A Mini Review on the Impact of Sewage Disposal on Environment and Ecosystem

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Abstract. Human activities contribute immensely to the production of wastewater which emanates from residences, industries and agricultural practices that pollutes the environment and water bodies. Up to 80-90% of the wastewater produced in developing countries is disposed of into surface and groundwater which is a major cause of environmental pollution that threatens human health. According to UN report, over 80% of the wastewater produced in the world and over 95% in some least developed countries is released without being treated into the environment. This paper reviews the methods of sewage disposal, the impact on the environment, aquatic contaminant and the human health. Emphasis is placed on the impact of disposal of various contaminants in aquifers and water bodies which could make water unsafe for drinking and to perform other domestic and recreational activities

Keywords: Eco system, Environment, housing, Sustainable

1. Introduction

The environmental impact of sewage disposal are numerous and constitutes major problems faced in our ecology resulting from human activities such as waste from households, industries and agriculture leading to pollution [1] Sewage is wastewater which consists of solid and liquid layer collected and conveyed through sewers, treated or untreated and disposed of into large bodies of water [2]

According to the United Nations (UN) report, it is estimated that there would be an increase of 1.1 billion in population in the next 15 years and over 6.3 billion people will live in urban centers by 2050 [3-5]. Urban settlements are expanding at a faster pace with a large number of people migrating from rural areas to cities which is as result of access to basic amenities and improved standard of living [6]. In most developing countries, it is estimated that 90% of sewage is disposed of into watercourses like rivers, lakes, streams and ponds without being treated thereby resulting in pollution of the environment [7]. Large amount of these wastewaters seeps into the soil, polluting aquifers and groundwater which is as a result of leakage in on-site sanitation facilities and lack of sewerage pipes for disposing wastewater in low and middle income countries [8].

Disposal of untreated waste into the environment can cause oxygen depletion as a result of microbial decomposition of organic matter, destructing the marine ecosystem, and also, affect the quality of water, making it unsafe for drinking and can lead to diseases such as dysentery, cholera and typhoid [9-10]. Wastewater in most countries especially in developing countries are not being treated before it

is disposed of into large bodies of water and this can pose significant threat to life below water, life on land, poor access to clean water and sanitation [11-12]. However, sewage which is a wastewater could contaminate drinking water in different ways which could be from septic tanks by infiltrating into the ground and polluting groundwater, partially treated wastewater, sludge, and leakages in sewer lines [13]

Hence, this paper focus on the review concepts of Sewage Disposal, the impact of untreated sewage on human health, environment and the aquatic ecosystem and the measures to be taken to ensure a safe and hygienic environment.

2. Critical Concept of Sewage and Environment

Increase in the volume of sewage produced is as a result of growth in population and industrialization imparting pressure on land and water resources [18]. Sewage which is also referred to as wastewater containing water and solid waste suspension is disposed of from households, buildings and industries and conveyed in large pipes called sewers [19, 20]. This wastewater is mostly left untreated and it either infiltrates into the ground polluting aquifers or is disposed of into watercourses. Disposing of this wastewater is dependent on the region and availability of natural water in a particular area. [1]. One of the major challenges we are faced with in this twenty first century is the lack of quality water and improved sanitation [12]. Over one third of the freshwater available is used for agricultural, industrial and domestic purposes and these activities also result in the contamination of natural water. Pollution of natural water by chemical pollutants is a major concern today [16, 24]. Chemical pollutants from Emerging contaminants, pharmaceuticals, fertilizers including pathogens are washed down by storm water into lakes, rivers and oceans that are meant to be for recreation and drinking [21-23].

A study by [20] carried out in Blantyre city shows that poor design of on-site sanitation systems and inadequate means of collecting and disposing of solid wastes are major challenges of sewage disposal. Improper disposal and collection of solid waste in this particular area is as a result of insufficient vans by the Blantyre City assembly which could not cater for more than half of the population. Also, most pit latrines, septic tanks and sewer lines are designed poorly and are not properly maintained which has posed threat to water resources in this particular area [25, 27]. [11] affirmed that efficient refuse and solid waste management has been a major problem in Port-Harcourt, a city in Nigeria over the past years. Dumping of various wastes which are produced from the industries, household and commercial waste such as food wastes, textiles, plastics, and scrap metals is one of the causes of traffic congestion in the city and has made water unsafe for drinking due to infiltration. Moreover, increase in population would lead to an increase in the production of wastes if the situation is not properly attended to [14]

Malaysia is faced with the problem of Solid Waste Management. Rapid rise in her economic growth, attitude of the populace, had been highlighted as the bottleneck of solid waste management [15]. Increase in population in this area is as a result of migration from slums and rural areas, affluence, which are major factors that needs to be addressed in order to have an effective way of managing and disposing wastes. According to [1], chemical pollution has an impact on the quality of water. The need for water cannot be overemphasized in ensuring food security, preserving the environment and in alleviating poverty. However, when access to clean and safe drinking water is not guaranteed, there is tendency for outbreaks of waterborne and epidemic diseases such as diarrhea, skin rash, cholera [24]

Various methods of sewage disposal are adopted in different cities in Nigeria. These methods include the use of septic tanks, flow of sewage into storm water drainages, open ground, water ponds and streams [19]. In Katsina metropolis where decentralized system is practised, all of these methods are adopted but the use septic of tanks causes ailment on human health resulting from unpleasant smell from cleared drainages which pollutes the air people breathe in and make them uncomfortable in their jurisdiction; accumulation of stagnant water serving as home for mosquitoes to breed [10]

3. Wastewater and Contaminant

The use of antibiotics is an integral part of human lives. It comprises of natural products which has been vastly used as medicine for human and veterinary and helps in changing the model of the way we live, prominent in treating and preventing infectious diseases [9]. In many cases, when these drugs are not used and get expired, justice is not done when disposing them. They are disposed and flushed in toilets and found in landfills and wastewater plants (WWTPs) which when disposed into large bodies of water, contaminate the aquatic environment.

The presence of antibiotics in the environment affect natural microbial environment by promoting the development of antibiotics resistant pathogen posing severe threat on human and veterinary health [25]. The event of these antibiotics in the ecosystem distorts the structure and functioning of microbial communities in soil and water ecosystems. Pharmaceuticals are known to be emerging contaminants which has the ability to induce physiological effects in human at low doses [21]. They are disposed of into large bodies of water through municipal wastewater and decomposition of pharmaceuticals in wastewater forms metabolites rather than resulting in their full mineralization. The major concern of this emerging contaminant in wastewater effluent is the exotoxicological effects on human health due to the presence of these compounds in drinking water. These wastewater containing pharmaceuticals and their metabolites can seep into the aquifers making water unsafe for human [15].

In areas where there is no access to water for agriculture, wastewater is mostly used as replacement to irrigate farmlands [14]. This wastewater contains great amount of nutrients which helps in the growth of crops and also contain toxic pollutants which are capable of creating havoc during production of agricultural produce [10]. Due to the non-biodegradable nature of heavy metals, their presence in the soil and crop pose serious environmental problem. Abundance of these heavy metals in soil from wastewater for irrigation may impact the food chain [23]. Moreover, heavy metals like copper and Zinc are nutrients essential to the human body but can be toxic if consumed in high concentration [22] Also intake of heavy metals like Cd and Pb has been shown to have carcinogenic effects [17].

3.1 Sewage Disposal Methods and Its Implication

The sewage disposal method adopted in a residence or community determines their health status [8]. In a developing country like Nigeria, sewage produced in rural and urban areas are majorly discharged into pit latrines and into septic tanks, soak ways and cesspools in towns and municipalities. The table 1 shows the sewage disposal methods used in Nigeria and its negative implication.

Table 1: Method of Sewage Disposal and its Implication

Method of Sewage Disposal	**Negative Implication**
Septic tank	Pollution of soil and water environment [19]
Sewage flow into Stormwater	Air pollution, Risk of causing flooding [20]
Sewage into ponds	Stagnant water which is breeding area for vector diseases [21]

Direct dumping of untreated waste in rivers	Presence of toxic substances in the food chain, via the plants and animals that feed on it directly or indirectly [9]

In urban areas, the pattern of sewage disposal involves the use of septic tanks, pit latrines, sewer lines, soil pit and defecation in bushes. Figure 1 shows the pattern of sewage disposal in urban areas in Nigeria.

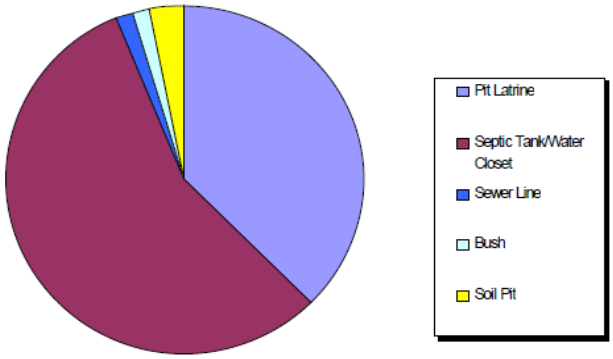

Figure 1: Sewage Disposal Pattern in Urban Areas of Nigeria [28]

The diagram in figure 1 shows the different methods of disposing waste in Nigeria having the septic tanks to be the most used. There is also abundance of pit latrines with sewer lines, though the primary concern of this study, are minimal. However, the traditional methods such as soil pit and defecating in the bush is still in use in some part of the country.

Different technologies are used in treating sewage which includes the Mechanical, Biological treatment technology. In the Biological treatment technology, microorganisms are made to feed on the organic material present in the sewage and decomposing them. This aim is to decrease the Biological Oxygen Demand (BOD) level [7, 19] The Mechanical treatment technology combines the biological, physical and chemical processes. Activated Sludge Process (ASP), Extended Aeration (EA), Moving Bed Biofilm Reactor (MBBR), Sequential Batch Reactor (SBR), Vermifiltration Technology are all technologies within the Mechanical Treatment technology for treating wastewater [27, 28]

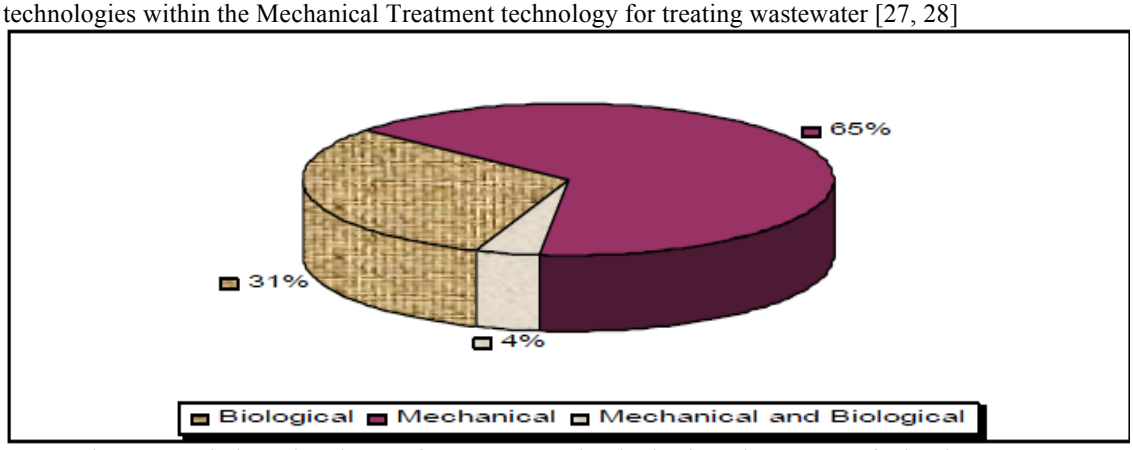

Figure 2: Relative Abundance of Sewerage Technologies in Urban Areas of Nigeria [28]

Figure 2 shows the various types of sewer system treatment used in Nigeria. It has been found that about 65% of most sewer system technologies involve the use of Mechanical technology for treatment, and are mainly found in industrial areas. Biological treatment method follows this (around

31 percent). The method of treatment using biological and mechanical methods in the country is the least (approximately 4%) means of sewerage treatment Nigeria [28]

Ensuring a safe, clean and hygiene environment is eminent to any sector in Nigeria. In order to achieve this, the following must be done.

- In order to prevent pollution of surface and ground water, it is important to treat sewage in order to alleviate the widespread of waterborne diseases such as cholera, dysentery caused by pathogenic organisms.
- It is everyone's priority to have a proper way of disposing waste so that flies, animals and human would not have any contact with them.
- Septic tanks should be properly installed and maintained so as to avoid leakages that cause offensive odour to the environment.
- Laws and regulations should be formulated and enforced on every citizen of the country on proper disposal of waste and also sensitize them on the effect of improper disposal on their health, the environment and the aquatic ecosystem.

4 CONCLUSION

The report on epidemic and waterborne disease has been a source of worry to every right thinking citizen of Nigeria. The review presented the major causes of sewage disposal and its implication on the ecosystem and mismanagement of sewage and sewage facilities can be said to be the reason for dilemma in our health sector. Adequate and proper attention should be given to the way we dispose our waste in various locations and critical review has been undertaken to access the way forward.

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