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IMPACT OF SOLID WASTE DISPOSAL ON HEALTH AND ENVIRONMENT IN THE NYAGATARE CITY: AN ASSESSMENT

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Abstract

Worldwide, solid waste disposal has been considered as one of the sources of the environmental pollution and in turn environmental degradation. In most of the developing countries, characterized by acceleration of population and the escalating demand for food, there has been a rise in the quantity of waste generated**.** This waste ultimately reaches into public disposal sites and due to poor and ineffective management, potential for negative health effects on people and animals and quality of land, air and water. Nyagatare city in Rwanda has more concernof methods of solid waste disposal and its ill effects. The present work projects lack of proper solid waste disposal system poses serious threat on living and non-living environment. Therefore, an attempt has been made to understand consequences of poor solid waste disposal on environment and Health.The study conducted through personal in-depth interview, observations and questionnaire. The data have been collected from primary and secondary sources and used for processing, analyzing and drawing recommendations and conclusion. It is found that lack of financial resources and rapid urbanization are the main causes of poor solid waste disposal. Simultaneously, lack of equipment's and uncontrolled use of packaging material worsen the problem. Furthermore, environmental conditions in Nyagatare are appalling due to inadequate

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provision services like water supply, sanitation and poor waste disposal. Due to lack of proper facility and skills toward waste management, the gathered waste in the city is just discarded to the open dump, and its accumulation causes the problem on environment and community health.

Keywords: Waste disposal, Environmental effects, Health effects, Nyagatare.

1. Introduction

In the cities of Rwanda, like other emerging countries, municipal solid waste consist of complex composition of garbage, plastics, bottles, glass, papers, metals, fabrics and are disposedwithinand on the periphery of the cities(Olaleye and Richard,2013).Nyagatare as well as other municipalities in developing nations face severe environmental problems and health jeopardies due to the inadequate municipal solid waste disposal (Nguyen et al., 2011). Currently, wastes are disposed into poorly managed open dump with diminutive or no pollution safety measures (Un-habitat 2010; Michael, 1988),deteriorating soil quality **(**Syeda et al., 2014), burning of wastes release like greenhouse gases (Meidiana, 2012, Rim-Rukeh, 2014), threats to human health (Foday et al., 2013, Pattnaik and Reddy, 2009), spread of diseases (UN, 2000), and undermines sustainable urban development (CPCB, 2000). Several studies have been conducted to elucidate the health and environmental effects by waste dumps (Aatamila et al., 2010, Yongsi et al., 2008). A few studies examined the impact on environment and health by solid waste disposal (Boardi and Kuitunen, 2005; Nabegu, 2010). Unattended waste lying around attracts flies, rats, and other detritus feeders and in turn spread different infectious diseases (Salam, 2010, Gouveia and Ruscitto, 2009).

Health care waste and other medical waste disposed in dump sites, mixed with domestic waste, increase the risk of infections like Hepatitis B and HIV (World Bank, 2005). The waste from agriculture and industries can also cause serious health risks (Rushton, 2003). The heavy metals found in waste disposal lead to bioaccumulation and biomagnifications (Raman and Narayanan, 2008). Solid waste can also block water channels, resulting in water stagnation leading to breeding ground for many pathogens. Organic waste disposed in wetlands, rivers, seas, and lakes increase toxic substances in the food web, through different trophic levels. The presence of contaminants in groundwater particularly near the landfill sites affects the quality of aquifer and

domestic water supply (Rajkumar et al., 2012). Open dumpsites harm the atmosphere through emissions of greenhouse gases (e.g. CH_4, CO_2) in which trapping heat in the atmosphere (Defra, 2004).

Soil and plants as parts of the ecosystem are frequently contaminated by undesired chemicals from dumpsites. Heavy metals are graded high amongst the chief pollutants of green vegetables (Mapanda et al., 2005), and injuriousness to plant (Magaji, 2012). Several studies have been conducted to assess the heavy metal uptake by plants in relation to soil pollution and atmospheric deposition on the surface of soils. Heavy metals in general have long half-life and have the potential for buildup in the different organs leading to annoying side effects (Sathawara, 2004). These metals can pose a noteworthy health risk to humans, particularly in raised concentrations above the very low body requirements (Gupta, 1998). The absorption of Lead if surpassing the maximum permissible limits in human disturbs nervous system, bones, liver, pancreases, teeth and gum and also causes blood-related diseases (Abbas, 2010). There is an escalating form of evidence which indicates that sizeable quantities of plastic waste are now polluting marine and other habitats (Thompson et al., 2009). The high nutrient present in organic wastes can reduce watery oxygen in water bodies, required to fish and other aquatic life forms. The unpleasant odors and unattractive appearance of piles from the solid waste disposed along streets and in fields, forests and other natural zones can dishearten tourism (Zeiss, 1998).

2. Material and Methods

Nyagatare city is the largest metropolitan area of Nyagatare Districtcloses to Rwanda's International borders with both Tanzania and Uganda countries. This city is coordinated on: 1° 18' 0.00"S, 30° 19' 30.00"E; Latitude: -1.3000; Longitude: 30.3250. The area is distinctly characterized by high summer temperatures which creates the presence of the dumpsite to be felt by the surrounding communities. The population affected by the dumpsite located in Nyagatare Sector in which chosen for field observation. This study was carried out from February to June 2016, and involving primary and secondary data collection. The primary data collection such as an interview, field observation and questionnaires guide for the public as well as for the relevant government agency saddled with the responsibility for understanding the situation and effects of waste disposal have been used. Secondary data were extracted from different sources in relation

to solid waste disposal and its effects on environment and community health. To collect informations, text books, journals and other relevant materials and different websites were useful to this research. The archival and documentary information also were also used. Qualitative and quantitative statistics were scrutinized. Descriptive statistics were employed for obtaining frequency, and expressing such in percentages.

3. Results presentation and Discussion

3.1. The main source of solid waste generated.

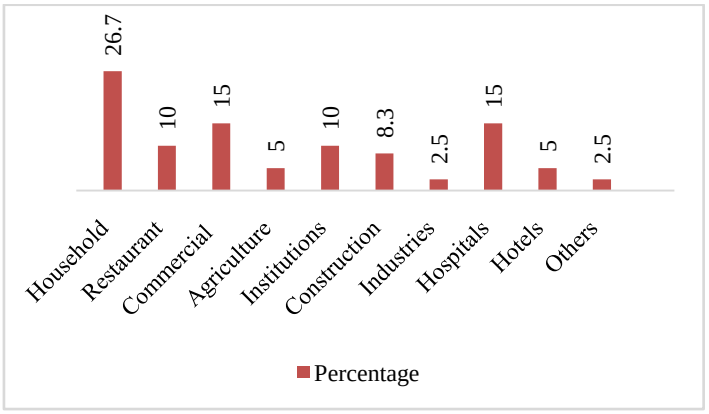

Figure 1: The main sources of solid waste generated

Source: Fieldwork

Main sources of solid waste in Nyagatare city are households represented by 26.7%, followed by commercial activities and hospitals with 15% for each, restaurant and institutions activities equalized and represented by 10%, construction has 8.3%, agricultural activities and hotels each has 5% and industries represented by 3%. Some respondents said that there are others source of solid waste with 3%.

According to the above data, household's activities produce many solid wastes because Nyagatare sector is the one of largest populated sector in Rwanda. The population size is amongst the factors influencing the source of solid waste. There is an optimistic correlation between city resident size and both the percentage of waste generated and rate of households enjoying regular waste activities. Each resident in Nyagatare city generates some amount of

wastes in his / her daily activities, and some families have animals in their homes like kitchens, pigs, goats which are the main sources of wastes. Industries currently operating in Nyagatare sector such as granite production plant (East African Granite) and Milk Processing Industry also generate a waste disposed in open dump. The governmental institutions like Nyagatare hospital and University of Rwanda – Nyagatare campus also are the main sources of medical and paper waste respectively. The commercial activities in the city dominated by the products especially from agricultural and industrial processing are the one amongst sources of solid waste. According to Smith & Scott, 2005, commercial and institutional businesses typically generate waste as a result of trade and business activities. As the city grown, the construction activities also increase, results in construction and demolition waste such as cement envelopes, metals, and paint waste. Behind that, many restaurants and Hotels like Blue Sky are also the main sources of waste in Nyagatare city.

3.2. The types of solid wastes generated.

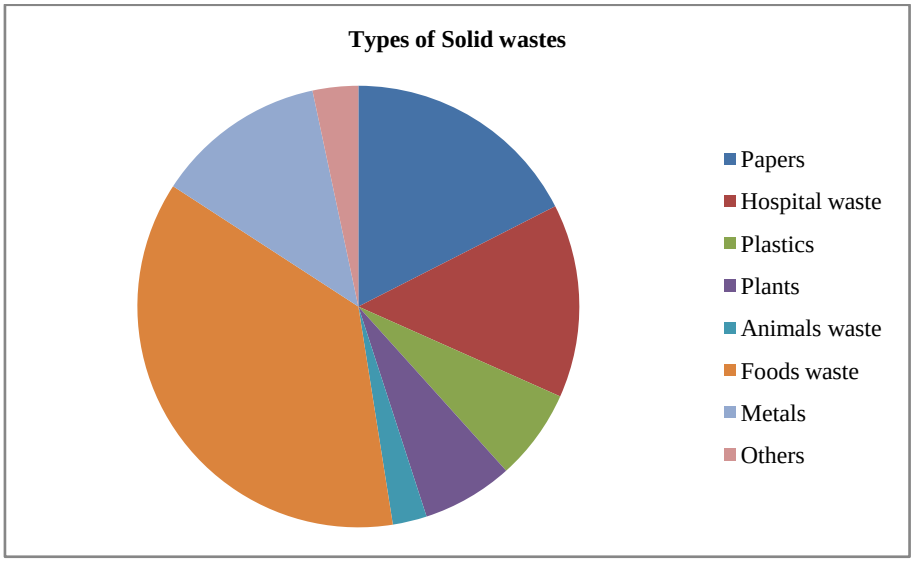

Figure 2: The types of oslid wastes generated

Source: fieldwork

Research revealed that the food wastes (peels, packing food wastes, etc) inNyagatare city consists of 36.6% because many of population used to take meals two times per day and generate wastes without manage it, as affirmed by the respondents. This is followed by the presence of

different kind of papers such as newspaper, envelope bags represented by 17.5%; this is true because Nyagatare city is a center of business and institution of high learning like University of Rwanda – Nyagatare Campus, Nyagatare Nursing School. The hospital waste was 14.2%, this is from Nyagatare hospital and other pharmacies and health centers in this city. Metals waste accounted for 12.5% due to construction activities, plastic and plant tissues have 6.7% respectively, the last one is animal waste with 2.5% because pastoral activities are done in farms; others types of waste such as wood, ashes, yard wastes ,textiles ,glass represented by 3.3%.

Nyagatare city, being one among the developing countries produces a broad range of potential wastes including municipal and industrial solid wastes, clinical wastes, construction and demolition wastes, hazardous wastes, and universal wastes which vary widely between organizations which actually makes the assessment difficult. According to the type of composition and the availability of wastes from various sources the solid wastes can be categorized as municipal garbage, industrial wastes, and hazardous wastes (Tammemagi, 1999). In Rwanda, the complexity of wastes, along with the rising socio-economic development has introduced large portions of non-degradable wastes into the environment. Certain amount of the total waste generated in urban centers are collected and disposed in the designed disposal sites; the rest of the waste are either dumped in unsuitable areas or disposed off in rivers that traverse the urban centers, or into the wetlands.

3.3. Cause of Poor Solid Waste Disposal

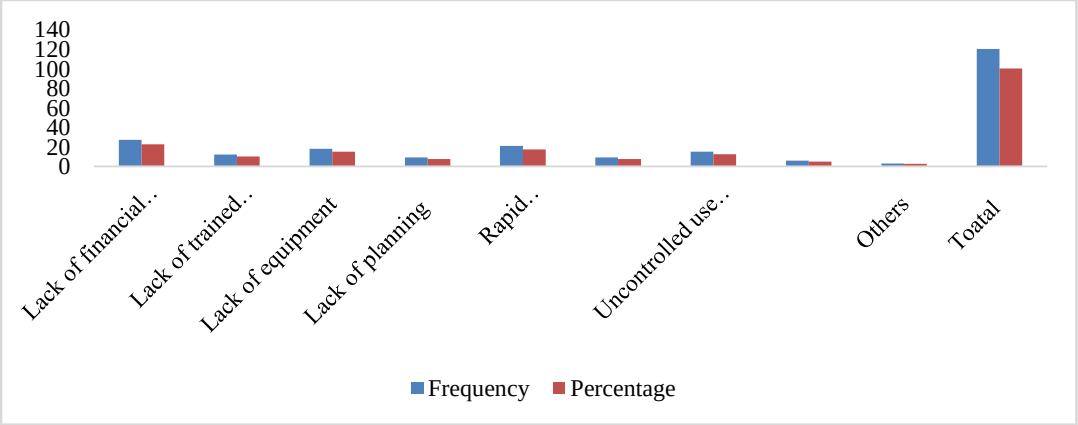

Figure 3: Cause of Poor Solid waste Disposal

Source: Fieldwork

The data above shown the lack of financial resources and rapid urbanization outstripping service capacity are the main causes of poor waste management represented with 22.5% and 17.5% one-to-one; lack of equipment and uncontrolled use of packaging material also represented by 15% and 12.5% correspondingly. Lack of trained personnel is represented by 10%, lack of planning, difficult to obtain cover material, and poor response to waste minimization have 7.5%, 7.5%, and 5% separately; but some respondents affirm that there are other causes of poor waste management with 2.5%.

Many people could be quick to say that the poor waste disposal in Nyagatare city is due to the lack of financial resources allotted to the waste disposal. The truth of the sources of this deplorable situation is more intricate. In fact, there is no single reason which explains why the solid waste disposal is so critical in this city. There are several causes which are interacted and make the problem of the solid waste disposal a kind of dilemma.

3.4. Attitude of Community toward waste disposal

Answers	Frequency	Percentage
Very interested	18	15
Interested	36	30
A little bit interested	36	30
Not interested	30	25
Total	120	100

Table 1:The respondents' interest on the waste disposal

Source: Fieldwork

Many people ignore waste disposal. They tend to ignore the consequences related to the environmental degradation and their health from poor waste disposal. The table overhead shows it. Only 15% of respondents are very interested in proper waste disposal, the remaining 30% are interested, 30% are little bit interested and 25% are not interested, this shows that their attitude

toward waste disposal is negligible. This is because of paucity of resources and ignorance and their living condition; also combined with the weak policy of waste management can aggravate the problem. The waste disposal habits of the Nyagatare city community fall into two domains: one connect to the disposal within household for pit compost and the other outside within the community for open dump where during research, various forms of personal waste disposal were observed along commercial streets in front of various shops. The disposal of the household waste is delegated to one member of the household, usually a female or servant, and carried out by several different methods. Peoples' involvement and responsibility sharing in waste management can be encouraged by creating the incentives like enabling activities, capacity building and legal support.

3.5. The main Health impacts of poor solid waste disposal

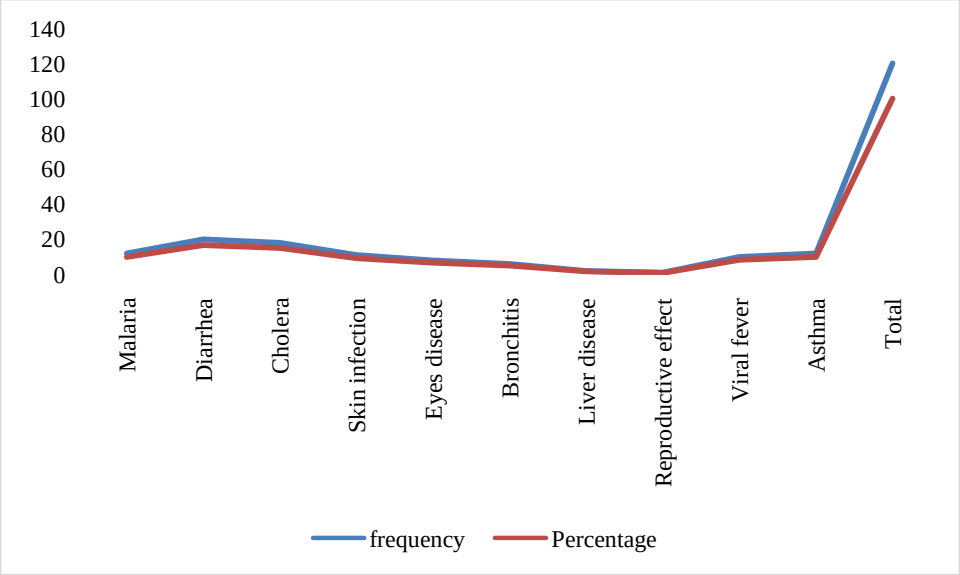

Figure 4: Health effects of Solid Wastes disposal

Source: Fieldwork

The Figure 4 shows that the Diarrhea, Cholera and malaria have 16.7% and 15% respectively; the skin infection, viral fever, asthma, eyes disease and bronchitis have 9.2%, 8.3%, 10%, 6.7% and 5% respectively. Liver disease and reproductive effect have 1.7% and 0.8%. This study shows that the waste disposal affected the health of community in the study area; this is evident and true based on the comments provided by the respondents approached. They claimed that most of their kids suffered from dysentery and malaria due to the presence of the household solid

waste disposed in open dump which offered breeding grounds for mosquitoes and microbes. Uncollected solid waste blocked storm water runoff, resulting in the creation of stagnant water bodies that become the breeding ground of disease. Waste dumped in the drainages channels also lead to the outbreak of vectors. Since the open dump in the city is exposed to all the living, feeding on animals, like cows the probability of getting diseases is so high. The organic domestic waste in open dump poses a serious threat, since they ferment, creating conditions favorable to the survival and growth of microbial pathogens. Used domestic water mainly from animal waste and refuse-infested drinking water can cause diseases such as typhoid, cholera, gastro-intestinal infections and dysentery.

3.6. **Environmental impacts**

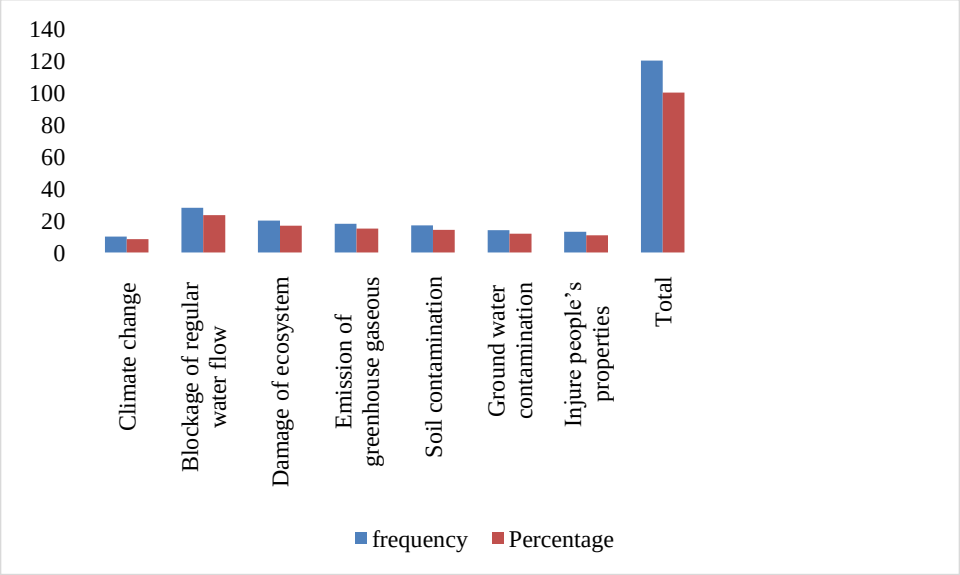

Figure 5: Environmental Impacts

Source: Fieldwork

Uncollected solid wastes create serious negative impacts on environment in Nyagatare city. By numerical order, negative impacts of solid waste disposal being observed in the study area are; blockage of regular water flow 23.3%,damage of ecosystem/ decrease in vegetation diversity 16.7%, emission of greenhouse gaseous and other air pollutants 15%, soil contamination 14.2%, ground water contamination 11.7%, injure people's properties 10.8%, and climate change 8.3%.

Heavy winds are spreading dust and filth from the open dumps to living areas and toxic gaseous emissions are continuously exposed to the atmosphere. It was also noticed during the field visit that unwanted solid waste in open dump site sometimes is being burnt and creating drastic air pollution. During heavy rains, most of the waste is carried to rivers in form of run off and this lowers the water quality for both consumption and some aquatic animals. Pesticides applied in several modes and places pollute various parts of the environment, counting groundwater sources (Sudhakar, 2001). Wastes that end up in water bodies negatively change the chemical composition of the water; this will disturb all ecologies existing in the water. It can also cause injury to animals that drink from such polluted water like cow and buffaloes.

Uncontrolled dumping wastes present threats to air quality. On arrival at the site, one of the encounters is the bad smell that comes out. Indiscriminate decomposition of waste also leads to the release of the CO_2 gas that leads to the depletion of the ozone layer. This disclosures people to U-V light to which with other carcinogenic gases created they lead to cancer. The municipal waste throws all over the place, and the acids from it reprobates the value of the land. Also, the waste lodges much space of which could have been used for more productive things, like farming and construction. Hazardous waste has become an increasingly serious ecological, social, economic and political problem (Sikabongo and Storey, 2003). Added waste not followed with immediate modification strategies to eliminate it would lead to environmental deterioration (McMicheal, 2000).

4. Conclusion

This study assessed the waste disposal and its effects on environmental and human health in Nyagatare city-Rwanda. Results from the analysis of data revealed that nearby residents suffered from related diseases due to the uncontrolled waste disposed closer to their settlements. Hence, they were victims of malaria, diarrhea, cholera, skin infection, eyes disease, bronchitis, liver diseases, reproductive diseases, viral fever, and asthma. This state of health of respondents in this study can be linked to pollution from the dumpsite. It was also noted that the extent of air and water pollution is worse as a result of offensive and disease-carrying odor, as well as land and ground water pollution.The study therefore concludes that the waste should be properly located, managed and disposed in appropriate sites to minimize its effects on the environment. For

protection of people health and environment in general, it is a matter of local government to pursue vigorously all activities carried out in the city and taking clean environment as priority. People need to be educated by health motivators about the effects of poor waste disposal on their health.

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