the least abundant.

Table 2: Relative Abundance of Various Parasite Species in Awka and Environs

Location	*Entamoeba histolytica*	*Cryptosporidium parvum*	*Giardia lamblia*
Ifite Awka	**9**	**0**	**20**
Amansea	**26**	**4**	**21**
Amaenyi	**10**	**1**	**12**
Temp Site	**19**	**0**	**19**
Total	**64**	**5**	**72**
Relative Abundance (%)	**45.39**	**3.55**	**51.06**

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DISCUSSION

This study recorded high parasite contamination of well water sources in Awka. The rate of contamination varies between the different sample sites of well water. Several researchers including Odetoyin *et al*. (2022) have also recorded high rates of contamination of water with various parasites in different parts of the country. The public health implication of these findings is that pathogenic parasites may pose serious hazards to the health of urban dwellers such as students, workers and traders due to their occupation and children due to their poor sanitary habits. Among these locations, Amansea recorded the highest prevalence of parasites at 36.17%. This could be attributed to the fact that various wastes may possibly affect the water. On the contrary, water samples from Ifite Awka and Amaenyi had lower rate of infestation (20.57% and 16.31%) respectively. This is contrary to the findings of Egwari *et al*. (2005) in Lagos, Southwestern Nigeria who in their bacteriological study of sachet water found no enteric pathogens. The non-occurrence of parasites in these products could be as a result of use of uncontaminated water sources and improved methods of water treatment. For instance, industries use ultraviolet radiation to treat deep well water. The presence of parasites (eggs/oocysts) in this study is in line with the studies carried out in Nasarawa state, Ebonyi state and Abia states, Nigeria by Gyang *et al*. (2017), Ani and Itiba (2015), and Anyanwu *et al.* (2018) who also reported similar parasites such *E. histolytica, G. lamblia, A. lumbricoides* and *T. trichiura*.

Similarly, more than half of the number of streams investigated were contaminated by parasites. This could be seen as a result of fecal and sewage contamination of the river and well during rainy season while water samples from boreholes and rainwater had low level of infestation respectively. This is because the well operates a closed system while water harvested from rains is usually uncovered and as such exposed to atmospheric contaminants. Unfortunately, contamination of water can be due to many reasons which include fecal contamination, poor sewage disposal, poor hygiene practices, lack of basic sanitary facilities and poor treatment of water. Apart from environmental contaminants, lack of water treatment also poses a serious threat to the health of ignorant citizens. Although no single method of purification can eliminate 100% contaminants from drinking water, water can be and should be made safe for consumption within acceptable limits. The potential health danger of contaminated water is obvious from the study as it has confirmed that the majority of the contamination might be due to various anthropogenic activities by inhabitants. For instance, Ekwunife *et al*. (2010) found no parasites within sachet water samples studied but rather outside the sachets which is partly in contrast to this work which found parasites within the well water samples in the present study. This agrees with the fact that infestation of water is contaminated in nature as human parasites do not directly use water bodies for their life cycle development. Rather, their vectors inhabit water bodies thereby associating their transmission to water (Ekwunife *et al*., 2010). In another study conducted in Gharbia, Egypt, Elmonir *et al*. (2020) also reported 18% contamination of well water samples analyzed. The three found water borne parasites, *Entamoeba histolytica*, *Giardia lamblia* and *Cryptosporidium parvum* identified in this study were seen in their cystic and ova forms. The high relative abundance of the protozoan parasites *E. histolytica, C. parvum* and *G. lamblia* in this study agrees with the work of Pam *et al*. (2018) that also reported similar findings in north central Nigeria as well as Ani and Itiba (2015).

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However, the 45.39% E. histolytica percentage abundance in this study is higher than the 4.2% reported in Umuahia by Anyanwu *et al*. (2018). Apart from the presence of these parasites, most of the water samples contained many dirty particles, thus making the water unsafe for drinking. The activities that go on within the area of the water source in addition to erosion and influx of surface water into water sources could also account for their contamination. The presence of *Entamoeba histolytica*, *Cryptosporidium parvum* and *Giardia lamblia* indicates that there is the tendency of amoebiasis, cryptosporidiosis and giardiasis infection within the study area. Their presence is closely linked with unsanitary attitudes of people who defecate in open places near water bodies and activities of farm animals which are major reservoirs of so many pathogens. The parasites identified in this study are thus responsible for major human infections through water borne transmission. These organisms are also implicated in the cause of diarrhea along with noticeable weight loss, pain and abdominal colic.

CONCLUSION

This study has shown the potential risk of contracting infectious pathogens through the use of well water found in Awka and its environs. All water sources in the study area were contaminated with water borne parasites such as *E. histolytica*, *C. parvum* and *G. lamblia*. These contaminations ranged from one factor to the other such as poor sanitary environment of the market, proximity of the sewage tank to the well source, unhygienic use of water at homes and workplaces as well various anthropogenic activities in the study area. Urban dwellers are therefore at high risk of water-borne diseases due to the high rate of parasitic contamination of these well water sources.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

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REFERENCES

Ani, O.P. and Itiba, O.L. (2015). Evaluation of parasitic contamination from local sources of drinking water in Abakaliki, Ebonyi state, Nigeria. *IOSR Journal of Dental and Medical Sciences*, 14(9): 30-34.

Anyanwu, E.D., Lawrence, Q.O. and Onyele, O.G. (2018). Parasitological assessment of drinking water in Umuahia, southeast Nigeria. A*frican Journal of Biology and Medical Research*, 1(1): 55-62.

Auta, K.I., Mohammed, S.S.D. and Abubakar, M.I. (2017). Assessment of bacteriological quality of well water around Dogon Dawa district in Birnin Gwari local government, Kaduna State. *Science World Journal*, 12(4): 38-42.

Cheesbrough, M. (2006). District laboratory practice in tropical countries part II. Cambridge University Press, Pp319-329.

Egwari, L.O., Iwuanyanwu, S., Ojelabi, C.I., Uzochukwu, O. and Effiok, W.W. (2005). Bacteriology of sachet water sold in Lagos, Nigeria. *East African Medical Journal*, 82: 235-240.

Ekwunife, C.A., Okafor, S.O., Ukaga, C.N., Ozumba, N.A. and Eneanya, C.I. (2010). Parasites associated with sachet drinking water (Pure Water) in Awka, southeastern Nigeria. *Sierra Leone Journal of Biomedical Research*, 2(1): 23-27

Elmonir, W., Remela, E.M.A. and Alwakil, Y. (2020). Diversity, virulence and antibiogram traits of Escherichia coli recovered from potable water sources in Gharbia, Egypt. *Journal of Water and Health*, 18(3): 430-438.

Gyang, R., Uzoigwe, N.R., Ayim, J.O., Ombugadu, A. and Ahmed, H.O. (2017). Evaluation of local drinking water sources to determine their possible contamination with parasites in Lafia local government area, Nasarawa state, Nigeria. *European Journal of Basic and Applied Sciences*, 4(1): 2059-3058.

Okonkwo, I.O., Ogoun, A.A., Adejoye, D.O., Ogunjobi, A.A., Nkang, A.O. and Adebayo-Tayo, B.C. (2009). Hazard Analysis Critical Control Points (HACCP) and microbiology qualities of sea foods as affected by handlers' hygiene in Ibadan and Lagos, Nigeria. *African Journal of Food Sciences*, 3(1): 035-050.

Okonkwo, I.O., Ogunsi, T.A., Adejoye, O.D. and Olasogba, M.C. (2008). comparative studies and microbial risk assessment of different water samples used for processing frozen seafood in Ijara-Olopa, Lagos state, Nigeria. *African Journal of Biotechnology*, 7(6): 2092-2097.

Onyido, A.E., Zeibe, C.C., Okonkwo, N.J., Ezugbo-Nwobi, I.K., Egbuche, C.M., Udemezue, I.O. and Ezeanya, L.C. (2011). Damage caused by the bean Bruchid, *Callosobruchus maculatus* (Fabricius) on different legume seeds on sale in Awka and Onitsha markets, Anambra state, south eastern Nigeria. *African Research Review*, 5(4): 116-123.

Pam, V.A., Ombugadu, A., Adejoh, V.A., Idris, A.A., Dung, P., Rwang, P.G., Kumbak, D. and Dogo, S.K. (2018). Evaluation of parasitic contamination of local portable water sources in Doma local government area of Nasarawa state, Nigeria. *Tropical Freshwater Biology*, 27(2): 31-41.

Prasanna, R.B. and Reddy, M.S. (2009). Bacteriological examination of drinking water with reference to coliforms in Jeedimetla, Hyderabad India. *African Journal of Biotechnology*, 8(20): 5506-5507.

Schriewer, A., Odagiri, M., Wuertz, S., Misra, P.R., Panigrahi, P., Clasen, T. and Jenkins, M.W. (2015). Human and animal fecal contamination of community water sources, stored drinking water and hands in rural India measured with validated microbial source tracking assays. *American Journal of Tropical Medicine and Hygiene*, 93: 509-516.

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