REVIEW ARTICLE

CONTAMINATION ASSESSMENT OF WATER RESOURCES AROUND WASTE DUMPSITES IN ABAKALIKI, NIGERIA; A MINI REVIEW

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ABSTRACT

Monitoring of water quality is needed from time to time to avoid outbreak of severe water borne disease. This article review previous literature on impact of waste dumpsites on water quality around Abakaliki and its environs, with emphasis on active and non-active dumpsite. Findings from reviewed article revealed that waste dumpsite sites close to water bodies or ways has altered water quality in Abakaliki urban, while groundwater is contaminated through leaching process. This groundwater contamination occurs mostly when waste dumpsite is sited close to borehole or hand-dug well. Based on reviewed literature it is advised that waste dumpsite should be sited distance away from residential buildings as the state government should also endeavor to continually monitor water quality for domestic use to avoid outbreak of various kind of water related disease.

KEYWORDS

Groundwater, surface water, dumpsite, waste and quality.

1. INTRODUCTION

Globally, the quality of water resources is continuously on decline due to various anthropogenic activities. UNEP, ERCE, UNESCO (2008) reported that water quality management contributes both directly and indirectly to achieving the targets set out in all eight Millennium Development Goals (MDGs), although it is most closely tied to specific targets of the goal 7, to ensure environmental sustainability. Armah et al., (2014) were of the view that increase in human population with its attendant intensification of industrial activities is impacting negatively on water resource quality across the globe. Also, indiscriminate discharge of untreated mining and industrial wastes coupled with runoffs from agricultural activities contributes significantly to the pollution of waterways or bodies. In a study carried out by (Ashbolt, et al., 2001) It was acknowledged that accessibility and availability of fresh clean water does not only play a crucial role in economic development and social welfare, but also it is an essential element in health, food production and poverty reduction. As safe drinking water remains inaccessible for about 1.1 billion people in the world and the hourly toll from biological contamination of drinking water is 400 deaths of children below the age five (Gadgil, 1998). Different methods have been used by various researchers in the evaluation of water quality across the study area ranging from hydrochemical analysis to statistical approach, (Eyankware, 2019; Obasi, et al., 2015; Ede and Nnabo, 2015; Afiukwa and Eboatu, 2013). A recent research was of the opinion that the geological nature of a particular area plays a major role in determining the quality of water resources (Eyankware, et al., 2020). In addition, Naylor (2003) stated that both geogenic and anthropogenic factors is important when discussing the overall water resources quality

of any given area. Eyankware et al., (2018) further revealed that minerals dissolution from dominant geological formations (water-rock interactions) typically determines the physicochemical characteristics of either the surface water or groundwater of that particular area. Other factors which tends to also alter water resources quality are; indiscriminate waste disposal especially in urban area in developing world. In time past, the state government has established the Ebonyi State Environmental Protection Agency (EBSEPA). This is a body charged with the responsibility of waste management across the state. As their major assignment is to designate waste collection points and dumpsites across the state. Their effort was not noticed not until the inception of the present administration that contracted waste management to private individual in and around Abakaliki city and its sub-urban to properly manage waste. Although some of these dumpsites are not well sited see Fig. 1a. as some are seen sited close to streams or water bodies. However, these waste before they are evacuated from these designated dumpsites most have flowed into minor stream and river thereby causing surface water contamination. In the same vein, (Eyankware and Ephraim, (2021); Omene, et al., (2015); Pohland, et al., (1985) mentioned that indiscriminate disposal of mine and waste can potentially contribute to elevated levels of various heavy metals in surface and groundwater. One of the major factor that influences solid waste with regards to water contamination is leaching. Leaching of organic and inorganic pollutants from solid waste dumpsites is influenced by the following factors such as; temperature, pH, moisture content, type and properties of soil, hydrology of the area and the rate of progress through these stages is dependent on the physical, chemical and microbiological conditions developed within the landfill with time. Subsequently, it was also observed that various

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human activities have greatly affected the quality of water resource which in turn affect every aspect of human life. For this reason, constant assessment/review of water is needed to sustain human life as this paper reviews previous literature with the sole aim of evaluating impact of waste/waste leachate on water resources quality around Abakaliki and its sub-urban.

2. LOCATION/CLIMATE/TOPOGRAPHY

The study area is accessible through various networks of roads. The two major seasons in the study area is the wet and dry seasons. The wet season runs from March to mid-October, while the dry season runs from October to mid-February, with temperature ranges of 25 to 29°C between the dry season and 16°C to 28°C during the rainy season (Eyankware, et al., 2020b). As the average monthly rainfall also ranges between 3.1 mm in January to 270 mm in July (Eyankware, et al., 2018). The annual rainfall of the study area ranges from 1750 to 2250 mm. Recent study suggested that the climate of the study area tends to support pollution from the mining and quarry activities (Eyankware, et al., 2020b). It was observed that surface runoff that transport the pollution and also assist infiltration of water is caused by high amount of rainfall (Eyankware, et al., 2020b). The study area lies within the rainforest region of southeastern Nigeria, with evergreen vegetation and humid climate. The area comprises of vegetation with underground creepers and thick trees in most rural areas. Most of the trees are tall in some locations, with buttress roots around river bodies, while the vegetation is influenced by various factors such as; geology, drainage, rainfall and topography. Igbozuruike (1975) further pointed out that the study area lies within the low land rainforest region. The drainage system of the area is dendritic, with its major river that drain into Ebonyi river with other tributaries that control the drainage with the underlying lithology (Eyankware, et al., 2020a; Eyankware, et al., 2018).

2.1 Mining/Quarrying Waste

Globally, the problem associated with mine/quarry in relation to waste management is more severe in developing nations such as Nigeria. As little or no emphasis is placed on waste generated from most mine/quarry site in Nigeria. The effect of this has been reported by various news outlets across the nation in time past and of recent. That is to say, mineral exploitation has and will continue to attract attention of individual and government because its contribute immensely to nation wealth with associated socio-economic benefits (Peter, et al., 2018). Although, mining and quarrying of solid minerals is thoroughly discussed in terms of quantity and quality by different scholar, it has been noted that there have been several reports on a global scale that waste generated from mining/quarrying activities has greatly affected water quality (Gurdeep and Rakesh, 2015; Shiv and Kumar, 2016; Binay, et al., 2016; Li, 2018; Okolo, et al., 2018; Frederick, 2012). Based on this, a previous research revealed that major mineral deposit in state include salt, lead-zinc, limestone (at Okposi and Uburu, salt lakes at Ohaozara, Enyigba in Abakaliki, Nkalagu) and among others (Nwofe and Ekpe, 2014). It was also observed that mining/quarrying within the study area occur in large and small scale, resulting in most mining areas been abandoned with minespits, whose ephemeral runoffs are captured by short-lived streams that flows into the river and infiltrate into aquifer system (Eyankware, et al., 2020a). Eyankware, et al., (2021) further reported that mining waste is still one of major factor that influences water resources quality, especially around active and abandoned mine sites (see Figure 1b).

2.2 Dumpsite Waste

Though Ebonyi State has been known for indiscriminate waste disposal in the past few decades. But of recent, it shows that the state government is currently trying to reduce open waste disposal system that were previously in existence. One of such waste site disposal that has existed for decades is the rice mill waste which is located within the premises of the popular Abakaliki rice mill, along Sam Egwu way. According to Eyankware, et al., (2016); Obasi, et al., (2015) the rice husk has been in existence for more than 20 years in the area and it is believed to have been in constant use as a refuse disposal site all through these years as shown in Figure 2a and b. The waste dumpsite has been reported to have effect on the environment, health and water resources (Eyankware, et al., 2016; Jessy, et al., 2015). Other forms of waste generated in study area are the waste site at mechanic village in Abakaliki town. As several scholars also indicated that waste generated from auto-mobile activities has altered the

quality of groundwater around that vicinity (Edeh and Nnabo, 2015; Ojor and Nnabo). A study which revealed that heavy metals in some part of Abakaliki urban such as; Hausa quarters, off Onwe road, AzuEbonyi, Mechanic village, Ogoja road and building materials generated heavy metals such as Cd, As, Cu, Ni and Pb that exceeded permissible limit recommended by WHO standard (Ojor and Nnabo, 2015). There was further report carried out at Water Work dumpsite close to CAS campus of the Ebonyi state University, this dumpsite is said to be as old as the Abakaliki town (Obasi, et al., 2015). These dumpsites are believed to have greatly affected water quality within the study area, though few of these dumpsite has been cleared off by the current administration. Another form of waste generated in Abakaliki urban is the medical waste dumpsite at Federal Teaching Hospital Abakaliki (FETHA), Rural Improvement Mission (RIM), and Matar Hospital (Eze, et al., 2020) see Table 1. Most of these dumpsites are associated with leaching process, resulting in groundwater contamination. A study by Njoku, (2015) reported that the concentration of heavy metal in water such Cu, Zn and Cr in water around Rice Mill and timber waste dumpsite were below WHO standard, while Pb was observed to be above WHO standard across the aforementioned dumpsite. Previous study also revealed that the presence of medical toxic waste poses significant threat to the environment particular in developing nations where such waste are not properly managed (Nwofe, 2015). These wastes in most cases are dumped close to surface water such as stream and river, which tends to contaminate waterbodies, thereby making it unsuitable for domestic and other usage (Ulakpa, et al., 2016). As reported the presence of abattoir wastes in Abakaliki and Ezzamgbo area of Ebonyi state and waste generated has greatly influenced heavy metals and chemical properties of water around these abattoirs as shown in Table 1 (Njoku, et al., 2017). Nwankwoala and Offor, (2018) were of the view that these activities have altered some analyzed chemical properties such as NO₃⁻, Cl⁻ and Mg. Other heavy metals such as; Pb, Cd, Cu and Zn were higher in water near abattoir waste dumpsites, as water resources situated around dump sites are said to be prone to toxic pollutions if the waste dump is not properly managed.

Table 1: Names previous and current dumpsite locations across the study area.

S/N	Location of Dumpsites	Type of Dumpsites	Active/Not active
1	Rice Mill, along Sam Egwu Way, Abakaliki	Solid waste	Active
2	Medical waste, Federal Teaching Hospital Abakaliki	Solid waste	Not active
3	Abattoir wastes in Abakaliki and Ezzamgbo area	Solid/Liquid waste	Active
4	Indiscriminate waste disposal at Nnorom Street, Abakaliki	Solid waste	Not active
5	Waste dump at Water-works, Abakaliki	Solid waste	Not active
6	Dumpsite along the road, at Kpirikpiri market Ogbuga, Abakaliki	Solid waste	Not active

Figure 1a: Dumpsite at Nnorom Street, Abakaliki

Figure 1b: Abandoned quarry pond at Umuoghara, Ebonyi State.

Figure 2a: Rice Mill husk deposited over decades, Abakaliki Ebonyi State.

Figure 2b: Waste from rice mill channeled into surface water.

CONCLUSION

Water of good quality is needed for human development. As a pressing need it is of utmost significant to constantly monitor water resources to avert diverse related illness. This paper reviewed previous published article on effect of waste dumpsites on water resources. It was observed that different types of waste exist within the study area, ranging from mines, quarries, medical wastes, waste from rice mills, waste dumpsite at CAS campus of the Ebonyi state university etc. It was also observed that these dumpsites and wastes generated influenced chemical properties of water within the study area thereby making it unsuitable for various use.

RECOMMENDATION

In other to avert future contamination and decline in water resource, the following steps were recommended;

- i. The state government should enlighten the inhabitants of the study area on the danger of indiscriminate waste disposal, especially around streams and water ways.
- ii. Temporary waste dumpsites in Abakaliki town should be evacuated within the shortest possible period of time.
- iii. The state government should ensure that waste dumpsites are well located distance away from buildings.

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