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# Levels of Water Supply, Sanitation, Hygiene and Health Status of Residents of Two Communities That Shares Boundaries with a First-Generation Tertiary Institution in Benin City, Edo State, Nigeria.

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**ABSTRACT:** Levels of water supply, sanitation, hygiene and health status of residents of two communities that shares boundaries with a first-generation tertiary institution in Benin City, Edo State, Nigeria was evaluated, using a structured questionnaire. Findings showed that residents primarily relied on boreholes within their premises as main water source, with 72.7 % and 87 % of respondents (Ekosodin and BDPA community respectively). The sanitation facilities were predominantly in both communities, however, 17.3% respondents in the BDPA community indicated that the toilets were not sufficient for use. Respondents (67.3 %) in Ekosodin community reported the availability of soap and water within their premises, against 42 % respondents in BDPA. Respondents of Ekosodin community (82.7 %) had separate containers for bathing and storing drinking water, contrary to the 31.3 % respondents of BDPA community. Health status' findings revealed that a worrisome percentage of respondents (81.3%) in Ekosodin community and (66.7%) in BDPA community indicated the presence of rodents in their houses, hospital/clinic facilities were the primary choice for medical treatment in both communities. In conclusion, community-based intervention programs need to be carried out to educate the populace of both Ekosodin and BDPA residents on the implementation and maintenance of WASH facilities.

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Water availability, sanitation, and hygiene practices are three interconnected and interdependent domains that are essential to the health and welfare of humans. These three primary challenges are combined together to depict an expanding sector because of their interdependence. Despite the fact each may represent a distinct field of activity, they are both dependent on the other (Brown *et al*., 2019). For instance, without clean water, fundamental hygiene practices cannot be carried out; similarly, without toilets, water sources become contaminated (Ngure *et al*., 2014). Good sanitation and hygiene habits, which

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in turn support better health and prevention of disease and its spread, depend on having access to clean water (Imarhiagbe and Eghomwanre, 2023). Water must, however, be available from a number of sources in order for it to be accessible in the first place. According to Wesseling *et al.* (2009), water availability is the volume of water that is available for human use after accounting for both human and natural factors, such as consumption and storage, as well as natural factors like rainfall and evaporation. However, the available water needs to be protected to avoid contamination of the water and to reduce the spread of diseases through it. As a result of this, proper sanitation practices should be encouraged and carried out. The World Health Organization defines the term "sanitation" as the provision of facilities and services for the safe disposal of human urine and faeces. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal" (WHO, 2020). Sanitation is also the treatment and disposal of human waste, and other circumstances linked to public health. Sanitation is avoiding human contact with excreta and washing hands with soap before eating (Oxford dictionary, 2017). Sanitation systems work to safeguard public health by creating a hygienic setting that will halt the spread of disease, particularly through the fecal-oral route (Susana, 2008). For instance, proper cleanliness can minimize diarrhea, a major contributor to malnutrition and stunted growth in children (WHO, 2014). There are numerous other illnesses that are easily spread in areas with poor sanitation, including cholera, typhoid fever, dysentery, dehydration and vomiting (Imarhiagbe *et al*., 2023). Although the MDG target 7c does not provide a global indicator for hygiene, the data on the presence of a handwashing facility with soap and water are increasingly collected as part of nationally representative surveys and will form the basis for efforts to monitor target 6.2 of the SDGs. Two main sources include nationally representative household surveys and a global review of published studies (Freeman *et al*., 2014). Research reviewed by Freeman *et al.* (2014) revealed that the global prevalence of handwashing with soap after contact with excreta is 19 %; rates are lower in Sub-Saharan Africa (14 %) and South East Asia (17 %), where the most studies have been conducted. Proxy indicators for handwashing practice from nationally representative surveys are not reliable and tend to over report hygiene practices (Biran *et al*., 2008).

Studies by Hutton *et al*. (2014) improved water supply and sanitation provide individuals with increased comfort, safety, dignity, status, and convenience, and also have broader effects on the living environment. The social welfare effects are difficult to quantify, given their subjective nature; nevertheless, those benefits are consistently cited as among the most important for beneficiaries of water supply and sanitation (Cairncross, 2004; Jenkins and Curtis, 2005) and may be particularly relevant for women (Fisher, 2006).

Access to improved sanitation and hygiene services in schools and workplaces contributes to school attendance, school performance, and choice of where to work, especially for girls and women. Recent evidence from India shows that a national government program to build toilets in schools led to an 8 % increase in enrollment among pubescent-age boys and girls and a 12 % increase among younger children of both genders (Adukia, 2014). The comparably large effect of school sanitation on primary school children and the robust effects for boys and girls at all ages suggest that at least some of the effect of school sanitation is related to health (Jasper *et al*., 2012). Ekosodin and BDPA communities share borders with a first-generation tertiary institution and play host to a sizeable population of students and staff of the institution, hence, the objective of this paper is to evaluate the Levels of water supply, sanitation, hygiene and health status of residents of two communities that shares boundaries with a first-generation tertiary institution in Benin City, Edo State, Nigeria.

## MATERIALS AND METHODS

*Study areas:* The study was carried out in two different communities sharing boundary with a tertiary institution in Benin City, Nigeria, and they are Ekosodin and BDPA communities. Ekosodin community is positioned to the east of Isihor within the Ovia North-East Local Government Area (LGA) of Edo State. The Ovia North-East LGA, with its administrative center in Okada town, covers an expanse of 2,301 square kilometers (Akinbo and Okaka, 2010). It is situated within the coordinates of 5°451 to 6°151 East longitude and 5°151 to 6°451 North latitude, within the central province of Edo State. As of the 2006 census conducted by the National Population Commission, Ekosodin community was estimated to have a population of 7,000 people. This population has been projected to grow by 543.2% using a geometric method, reaching an estimated 45,000 people by the year 2022 (Ogeah and Ajalaye, 2011). While BDPA community (Bendel Development Property Authority) is located 320 kilometers (200 miles) East of Lagos and about 40 kilometers (25 miles) North of the Benin River with coordinates of 6°20′00″N 5°37′20″E and located in the southern part of Nigeria. The estate was

designed in the late 1970s by the BDPA, an agency of the then government of Bendel State (which was split into Edo and Delta states in 1991). The Authority was founded in 1968 to execute property management, property development and urban planning functions. Though figures are not available, the population is observed to increase over the years (Ndubisi *et al.,* 2023).

*Data Collection and Analysis:* This assessment was carried out adopting a descriptive cross-sectional study using a structured questionnaire to households in Ekosodin and BDPA community. A total of three hundred completed copies of questionnaires were retrieved from each study area (estimated sample size) upon completion of the survey. The questionnaires were pretested and the questions were clarified with additional explanations in pidgin by the interviewers. The questionnaire consists of different sections such as Section A; socio-demographics of respondents, Section B; availability of water source and its location, Section C, hygiene and Section D; respondents' health status and management. The retrieved questionnaires were analyzed using Statistical Package for the Social Sciences (SPSS, version 22) and results were presented using descriptive tables.

## RESULTS AND DISCUSSION

The socio-demography of participants in this study as revealed in table 1, showed the sex distribution of which 170 (56.7%) were female, while 130 (43.3%) were males for Ekosodin residents, while for BDPA residents the sex distribution showed that 162 (54%) were females and 138 (46%) were males, suggestive of the relative willingness of females to responding to survey interviews when compared to males. The age group of participants revealed a varied frequency in age categories as 18-20 years (16.7%), 21-24 years (39.3%) 25-30 years (29.3%), 31-40 years (9.3%) and 41-50 years (5.3%); with the highest proportion occurring in aged 21-24 years which represents 39.3% of the total respondents for Ekosodin, while the highest proportion occurring in aged 25-30 years which represents 29.3% of the total respondents for BDPA. The participants' level of education suggests that the majority of respondents in Ekosodin had tertiary level of education (85.3 %), while 14.7 % were secondary school certificate holders. The same was true for BDPA residents where 79.3% of the respondents had tertiary level of education, while 20.7% were secondary school certificate holders. Survey for Ekosodin respondents also showed that 256 (85.3%) were single, while 44 (14.7%) were married indicating the respondents' marital status. A similar result regarding marital status was obtained for the respondents in BDPA indicating that 266 (88.7%) were single, while 34 (11.3%) were married.

**Table 1: Socio-demography of Participants from studied locations**

| Parameter | Opinions | Ekosodin | | BDPA | |
|---|---|---|---|---|---|
| | | Frequency of Participants (n = 300) | Percent of participants (%) | Frequency of Participants (n = 300) | Percent of participants (%) |
| **Sex of Participants** | Female | 170 | 56.7 | 162 | 54 |
| | Male | 130 | 43.3 | 138 | 46 |
| **Age of Participants** | 18-20yrs | 50 | 16.7 | 20 | 6.7 |
| | 21-24yrs | 118 | 39.3 | 42 | 14 |
| | 25-30yrs | 88 | 29.3 | 156 | 52 |
| | 31-40yrs | 28 | 9.3 | 58 | 19.3 |
| | 41-50yrs | 16 | 5.3 | 24 | 8 |
| **Level of Education of Participants** | Secondary school | 44 | 14.7 | 36 | 20.7 |
| | Tertiary | 256 | 85.3 | 238 | 79.3 |
| **Marital Status of Participants** | Married | 44 | 14.7 | 34 | 11.3 |
| | Single | 256 | 85.3 | 266 | 88.7 |

These findings from both studied communities suggest that the majority of respondents are educated, with a higher representation of individuals with tertiary education and a clear description of both communities, where a large proportion of staff and students of University of Benin, Ugbowo campus are residents. The responses of the participants to core water issues in Ekosodin and BDPA communities are shown in table 2. The survey in Ekosodin community revealed that 72.7 % of respondents reported using boreholes as main source of water in their houses, 11.3 % relied on piped water, while 16 % relied on protected dug well. The survey carried out in BDPA community revealed that the main source of water for the residents was borehole (87.3 %), a small number of respondents (4 %) relied on piped water, while 8.7 % reported protected dug well as their source of water. Furthermore, 94 % of participants in Ekosodin community had their main water source located within their premises, with 82.7 % confirming the availability of this source, while 100 % of respondents in BDPA community had their main

water source within their premises, with 99.3 % confirming the availability of this source. The majority of the respondents (70 %) in Ekosodin community asserted using the water from their premises for washing and cooking only, while only 30 % used it for drinking, washing, and cooking. The same was also true for the residents of BDPA, as an alarming amount of 85.3% of respondents said that they only use the water from their premises for washing and cooking, while 14.7 % of respondents used it for drinking, washing and cooking. Sachet/bottle water was the preferred alternative drinking water source for majority of respondents in communities, 82 % of participants in Ekosodin community and 99.3 % in BDPA community. An overwhelming 90.7 % of respondents in Ekosodin community stated that they do not boil their water before its usage. The same was even more evident in the responses of BDPA community respondents as an alarming 98.7 % admitted that they did not boil the water before use. Some residents (76.7 %) in Ekosodin community reported that their main water source had no taste, and 77.3 % mentioned it had no color; however, 55.3 % of the respondents had observed sand particles and visible impurities in their water source within the community, which defines the water not fit for human consumption (WHO, 2008). A sharp contrast was observed in the responses from BDPA respondents as only 8.7% admitted that sand particles and visible impurities were present in their water source. According to earlier report of WHO and UNICEF (2015), 91 % of the world's population used drinking water from improved sources, 58 % used water from a piped connection in their dwelling, plot or yard and 33 % from other improved drinking water sources, leaving 663 million people lacking access to an improved source of water.

**Table 2:** Participants' responses to core water questions

| Parameter | Opinions | Ekosodin | | BDPA | |
|---|---|---|---|---|---|
| | | Frequency of Participants (n=300) | Percent of participants (%) | Frequency of Participants (n=300) | Percent of participants (%) |
| | | 34 | 11.3 | 12 | 4 |
| | Borehole | 218 | 72.7 | 262 | 87.3 |
| | Protected dug well | 48 | 16 | 26 | 8.7 |
| Location of main water source in premises | Yes | 282 | 94 | 300 | 100 |
| | Off premises but up to 500m | 18 | 6 | 0 | 0 |
| Availability of main source of water | Yes | 248 | 82.7 | 298 | 99.3 |
| | No | 52 | 17.3 | 2 | 0.7 |
| Purpose of water usage | Drinking, Washing and Cooking | 90 | 30 | 44 | 14.7 |
| | Washing and Cooking only | 210 | 70 | 256 | 85.3 |
| Alternative source of drinking water | Sachet/Bottle Water | 246 | 82 | 298 | 99.3 |
| | Vendors supply | 54 | 18 | 2 | 0.7 |
| Boil water before usage | Yes | 28 | 9.3 | 4 | 1.3 |
| | No | 272 | 90.7 | 296 | 98.7 |
| Does Water from main source has taste | Yes | 70 | 23.3 | 10 | 3.3 |
| | No | 230 | 76.7 | 290 | 96.7 |
| Does Water from main source has Colour? | Yes | 68 | 22.7 | 12 | 4 |
| | No | 232 | 77.3 | 288 | 96 |
| Presence of sand particles and visible impurities | Yes | 166 | 55.3 | 26 | 8.7 |
| | No | 134 | 44.7 | 274 | 91.3 |
| Number of water taps present within facility | None | 284 | 94.7 | 2 | 0.7 |
| | 1-5 taps | 16 | 5.3 | 298 | 99.3 |
| Is there adequate number of water taps for users? | Yes | 274 | 91.3 | 270 | 90 |
| | No | 26 | 8.7 | 30 | 10 |

The responses of the participants to core sanitation questions in Ekosodin and BDPA communities are shown in table 3. Participants' responses to core sanitation questions in Ekosodin community show that the majority of participants (99.3 %) have access to usable toilets and contrary to the opinions of few (0.7 %). The same can be observed in the responses of BDPA community respondents as 94.7 %

mentioned that they have access to usable toilets. Also, an overwhelming 99.3 % of respondents in Ekosodin community expressed satisfaction with the available toilets, and a mere 0.7 % requested that more toilets be constructed for their use. This was similar to the result obtained from BDPA community where 82.7 % of respondents expressed satisfaction with the available toilets. The survey data revealed that only 34 % of the respondents in Ekosodin community had access to flush or pour-flush toilets connected to sewers, while the remaining 66 % had flush or pour-flush toilets connected to tanks or pits, while an alarming 96.7 % of respondents in BDPA community had access to flush or pour flush toilets connected to sewers compared to the survey of Ekosodin community. Findings also revealed that an approximately 64.7 % of the respondents in Ekosodin community indicated that the toilets in the area were separated into male and female sections and 35.3 % stated otherwise. However, in BDPA community, respondents (57.3 %) reported that the toilets in the area were not separated into male and female sections. This can pose a serious health issue. Health outcomes that could result from shared toilets between males and females include diarrhoea, helminth infections, enteric fevers, other faecal-oral diseases, trachoma and adverse maternal or birth outcomes (Heijnen *et al*., 2014). A significant majority in Ekosodin (87.3 %) reported that female toilets have menstrual hygiene facilities, and 12.7 % indicated a lack of such facilities. Respondents (70 %) in BDPA community stated that female toilets have menstrual hygiene facilities, while 30 % admitted a lack of menstrual hygiene facilities. Also, the survey from Ekosodin community highlights that 95.3 % of participants stated that their toilets are frequently maintained, as against 4.7 % respondents who expressed dissatisfaction with the maintenance. A similar report was observed by respondents in BDPA of which 96 % stated that they frequently maintain their toilets. According to report of UN-Water (2021), the presence of a safe water supply and clean, functioning, private toilet facilities can enhance students' education and comfort; also females would have the facilities and knowledge to be able to manage their menstrual cycles in safety and dignity. The provision of these facilities in an institutional area will obviously enhance the girls' education, strengthens economies and reduces inequality (Orimoloye *et al*., 2015). A substantial 91.3 % of respondents confirmed the presence of functional drainage systems within the premises, and 8.7 % reported the absence of such systems, compared to the report obtained from BDPA respondents, from which only 36 % stated that functional drainage was present, while a substantial 64 % admitted that there were not any functional drainage systems within the premises. Drainage systems are very important in a community. Without proper drainage systems in a community, the sanitation status is poor, water runs over the ground during rainstorms, picks up faeces and contaminates water sources. This contributes significantly to the spread of diseases such as typhoid and cholera, and may increase the likelihood of contracting worm infections from soil contaminated by faeces (Yarima *et al*., 2019). A respondence (82%) on Ekosodin community stated that the drainage systems are maintained by the residents, and 18 % reported the involvement of a government agency. The same was true for respondents in BDPA, (92 %) stated that the drainage systems are maintained by the residents, and only 8 % reported the involvement of a government agency. Participants (56 %) of Ekosodin community claimed that the general waste is safely separated into three bins, but 44 % mentioned that the separation is somewhat lacking or not fully adhered to. The survey reveals poor waste management in Ekosodin community, with 83.3 %, reported that the wastes were not centrally collected and were openly burnt. Results further confirmed that 76.7 % agreed that wastes were collected and burnt in a closed setting and 23.3 % indicated otherwise. Also, respondents' opinions in Ekosodin showed that accumulated wastes are collected and evacuated by both scavengers and by the Government Waste Management Board. However, 63.7 % of respondents of BDPA community strongly disagreed that accumulated wastes were collected and evacuated by the Government Waste Management Board. According to the study of Armah *et al.* (2018), only 30 % and 47 % of populations of Sub-Saharan Africa and Southern Asia used improved sanitation facilities with about 13 % of the world's population living without any form of sanitation and practices open defecation. He also went further to state that people who are deprived of improved water and sanitation services do not get opportunities to realize their potentials in the professional arena.

The responses of the participants to core hand hygiene questions in Ekosodin and BDPA communities are shown in table 4. A total of 67.3 % of responses to core hand hygiene questions (table 4) in Ekosodin community reported that soap and water were available in their premises, and 32.7 % reported a partial availability. On the other hand, respondents (42 %) in BDPA community stated that soap and water were available in their premises, while 30 % reported a partial availability and 28 % of respondents admitted that there were no soap and water currently available in their premises.

**Table 3:** Participants' responses to core sanitation questions in resident

| Parameter | Opinions | Ekosodin | | BDPA | |
|---|---|---|---|---|---|
| | | Frequency of Participants (n=300) | Percent of participants (%) | Frequency of Participants (n=300) | Percent of participants (%) |
| **Number of usable toilets** | 1-5 toilets | 298 | 99.3 | 284 | 94.7 |
| | None | 2 | 0.7 | 16 | 5.3 |
| **Are the usable toilets sufficient for users?** | Yes | 298 | 99.3 | 248 | 82.7 |
| | No | 2 | 0.7 | 52 | 17.3 |
| **Types of toilets and latrines** | Flush/pour-flush to sewer | 102 | 34 | 290 | 96.7 |
| | Flush/Pour-flush to tank/pit | 198 | 66 | 10 | 3.3 |
| **Are the toilets separated based on sexes?** | Yes | 194 | 64.7 | 128 | 42.7 |
| | No | 106 | 35.3 | 172 | 57.3 |
| **Menstrual hygiene needs available in female toilets** | Yes | 262 | 87.3 | 210 | 70 |
| | No | 38 | 12.7 | 90 | 30 |
| **Are toilets frequently maintained?** | Yes | 286 | 95.3 | 288 | 96 |
| | No | 14 | 4.7 | 12 | 4 |
| **Are there functional drainage system within premises?** | Yes | 274 | 91.3 | 108 | 36 |
| | No | 26 | 8.7 | 192 | 64 |
| **Who maintains drainage systems?** | Residence | 246 | 82 | 276 | 92 |
| | Government agency | 54 | 18 | 24 | 8 |
| **General wastes are safely separated into three bins** | Yes | 168 | 56 | 46 | 15.3 |
| | Somewhat [Bins full, include other waste or only 1/2 available] | 132 | 44 | 156 | 52 |
| | No | | | 98 | 32.7 |
| **Wastes are centrally collected and openly burnt** | Yes | 50 | 16.7 | 164 | 54.7 |
| | No | 250 | 83.3 | 136 | 45.3 |
| **Wastes are centrally collected and burnt in closure** | Yes | 230 | 76.7 | 52 | 17.3 |
| | No | 70 | 23.3 | 248 | 82.7 |
| **Solid wastes from facility accumulated outside fenced premise** | Yes | 114 | 38 | 138 | 46 |
| | No | 186 | 62 | 162 | 54 |
| **Accumulated wastes are collected and evacuated by scavengers** | Yes | 128 | 42.7 | 148 | 49.3 |
| | No | 172 | 57.3 | 152 | 50.7 |
| **Wastes are collected and evacuated by Govt waste management board** | Yes | 300 | 100 | 110 | 36.7 |
| | No | 0 | 0 | 190 | 63.3 |
| **Are rodents present in the house?** | Yes | 244 | 81.3 | 200 | 66.7 |
| | No | 56 | 18.7 | 100 | 33.3 |

Findings further revealed that participants (37.3 %) of Ekosodin community had soap and water within 5 meters from their toilets, and 62.7 % reported that soap and water were available but at a distance greater than 5 meters from the toilets. Contrary was the report from BDPA community as a substantial 84 % had soap and water within 5 meters from their toilets, and 15.3 % reported that soap and water were available but at a distance greater than 5 meters from the toilets, while 0.7 % admitted that there were no soap and water available at all. A significant majority, 76 % of respondents in Ekosodin community reported that they always washed their hands after using toilets and 24 % admitted to sometimes neglecting this important practice. The same was almost the case of respondents in BDPA, as 88 % reported that they always washed their hands after using toilets and 12 % admitted also to sometimes neglecting this important practice. Also, a total of 54 % of participants in Ekosodin community claimed that they always washed their hands before eating or cooking; contrary to 46 % reported that they sometimes skipped this essential hygiene step. However, a change was observed from the respondents in BDPA community, as 76 % of respondents claimed that they always washed their hands before eating or cooking; while 24 % admitted that they sometimes skipped this essential hygiene

step. It was also observed that 68 % of respondents in Ekosodin community used soap and water for handwashing and 32 % relied on water alone, which may not be as effective in removing contaminants. Similar report was also observed from the respondents in BDPA community regarding soap and water for handwashing. A significant number of the respondents in Ekosodin community (82.7 %) reported having separate containers for bathing and storing drinking water. However, 17.3 % did not maintain this separation, which could potentially affect water quality. This was even further evident from the respondents in BDPA community as 31. 3 % did not maintain separation of bathing containers from drinking ones. Also, respondents in Ekosodin community (89.3 %) claimed that they always take their baths, while 10.7 % admitted that they sometimes take their bath. The survey from BDPA also had it that 16 % of the respondents sometimes took their baths, which may have varying implications for personal hygiene and health (Imarhiagbe and Eghomwanre, 2023).

**Table 4:** Participants' responses to core hand hygiene questions in residence

| Parameter | Options | Ekosodin | | BDPA | |
|---|---|---|---|---|---|
| | | Frequency of Participants (n= 300) | Percent of participants (%) | Frequency of Participants (n= 300) | Percent of participants (%) |
| Soap and water currently available in premises | Yes | 202 | 67.3 | 126 | 42 |
| | Partially [Lacking materials] | 98 | 32.7 | 90 | 30 |
| | No | 0 | 0 | 84 | 28 |
| Soap and water currently available at toilets | Yes [within 5m from toilets] | 112 | 37.3 | 252 | 84 |
| | Yes [more than 5m from toilets] | 188 | 62.7 | 46 | 15.3 |
| | No [soap and water not available] | 0 | 0 | 2 | 0.7 |
| Are staff employed to clean toilets? | Yes | 262 | 87.3 | 74 | 24.7 |
| | No | 38 | 12.7 | 226 | 75.3 |
| How often do you wash hands after using toilets? | Yes, Always | 228 | 76 | 264 | 88 |
| | Yes, Sometimes | 72 | 24 | 36 | 12 |
| How often do you wash hands before eating or cooking? | Yes, Always | 162 | 54 | 228 | 76 |
| | Yes, Sometimes | 138 | 46 | 72 | 24 |
| What do you use to wash hands? | Water only | 96 | 32 | 92 | 30.7 |
| | Soap and Water | 204 | 68 | 208 | 69.3 |
| Separate containers for bathing and storing drinking water | Yes | 248 | 82.7 | 206 | 68.7 |
| | No | 52 | 17.3 | 94 | 31.3 |
| How often do you take your bath? | Yes, Always | 268 | 89.3 | 252 | 84 |
| | Yes, sometimes | 32 | 10.7 | 48 | 16 |

Findings from this study on health status and management (table 5) revealed a worrisome percentage of respondents (81.3 %) in Ekosodin community and (66.7 %) in BDPA community reported the presence of rodents in their houses, which is suggestive of a possible disease outbreak due to potential sanitation and hygiene challenges (Usifoh *et al*., 2018).

The survey revealed that participants both in Ekosodin and BDPA community had experienced typhoid fever in the past, contrary to no reported cases of dysentery and dehydration among the participants as at time of this survey. In contrast to the other health conditions outlined in this study, vomiting was reported by 200 participants (66.7 %) in Ekosodin community, and then 136 participants (45.3 %), and of those who experienced vomiting in Ekosodin community, 100 participants (33.3 %) reported experiencing it frequently and 138 participants (46 %) in BDPA community reported experiencing it frequently as well. It was also observed that 224 respondents in Ekosodin community (74.7 %), sought medical treatment at hospitals or clinics, while 25.3 % participants opted for herbal preparations. A total of 102 participants in Ekosodin community (34 %) reported visiting health facilities frequently, and 198 participants (66 %) indicated that they seldom visit health care facilities.

The same was also true for BDPA community respondents to those parameters. Contaminated water and poor sanitation are strongly linked to transmission of diseases such as cholera, diarrhea, dysentery, hepatitis A, malaria, typhoid and polio (Cheesebrough, 2001). Individuals are exposed to preventable health risk due to absent, inadequate or inappropriately managed water and sanitation (Ogeah and Ajalaye 2011).

**Table 5:** Participants' responses to health status and management questions in residence

| Parameter | Opinions | Ekosodin | | BDPA | |
|---|---|---|---|---|---|
| | | Frequency of Participants (n = 300) | Percent of participants (%) | Frequency of Participants (n = 300) | Percent of participants (%) |
| **Typhoid fever** | Yes | 190 | 63.3 | 124 | 41.3 |
| | No | 110 | 36.7 | 150 | 50 |
| **Dysentery** | Yes | 0 | 0 | 128 | 42.7 |
| | No | 300 | 100 | 172 | 57.3 |
| **Vomiting** | Yes | 200 | 66.7 | 136 | 45.3 |
| | If Yes, how often? | 0 | 0 | 26 | 8.7 |
| | No | 100 | 33.3 | 138 | 46 |
| **Type of Treatment facility patronized** | Hospital /clinic | 224 | 74.7 | 78 | 26 |
| | Herbal Preparation | 76 | 25.3 | 64 | 21.3 |
| | Medical Drug shop | 104 | 34.7 | 104 | 34.7 |
| | Self-medication | 120 | 40 | 54 | 18 |
| **How often do you visit health facility?** | Frequently | 102 | 34 | 160 | 53.3 |
| | Seldom | 198 | 66 | 140 | 46.7 |

*Conclusion:* Considering the fact that Ekosodin community and BDPA community play host to several staff and students of University of Benin (Ugbowo campus), effort should therefore be put into ensuring community-based intervention programs being carried out to educate the populace of both communities on practice and sustainability of water, sanitation and hygiene services due to the enormous health benefits that will be derived as well as in pursuance of the global Sustainable Development Goal-6 target.

*Declaration of Conflict of Interest*: The authors declare no conflict of interest.

*Data Availability Statement*: Data are available upon request from the first author/corresponding author.

## REFERENCES


Adukia A (2014). Sanitation and Education. Cambridge, MA: Harvard University. Available Online at: http://scholar.harvard.edu/files/adukia/files/ [Accessed 29th August, 2023].

Akinbo, FO; Okaka, CE (2010). Hyperendemicity of Onchocerciasis in Ovia North-East Local Government Area, Edo State, Nigeria. *East Afr. J. Public Health*, 7(1): 84-86.

Armah, F; Ekumah, B; Yawson, DO; Justice, OO; Afitiri, A; Nyieku, FE (2018). Access to Improved Water and Sanitation in Sub-Saharan Africa in a Quarter Century. *Heliyon*, 4(11): 56-58.

Biran, A; Schmidt, WP; Wright, R; Jones, T; Seshadri, M; Isaac, P; Nathan, NA; Curtis, V (2008). The Effect of a Soap Promotion and Hygiene Education Campaign on Diarrhoea in Children: A Cluster Randomised Trial in Rural India. *TM &IH*, 14(10): 1303-1314.

Brown, H; Li, W; Vaidya, A; Luong, N; Thomas, B; Nazar, T (2019). Interdependencies Between Water, Sanitation and Hygiene (WASH) and Health Systematic Review of Reviews. *HPP*, 34(5): 733-747.

Cairncross, S (2004). The Case for Marketing Sanitation. Field note, Water and Sanitation Program. Washington, DC: World Bank.

Cheesebrough M (2001). District Laboratory Practice in Tropical Countries. Part II. Cambridge University Press, Cambridge, p. 426.

Fisher, J (2006). For Her it's the Big Issue: Putting Women at the Centre of Water Supply, Sanitation and Hygiene. Water, Sanitation and Hygiene: Evidence Report, Water Supply and Sanitation Collaborative Council (WSSCC). Geneva: WSSCC.

Freeman, M; Stocks, M; Cumming, O; Jeandron, A; Higgins, J (2014). Hygiene and Health: Systematic Review of Handwashing Practices Worldwide and Update of Health Effects. *TM & IH*, 19(8): 906–916.

Heijnen, M; Cumming, O; Peletz, R; Ka-Seen, G; Brown, J; Baker, K; Clasen, T (2014). Shared Sanitation Versus Individual Household Latrines: A Systematic Review of Health Outcomes. *Plos One*, 9(4): 93300-94300.

Hutton, G; Haller, L; Bartram, J (2014). Global Costs and Benefits of Drinking-Water Supply and Sanitation Interventions to Reach the MDG Target and Universal Coverage. *JWH.*, 5(4): 467-480.

Imarhiagbe, EE; Eghomwanre, AF (2023). Assessment of Water, Sanitation and Hygiene Conditions in Selected Markets in Benin City, Nigeria. *JASEM.*, 27(6): 1229 – 1235.

Imarhiagbe, EE; Oriakhogba, E; Osayande AG (2023). Assessment of Water, Sanitation and Hygiene (WASH) Status and Water Qualities using Physicochemical and Bacteriological Indices at Automobile Spare-Parts Markets in Benin City, Nigeria. *AFSJ.*, 24(1): 105 – 113

Jasper, C; Le, TT; Bartram, J (2012). Water and Sanitation in Schools: A Systematic Review of the Health and Educational Outcomes. *Int. J. Environ. Res. Public Health*, 9(8): 2772-2787.

Jenkins, MW; Curtis, V (2005). Achieving the 'Good life': Why Some People Want Latrines in Rural Benin. *Soc. Sci. Med.*, **61**(11): 2446-2459.

Ndubisi, O; Pius, C; Aderemi, A (2023). On Land Development Practice and Urban Environmental Degradation: The Example of BDPA Estate in Benin City. *IJGEM*, 9(4): 36-48.

Ngure, FM; Reid, BM; Humphrey, JH; Mbuya, MN; Pelto, G; Stoltzfus, RJ (2014). Water, Sanitation, and Hygiene (WASH), Environmental Enteropathy, Nutrition, and Early Child Development: Making the Links. *Ann. N. Y. Acad. Sci.*, 1308 (1): 118–128.

Ogeah, FN; Ajalaye, V (2011). Students' Off-campus Residence and Impact on Localities: The Case of the University of Benin and Ekosodin Village. *Glob. J. Soc. Sci*, 10 (1 and 2), 37-43.

Oxford English Dictionary. (2017). Sanitation. Oxford English Dictionary (20th ed., p. 170664). Oxford University Press.

UN-Water. (2021). Water, Sanitation and Hygiene. Retrieved from https://www.unwater.org [Accessed 3rd September, 2024]

Usifoh, SF; Ighedosa, SU; Aighewi, IT; Asemota, OD; Odigie, EA; Faboya, T (2018). Impact of Lassa Fever on the Practice and Consumption of Stored Food by University of Benin Community in Benin City, Nigeria. *JCMPHC*, 30(1): 66 – 76

Wesseling, JW; Venot, J; Aerts, JC (2009). Water availability: definitions and meanings. *Water Policy*, 11(3): 247-261.

WHO and UNICEF. (2015). Progress on Drinking Water and Sanitation: Update and MDG Assessment.

World Health Organization (2008). Guidelines for Drinking-water Quality: Incorporating 1st and 2nd Addenda, Vol.1. Recommendations. 3rd ed., WHO, Geneva, p.668.

World Health Organization (2014) Preventing Diarrhoea through Better Water, Sanitation and Hygiene. Geneva: World Health Organization. Available at: https://www.who.int/publications/i/item/9789241564823 (Accessed: 2 September 2024).

World Health Organization. (2020). Guidelines on Sanitation and Health. https://www.who.int/publications/i/item/9789241549/. (Accessed August 28th, 2023)

Yarima, U; Sidi, YD; Ismaila, A (2019). The Impacts of Poor Maintenance of Drainage System in Damaturu Town, Yobe State Nigeria. *AJECM*, 19(4): 250-322.