



Environmental Sanitation Practices in Maiduguri Metropolitan Council, Borno State, Nigeria

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Abstract: This study assessed the environmental sanitation practices in Maiduguri Metropolis among the residents in high, medium and low density residential areas with the sole aim of identifying the extent of relationship between socio-economic and demographic characteristics and sanitation practice. A systematic random sampling technique was used to select 394 participants from residents of high, medium and low density residential areas of Maiduguri Metropolitan Council was used. Questionnaires were administered using the systematic random sampling technique whereby every tenth house was selected for the study and a respondent was sampled in each of the selected buildings. Descriptive tools was used for the study. The descriptive tools used include frequency and percent tables. The study revealed that residents' educational background and income earnings varied among the respondents in different residential density areas, thus affects their sanitation practice. The study revealed that 51.9% of the residents had tertiary education in the low density residential area while 20.7% and 27.4% had tertiary education in the high and medium densities areas. The findings also revealed 51.9% of high income earnings for the respondents in the low density area while it were 20.7% and 27.4% in the high and medium density areas. Results of the findings further showed that 30.8% of waste storage facilities in the high density area were open dumping. Findings showed that 32.1%, 30.5% and 33% of residents in the high, medium and low densities, respectively stored/disposed waste in less than 7 days. The predominant method of waste disposal in the high and medium density was house to house collection, while the use of burning was prevalent in the low density. The recommends needs for urgent attention in the area of public enlightenment on environmental and health education. This hinges on the understanding that community participation in sanitation practices is one of the most important and essential means for solving the sanitation problems at the present time.

Keywords: Environmental, Sanitation, Practices, Respondents, Densities, and Maiduguri.

Introduction

Environment is the term refers to the natural environment in which man, animals and plants live and interact, it includes basically the land, water and air. It is upon this natural surrounding that all creatures depend for their existence and sustenance (Uchegbu, 2000). According to World Health Organization (2012) sanitation is defined as a way of life that is expressed in the clean home, farm, business, neighborhoods and community. Also, World Health Organization (WHO) defines sanitation as the provision of facilities and services for the safe disposal of human urine and faeces (UNICEF 2012; WHO, 2012). Environmental sanitation comprises the disposal and treatment of human excreta, solid waste and wastewater, control of disease vectors, and provision of washing facilities for personal and domestic hygiene which work together to form a hygienic environment (World Health Organization, 2017). Environmental sanitation, therefore, is conveyed as the control of all the factors in man's physical environment that may exercise deleterious effect

on human physical development, health and survival (WHO, 2012). According to Adeniyi (1994), the environment should be protected through different means such as regular removal of wastes, maintenance of clean surroundings, good food and appropriate personal hygiene. It also involves regular supply of safe water, prevention of pollutions, and provision of decent housing with appropriate facilities essential for human conveniences.

Accessibility to proper sanitation will have improved living conditions, in terms of increased health and well-being and economic productivity (Elledge, 2003). Proper sanitation not only reduce the burden of disease, but it also provides secondary benefits such as increasing child school attendance, increasing economic productivity of communities, as well as assisting in the empowerment of women (WHO *et al.*, 2004). However, despite its importance, inadequate sanitation impacts individuals and communities worldwide. In a country such as Nigeria, majority of people in the lack sanitation and, the provision of improved sanitation remains a continuous challenge due to the inability to cope with the associated increase in population as communities move from rural, semi urban to urban development Mara *et al* (2010). The rapid population growth which is not accompanied by a corresponding increase in the delivery of environmental sanitation facilities and services capable of enhancing environmental sanitation practices. The resultant effects of these are unsanitary and unhealthy environmental conditions that are prevalent in Nigerian urban centers (Daramola, 2012).

The growth urban centers is not accompanied by a corresponding increase in the provision of environmental sanitation facilities. So in addressing these challenges of sanitation in the urban communities, the trend in the promotion of sanitation is progressively moving from the emphasis on centrally planned sanitation infrastructure to a demand led approach that empowers people to change behaviour and improve their own sanitation (Mara *et al* 2010). Provision of environmental sanitation is germane to the health status of the people (Eaves *et al.*, 2017). However, the success may largely depend on the effective accesses to information and education which are communicated to the public on environmental sanitation education. Improved environmental sanitary condition impact positively a wide range of development indicators. Hence, environmental sanitation is a means to improved quality of life of the individuals or community and a contributor to their social, economic and physical development (Olowoporoku, 2013). Thus, in order to attain the goal of proper environmental sanitation practices, good sanitation behaviour and availability of facilities and services must work together (Mmom and Mmom, 2011). As it is in other environmental management activities, environmental sanitation practices are influenced by various factors which includes: socio - economic and demographic attributes, such as age, income, gender, education, household structure; situational conditions. Others include level of awareness of the residents, attitude of residents towards the sanitation practice, availability of facilities and services, enabling law and place of residence. Maiduguri metropolis is facing environmental sanitation challenges such as improper drainage system; lack of good refuse disposal systems; inadequate number of toilets and bathrooms; blockage of essential routines and exits that will be used for emergency purposes; lack of health facilities; absence of health personnel.

The significance of clean environment to a healthy living condition for man cannot be overstated. This has warranted the need for effective and regular sanitation activities for every society. The provision of adequate sanitation facilities, urban infrastructure and enabling environmental sanitation policies influence the achievement of a high quality living condition for man and his environment. Adequate environmental sanitation practices are more than just an inconvenience. It allows users knowledge and experience to the design and management of facilities and services and to increase the likelihood that the services will be used sustainably. It will provide a reference material to the Agencies such as Ministry of Environment, Borno State Environmental Protection Management Agency (BOSEPA), Borno State Urban Planning and Development Agency (BUPDA) and other relevant bodies for sustainable development of sanitary condition management

in Maiduguri metropolis. It will also provide an in-sight of what the menace of poor sanitation practices are and the ways to remediate it. And the study will further add to the existing body of knowledge with regard to sanitation practices toward achieving effective environmental sanitation.

In spite, the aforesaid significance of studying environmental sanitation practices, only few authors have written on environmental sanitation practices in Maiduguri. For example Dauda *et al* (2020) examined the degree of correlation of demographic factors and environmental sanitation education on individual's health status of residents in Maiduguri Metropolis, However, this study did not properly examined the environmental sanitation practices considering the differences in residential densities areas of the respondents which has enormous influence in the sanitation practices. Also, much emphasis was not laid on the resident's level of satisfaction and response to the inadequacies with the sanitary conditions and facilities as well as the indebt strategies to improve the people's health conditions in the environment. So this study sets out to determine the knowledge, attitude and practices of environmental sanitation in semi-urban communities with a view to designing specific strategies that targets behavioural change by improving their knowledge and attitude towards sanitation. Thus, this study was developed to answer the following questions: To what extent does age, gender, level of education, occupation, income status relates to residents' sanitation practices in Maiduguri? What are the sanitation facilities in the communities with high, medium and low density areas? And how do the residents respond to inadequacies in the provision of these facilities in the communities with high, medium and low building densities area?

Research Questions

1. Does the resident's socio-economic and demographic characteristics influence environmental sanitation practice? 2. Does the differences in the high, medium and low density residential areas influence the environmental sanitation practices of the communities?

Aim and objectives of the Study

The study aimed at assessing the residents' environmental sanitation practices in high, medium and low building density areas in Maiduguri Metropolis in relation to socio-economic and demographic characteristics of the respondents in the study area. In view of this, the study

1. Assessed the socioeconomic characteristics among the residents of high, medium and low density residential areas
2. Examine the relationship between sanitation practices among the respondents of high, medium and low density residential areas.

Significance of the study

The study will provide an in-depth understanding on the problems related to poor sanitation practices as well as the ways to overcome such problems in the metropolis of Maiduguri and other cities in Nigeria. This study will further contribute to the existing body of knowledge with regard to sanitation practices in Maiduguri toward achieving efficient and effective measures of environmental sanitation practice. Lastly, the study will also stimulate further research on the subject in the area and other market places with similar problems in the state and the country in general.

Literature Review

Sanitation is the state of cleanliness of a place, community or people particularly relating to those aspects of human health, including the quality of life determined by physical, biological, social and psychological factors in the environment (Mensah, 2002).and the use of safe water for domestic purposes. It describes the act of maintaining clean and hygienic conditions that help prevent diseases through services such as garbage

collection and waste water disposal (WHO/UNICEF, 2006). Environmental sanitation practice refers to the conscious efforts and pattern adopted by individuals towards achieving clean environment.

Sanitation is one of the most basic services in human life. Improving environmental sanitation is known to have a significant beneficial impact on health both in households and across communities. However, the behaviour and attitude of the inhabitants towards sanitation do not augment this effort. People do not seem to care about good environmental sanitation practices and constantly litter indiscriminately without considering the future effects of these poor sanitation practices on their health. If appropriate efforts are not made to halt such practices, the metropolis will continue to spend the greater part of her resources in an attempt to ensure good environmental sanitation without success. This in tandem with the high population growth is the lack of institutional capacity to formulate and adopt strategies to ensure proper environmental management. Environmental sanitation is crucial to –the overall national growth and development. It refers to the promotion of hygiene, prevention of diseases and other consequences of ill-health which relates to environmental factors. WHO and UNICEF (2000) noted that environmental sanitation includes issues safe excreta disposal, solid waste management, medical waste management, site drainage, personal hygiene facilities, vector and pest control, and food hygiene.

Materials and Method

The Study Area

The study area is Maiduguri Metropolis, which is also called Yerwa the capital and largest city of Borno State, is situated in north-eastern Nigeria. Maiduguri in 2022 had a population of 870,000 (www.macrotrends.net/cities/pop). The area lies between longitudes 13°03'23" and 13°14'19"E and Latitudes 11°46' and 11° 53'N with a total land area of 77,818 KM² (Figure 2), which means Maiduguri is categorized as a 'medium' size city in the Nigerian urban. This city contains 15 political wards delineated for electoral purposes. The influx of people from the rural areas to the city of Maiduguri metropolis in search of white collar jobs and good conditions of living, the provisions of basic amenities have been in short supply within the city of Maiduguri. Inadequate supply of sanitation facilities has resulted in different practices by the residents. It is common to see children defecate in the open while adults are found urinating anywhere especially along the rivers, uncompleted buildings, and open fields of the town. The drainage system is blocked and generates filthy waters and harmful insects. Consequently, there are growing cases of flooding within the metropolis especially during heavy rainfall. This emanates from unplanned development in some areas which may not be able to meet the emerging demands from the new development activities.

The climate of Maiduguri is tropical in nature and it is characterized by wet and dry seasons. The temperature ranges between 21 and 34°C, while the annual rainfall ranges between 150 and 3000 mm. The area is predominantly under the influence of northeast trade wind from the Sahara Desert during the long dry season, while short wet season is associated with the Southwest trade wind from the Atlantic Ocean. The city sits along the seasonal Ngadda River which disappears into the Firki swamps in the areas around Lake Chad.

Sampling Technique

Data for this study were drawn from administration of questionnaire. The target population for this study were the respondents spread across the fifteen political wards, which further subdivided into three category based on their population density. Thus, the metropolis was grouped into three (based on their residential densities); namely: high density residential (with low income), medium density residential (with medium income) and the low density residential (with high income). Densities were therefore selected based on the 15 wards in Maiduguri. For high density, the target was Bulumkutu, for medium density the target was Bolori and for low density, the target was GRA. In all, there are fifteen wards in the study area. Out of these fifteen, three which fall under high, low and medium density residential areas were examined respectively.

Data Collection

Systematic sampling technique was used to distribute the questionnaire by selecting at the interval of ten houses in each settlement representing 10% of all residential buildings in the selected wards of the study area. The first building was randomly selected using a system whereby numbers 1-10 were written on pieces on paper thoroughly wrapped and kept in a box. The buildings sampled amounted to 10 percent of the total buildings in the study area. Thus, a total of 394 residents were selected on which questionnaires were administered. Thus, the sample comprised 142 respondents in the high density residential area, 135 respondents in medium density residential area and 113 respondents in the low residential area.

Data Analysis

Data collected was analyzed using frequency counts and percentage and description of the demographic characteristics of respondents. Descriptive statistics such as frequency distribution and percentages were used to describe the socio-economic and demographic characteristics of the respondents.

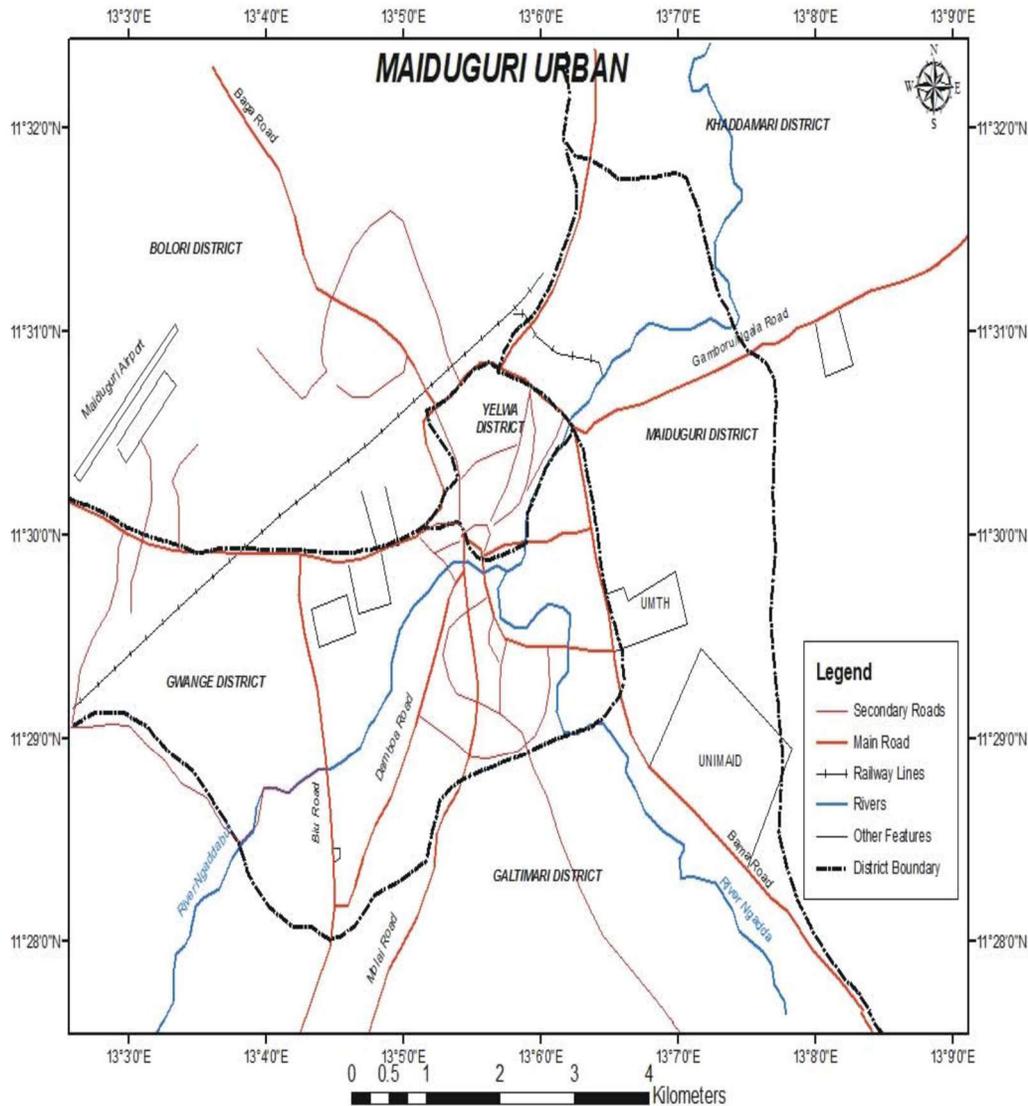


Figure 2: Map of Maiduguri Metropolitan council

Research Findings

This section discusses the profile of the respondents on age, gender, marital status, educational status, occupation and income status based on the density in the high, medium and low residential areas, and their relation with environmental sanitation practices of the respondents in the study area.

Profile of the Respondents in Maiduguri

Table 1 below shows the data on the profile of the respondents discussed are the age, gender, marital status, educational status, occupation, and income status.

Age

Data on residents' age distribution were grouped into four. It is revealed in Table 1 that 14.4%, 18.3% and 17.6% of the respondents were from ages (20 to 39 years) in the high, medium and low density residential areas. Further, it shows 31.1%, 32% and 30.5% were from ages (40 to 49 years) in high, medium and low densities, while 37.9%, 34.4% and 35.9% were from ages (50 to 59 years) and 16.6%, 15.3% and 16% were from ages (60 years and above) in the three densities respectively. This proportional representation of the adult residents can influence the respondent's response in the participation of the environmental sanitation practices because of their agility. The findings on age revealed that the average age of respondents for high, medium and low density residential areas were 46 years, 44 years and 44 years respectively. The findings indicate an average age of the respondents in the three densities stood at 47 years. This means residents in the study area were mainly within the working group. The analysis suggested that majority of the respondents in all the three density residential areas are active and productive; and could participate in the exercises of environmental sanitation practices in their areas.

Gender

The representation of the two gender distribution from the three different residential areas revealed 112 (35%), 110 (34.4%) and 98 (30.6%) were male in the high, medium and low densities residential areas. While there were 16 (21.6%), 20 (27%) and 38 (51.4%) female in the high, medium and low density residential areas respectively. The finding indicates that the two genders were not properly represented across the residential areas as majority of the respondents were male counterparts. The higher percentage of male respondents reflects the culture of the people in the study area where mostly men are the one responding to activities outside their houses in the area.

Moreover, some of the women often preferred their husbands to respond wherever they are available. This implies that the females who were traditionally assigned with the responsibility of taking care environmental sanitation activities and with greater sensitivity towards environmental issues were not fully involved in the study. And, this in proportionate representation of the two genders may influence the residents' response in the evaluation of environmental sanitation practices in the study area.

Marital Status

Marital status was categorized into two: single and married. Findings on residents' marital status across the three residential densities of Maiduguri revealed that most 74 (27.1%), 96 (35.2%) and 103 (37.7%) of the residents in the low, medium and high density residential areas were married. Findings further revealed 50 (41.3%), 38 (31.4%) and 33 (21.3%) were single in the low, medium and high residential areas. It can therefore be deduced from this result that the marital status of respondents spread across the three residential densities is slightly increasing for married and declining in the number of single residents from low to medium to high, reflecting the level of their respective residential densities. The high proportion of the married also reflect the age structure in the area as shown in table 1.

Table 1. Socio-economic Information of the Respondents.

| Attribute | High density Residential area frequency (%) | Moderate density Residential area frequency (%) | Low density Residential area frequency (%) | Total frequency (%) |
|----------------------------|---|---|--|---------------------|
| Age | | | | |
| 20–39 | 19(14.3%) | 24(18.3%) | 23 (17.6%) | 66 (16.8%) |
| 40–49 | 41 (31.1%) | 42 (32.0%) | 40 (30.5%) | 123 (31.2%) |
| 49–59 | 50 (37.9%) | 45 (34.7%) | 47(35.9%) | 142 (36.0%) |
| ≥ 60 | 22 (16.6%) | 20 (15.3%) | 21(16.0%) | 63 (16.0%) |
| Total | 100 | 100 | 100 | 100 |
| Gender | | | | |
| Male | 112 (35%) | 110 (34.4%) | 98 (30.6%) | 320 (100%) |
| Female | 16 (21.6%) | 20 (27%) | 38 (51.4%) | 74 (100%) |
| Total | 128 | 130 | 136 | 394 (100%) |
| Marital status | | | | |
| Single | 33 (27.3%) | 38 (31.4%) | 50 (41.3%) | 121 (30.7%) |
| Married | 103 (37.7%) | 96 (35.2%) | 74 (27.1%) | 273 (69.3%) |
| Total | 136 (100%) | 134 (100%) | 124 (100%) | 394 (100%) |
| Educational Qualifications | | | | |
| Primary | 31 (21.3%) | 42 (29%) | 72 (49.7%) | 145 (36.8%) |
| Secondary | 40 (34.2%) | 49 (41.9%) | 28 (23.9%) | 117 (29.7%) |
| Tertiary | 21 (15.9%) | 28 (21.2%) | 83 (62.9%) | 132 (33.5%) |
| Total | 92 (100%) | 119 (100%) | 183 (100%) | 394 (100%) |
| Occupation | | | | |
| Civil servant | 8 (12.7%) | 16 (25.4%) | 39 (61.9%) | 63 (16%) |
| Business / Trading | 40 (36.7%) | 38 (34.9%) | 31 (28.4%) | 109 (27.7%) |
| Farmer | 15 (12.1%) | 29 (23.4%) | 80 (64.5%) | 124 (31.5%) |
| Artisan | 12 (12.2%) | 46 (47%) | 40 (40.8%) | 98 (24.8%) |
| Total | 75 (100%) | 129(100%) | 190 (100%) | 394 (100%) |
| Level of Income | | | | |
| ≤ N18, 000 | 50 (38.5%) | 43 (33%) | 37 (28.5%) | 130 (33%) |
| N18, 000 – N55, 000 | 29 (22.5%) | 41 (31.8%) | 59 (45.7%) | 129 (32.7%) |
| ≥ N55, 000 | 28 (20.7%) | 37 (27.4%) | 70 (51.9%) | 135 (34.3%) |
| Total | 107 (100%) | 121 (100%) | 166 (100) | 394 (100%) |

Source: Field analysis, 2023

Education

Analysis of the educational level in the different density residential areas showed a large number of the respondents had primary qualifications. The study also revealed that educational level of the respondents in the low density residential areas had 72 (49.7%) primary, 28 (23.9%) secondary and 21 (15.9%) tertiary education respectively. In the moderate density residential areas, it changed to 42 (29%) for those attained primary education and 49(41.9%) secondary level and 28 (21.2%) tertiary education. In the high density

residential areas the level of education attainment was 31 (21.3%) primary, 40 (34.2%) secondary and 83 (62.9%) tertiary. Of all, the primary category represents a total of 36.8 percent while tertiary and secondary qualifications accounted for 33.5 percent and 29.7 percent out of the 394 residents responded to the questionnaires respectively. This in proportionate representation of respondents with tertiary education may influence the resident's response in the evaluation of the sanitation practices in the study area. This is because education tends to create awareness. Because the level of educational attained by the respondents play a significant role in environmental awareness. There is every tendency to believe that a well-educated person may perceive his immediate environment differently from a less educated fellow and this is reflected in the result of the analysis. Olofsson and Öhman (2006) opined that educated people are more concerned about the environment and place more emphasis on preserving the environment. This study exhibits that 62.6 percent of the respondents have tertiary education in the low density residential areas, while this declined to 21.2 percent and 15.9 percent in the medium and high densities areas. The findings also imply that the most respondents can easily understand and review events around them because of attainment of tertiary education level. This result is in congruent with the results of some earlier studies (Daramola, 2015; Adejumo, 2013; Daramola, 2012) which have indicated a relation between characteristics such as education of residents' with environmental sanitation practices.

Occupation

Findings on residents' occupation across the residential density revealed most of the respondents in low density residential area were civil servant. This category represented 61.9%, while 25.4% and 12.7% were civil servants in the medium and high density residential areas. The survey also revealed that 36.7%, 34.9% and 28.4% of the respondents were business/traders in the low, medium and high density areas. Farmers accounted for 12.1% in the low, 23.4% in medium and 40.8% in high density areas. The study further revealed that artisan represented 12.2% in the low, 47% in the medium and 24.8% of the respondents in the high density areas. The relative high proportion of civil servants and business class in the low density residential area as shown in table 1 could be attributed to the fact that majority of the residents in that area are well educated and business oriented so engage in different occupation to sustain their livelihood.

Income Status

The findings shows that majority of the respondents 135 (34.3%) had incomes levels with greater than or equal to the N55, 000, followed respectively by incomes level of less than or equal to N18, 000 130(33%) and the lowest incomes levels that ranges between N18,000 – N55,000 represent 130(32.7%). These results revealed that income distribution varied significantly with residential density of the areas and income level decreased with increase in the high residential density to the low residential density area. The analysis grouped the data on residents' income level into three: low, medium and high. Incomes less than or equal to ₦18,000 were categorized as low income while income ranges between N18, 000 – N55, 000 and incomes level greater than or equal to N55, 000 were categorized as medium and high respectively. That the occupation of respondents is directly proportional to their residential densities, that is, high density residential area with low income, medium density residential with medium income and low density residential with high income. The results indicates residents' with low income earnings \leq N18000 represents 50 (38.5%) in the high density 43 (33%) in the medium density and 37 (28.5%) for low density areas. For medium income earnings ranges between N18000 – N55000, high density residential accounts for 29 (22.5%), medium residential 41 (31.8%) and low residential 59 (45.7%) while high income earners represents 28(20.7%) for high residents, 37 (27.4%) medium residents and 70 (51.9%) for low residents. Therefore, this study consistent with other studies that have shown those who have high income are willing to support programs that enhance the quality of the environment than those in with low income group (WHO 2011).

ENVIRONMENTAL SANITATION PRACTICES AMON RESPONDENTS IN HIGH, MEDIUM AND LOW DENSITY RESIDENTIAL AREAS IN MAIDUGURI METROPOLIS.

This section examined sanitation issues which include types of waste generated, quantity of waste generated, waste storage facility, waste collection and disposal, method of refuse disposal and practice of clearing environments.

Types of Waste generated

The results showed respondents on average generate solid waste such as paper, polythene bags and plastics represents 66 percent while respondents generate clothing materials, leather and stationary account for 34 percent. The finding further reveals respondents mainly generate paper, polythene bags and plastics constitutes 97 (37.7%) in the high, 91 (35%) in medium and 72 (27.7%) in low density residential areas. While, residents generate clothing materials, leather and stationary accounts for 29.9 percent in high, 26.1 percent in medium and 44 percent in low density residential areas respectively.

Table 2: Resident’s Environmental Sanitation Practices in Maiduguri Metropolis

| Practice | High Density F (%) | Medium Density F (%) | Low Density F (%) | Total F (%) |
|--|-----------------------|-------------------------|----------------------|-------------------|
| What types of solid waste is generated in your area? | | | | |
| 1. Paper, polythene bags, & plastic | 97 (37.7%) | 91 (35%) | 72 (27.7%) | 260 (66%) |
| 2. Clothing, leather, stationary | 40 (29.9%) | 35 (26.1%) | 59 (44%) | 134 (34%) |
| Total | 140 | 126 | | 394 (100%) |
| What is the quantity of solid waste generated per house hold? | | | | |
| 1 - 2 buckets (5 - 10 kg) | 59 (44.7%) | 47 (35.6%) | 26 (19.7%) | 132 (33.5%) |
| 3 - 4 buckets (11 - 20 kg) | 28 (21.3%) | 34 (26%) | 69 (52.7%) | 131 (33.25%) |
| 5 - 10 buckets (21 - 40 kg) | 25 (19.1%) | 46 (35.1%) | 60 (45.8%) | 131 (33.25%) |
| Total | 112 | 127 | 155 | 394 (100%) |
| How do you collect waste generated? | | | | |
| Baskets | 10 (7.7%) | 16 (12.2%) | 50 (37.6%) | 76 (19.3%) |
| Bags/nylon bags/ sacs | 30 (23.1%) | 42 (32%) | 13 (9.8%) | 85 (21.6%) |
| Open dumping | 40 (30.8%) | 34 (26%) | 12 (9%) | 86 (21.8%) |
| Closed containers | 19 (14.6%) | 20 (15.3%) | 30 (22.6%) | 69 (17.5%) |
| Open container | 31 (23.8%) | 19 (14.5%) | 28 (21%) | 78 (19.8%) |
| Total | 130 | 131 | 133 | 394 (100%) |
| Method of Waste Disposal? | | | | |
| House to house collection | 42 (31.1%) | 39 (29.7%) | 24 (18.8%) | 105 (26.6%) |
| Dumping on refuse site | 35 (26%) | 30 (22.9%) | 30 (23.4%) | 95 (24.1%) |
| Burning | 18 (13.3%) | 27 (20.6%) | 32 (25%) | 77 (19.5%) |
| Burying | 15 (11.1%) | 15 (11.5%) | 23 (18%) | 53 (13.5%) |
| Water Bodies | 25 (18.5%) | 20 (15.3%) | 19 (14.8%) | 64 (16.2%) |
| Total | 135 | 131 | 128 | 394 (100%) |
| How frequently do you dispose waste? | | | | |
| Daily | 30 (22.9%) | 38 (29%) | 58(44%) | 126 (32%) |
| Once a week | 42 (32.1%) | 40 (30.5%) | 44 (33%) | 126 (32%) |
| Every month | 59 (45%) | 53 (40.5%) | 30 (22.7%) | 142 (36%) |
| Total | 131 | 131 | 132 | 394(100%) |

| | | | | |
|---|------------|------------|------------|------------|
| Do you practice refuse and drainage channels clearing in your area? | | | | |
| Yes | 79 (29.4%) | 85 (31.6%) | 105 (35%) | 269(100%) |
| No | 51 (40.8%) | 46 (36.8%) | 28 (22.4%) | 125 (100%) |
| Total | 130 | 131 | 133 | 394(100%) |
| If yes, how often do you participate in clearing refuse dump and drainage channels? | | | | |
| Daily | 69 (33.3%) | 65(31.4%) | 73 (35.3%) | 207(100%) |
| Weekly | 41 (28.9%) | 52(36.6%) | 49 (34.5%) | 142(100%) |
| Monthly | 83 (33.7%) | 78(31.7%) | 85 (34.6%) | 246(100%) |
| Total | 132 | 131 | 131 | 394(100%) |
| Does the government provide sanitary facilities and equipment in your area? | | | | |
| Yes | 78(31.7%) | 83 (33.7%) | 85 (34.6%) | 246(100%) |
| No | 53 (35.8%) | 49 (33.1%) | 46 (33.1%) | 148 (100%) |
| Total | 131 | 132 | 131 | 394(100%) |

Source: Generated from questionnaire's response

Quantity of waste generated

The results showed that majority of the respondents on average generate solid waste 5 – 10kg accounts for 44.7%, 35.6% and 19.2% in the high, medium and low densities respectively, while residents that generate waste 11 – 20kg per household represent 21.4%, 26% and 52.7% in the high, medium and low density residential areas as well as waste generation per household of 21 – 40kg represents 19.1%, 35.1% and 45.8% in the high, medium and low density residential areas. This results exhibits that large quantity of waste are been generated in the low density areas. This reflects the income status of the respondents in low density areas as shown in (table 1), that enabled them supplied more items of demand than their counterparts in the high and medium density residential areas. The more they supply the needed items the more they generate wastes that built to large quantity of waste materials in the area. This result is in conformity with other studies that showed larger quantity of wastes have been generated in low density residential areas (Adewale, 2019). This reflect the level of income of the respondents that supplied much and dispose larger quantities of refuse.

Waste storage facility

The findings from the study showed that various waste storage facilities were used in the study area. The results revealed majority of the residents had designated containers for dumping solid wastes in their homes. Further investigation revealed the most adequate facility used was open dumping represents 30.8 percent, 36 percent and 9 percent in high, medium and low density residential areas respectively while the proportion of respondents reported bags/sacs second adequate facility they utilized to store waste in the high, medium and low density residential areas with 23.1 percent, 32 percent and 9.8 percent. Other waste storage facilities in respondents' homes were opened container and baskets were reported third most adequate facilities been used. These were used by 23.8 percent, 14.5 percent and 21 percent as well as 7.7 percent, 12.2 percent and 37.6 percent of the respondents in the three residential densities. The practice of disposing these wastes by covered container was the least common practice by majority of the respondents in the present study accounting to 14.6 percent, 15.3 percent and 22.6 percent in the high, medium and low density residential areas. The practice of disposing wastes by open dumping is prevalent as observed in this study was also observed in previous Nigerian studies (Adeagbo, 2004).

Waste collection

Taking into consideration the duration of waste collection and subsequent disposal is pivotal to the safety of the environment. The data showed that the most prominent duration of waste storage before disposal is less

than seven days. The results further indicates that 55 percent, 59.5 percent and 77 percent of respondents disposed their waste collections in an interval 5 days in the high, medium and low density residential areas. And majority of the respondents were in the low density residents. This could be not unconnected with the fact that the waste disposal operators do collect waste items almost on every week. Respondents who claimed to store and dispose their waste items in more than a week time could be those who do not mind the environmental sanitation practice of their immediate surroundings. However, 45 percent, 40.5 percent and 22.7 percent in the high, medium and low density residents reported their waste dispose once in a month. The 22.7 percent has affirmed the aforesaid statement that majority of the residents in the low density disposes waste items more frequently than both high and medium residents. Respondents who claimed to store and dispose their waste items at a longer duration could be those who do not generate much waste items or those that are not always available during the visits of the waste collectors.

Method of Refuse disposal

The findings revealed house to house collection waste disposal method decreases as residential density increases from the high through medium to low density residential area which accounts for 31.1 percent, 29.7 percent and 18.8 percent in the high, medium and low density residential areas respectively. The second method of refuse disposal shows residents burnt their refuse within the residential environment which stood at 13.3 percent, 20.6 percent and 25 percent in the high, medium and low density residential areas, thereby causing air pollution. The practice of burning waste in the high, medium and low density residential areas can be attributed to the presence of uncompleted buildings and undeveloped lands which are converted to communal waste burn sites within the residential areas. The pattern of the rate of dumping of waste on dumpsite is further explained as dumping of refuse on water bodies around them accounts for 18.5 percent, 15.3 percent 14.8 percent without minding the effect. This can be attributed to the fact that majority of the respondents reported that their community did not have a designated central area for waste disposal which warranted residents towards indiscriminate dumping of refuse in the study area. So it appears that, even if the people are willing to practice proper sanitation, they are constrained by inadequacy of existing sanitation facilities that result in dumping of refuse indiscriminately, which causes pollution and exposure to diseases. In addition, the heaps of refuse that are seen commonly in the study area have a negative impact on the beauty of the city. The findings also revealed residents burying their refuse constitutes 11.1 percent, 11.5 percent 18 percent in the high, medium and low density residential areas. Although, the practice of burying refuse within the environment is the least common method among the residents of the three residential densities. This indicated that poor sanitation practices in the Maiduguri is as a result of inadequate refuse collection and poor disposal system.

Practice of Clearing Environments

The study revealed that in the high density residential area, 22.9%, 32.1% and 45% of the residents clean their refuse sites and drainage channels on daily, weekly and monthly basis and in the medium the value transformed to 29% clean their refuse sites and drainage channels daily, 30.5% percent weekly and 40.5% monthly. The result further exhibit improvement in the timely cleaning of refuse sites and drainage channels in the low density residential areas with 44% of the residents practice the exercise of cleaning their environment daily, 33% weekly and 22.7% on monthly basis. This means that respondents who regularly participate in the monthly environmental sanitation exercise constitutes 269 (68.3%) respondents out of 394 represented the total majority, while 125 (31.7%) respondents said they do not participate in cleaning their environment exercise regularly. The findings also indicated that the residents are aware of the need to clean their refuse sites and drainage channels regularly. This study clearly indicated the period of cleaning of refuse sites and drainage channels varies with the density of residential area. Areas with low density residents observed the exercise more frequent than the high and medium density residential areas respectively.

Availability of facility in your area

Availability of environmental sanitation facilities to residents is pivotal in order to ease the activities of proper and appropriate sanitation exercise. This is due to the fact that provisions of facilities in the area may influence resident's sanitation practices of waste collection and disposal as well as the what method of disposal is to adopt. The findings revealed that majority of the respondents said yes that government provides sanitary facilities in the high density area are 78(31.7%), in the medium density are 83(33.7%) and in the low density areas are 85(34.6%). The findings further shows respondents who said no government did not provides sanitary facilities in their areas stood as 53 (35.8%) 49 (33.1%) and 46 (33.1%) in the high, medium and low densities respectively. The decline in the will and capacity of the government to effectively cope with the provision of the basic needs of the people experienced a great setback as due to demographic and spatial growths of Nigerian cities that doesn't commensurate with increase in provision of environmental amenities. The inadequate supply of sanitation facilities like public toilets, drainage, sewerage networks, disposal facilities and poor sanitation practices have contributed to various social and health problems in the Maiduguri. This is because when a community is faced with limitations in sanitation facilities; the poor use various techniques to compensate, often in ways that adversely impact human dignity and public health, and that are destructive to surrounding infrastructure. Such practices include disposal of solid waste and excreta on vacant lands, drainage paths and water bodies; discharge of waste water on streets, and taking bath in the open before dawn, among others.

Conclusion

This study assessed the environmental sanitation practices in Maiduguri metropolitan council in the northeast, Nigeria. The study revealed the reflections of residents' level of socio-demographic attainments and environmental sanitation practices in the high, medium and low density residential areas respectively. This study has suggested sanitary conditions of the study area is fair however, there were still some negative environmental practices like dumping of refuse indiscriminately, disposal of solid waste and excreta on vacant lands, drainage paths and water bodies and discharge of waste water on streets among others which causes pollution and exposure to diseases. In addition, the heaps of refuse that are seen commonly in the study area have a negative impact on the edifice of the metropolis. The study also indicated that environmental sanitation practices in the three density residential areas of Maiduguri are reflections of the respondent's socio-economic and demographic characteristics such as educational background and income status in the study area.

Recommendations

The study recommends that the first thing that needs urgent attention is in the area of public enlightenment on environmental and health education. This hinges on the understanding that community participation in sanitation practices is one of the most important and essential means for solving the sanitation problems at the present time. There is therefore a need to educate the people about the danger of living in disheveled environment. Also a lot of attention is still required in the area of environmental sanitation with respect to not respect to employing and promoting strategies that influence behavioural change through effective regular education and awareness campaigns. The government should be more proactive in the provision of adequate basic infrastructural facilities for disposal of refuse. Waste reservoirs at community dumping sites should be cleared regularly to prevent overflow of refuse. And lastly, provision of reasonable fine by the government will be essential, so as to promote and maintain public order towards sanitation as a way to facilitate effective, and sustainable sanitation practices among the residents.

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