



Assessment of Waste Management Among Private and Public Schools in Sokoto: A Case Study of Illela Local Government

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Abstract:

Waste mismanagement is a threatening issue globally. Schools produce large amount of waste due to human activities, thus, if poor handled it the condition will pose risks to learners and staff and affect learning. The objective of this study was to assess waste management among schools in Illela Local Government Area, Sokoto State, Nigeria. A survey study design using visual observation and inspection among 36 schools in Illela Local Government Area, Sokoto State, was carried out. The data collected were managed using descriptive statistics ($p < 0.05$). The waste disposal methods employed by private and public schools in Illela Local Government Area, Sokoto State, Nigeria were found. The findings reveal: - Open dumping is the most prevalent method (50.0%) - Open burning ranks second (33.3%) - Landfilling is the least utilized method (16.7%). The distribution of waste types generated by schools in Illela Local Government Area, Sokoto State, Nigeria reveals: - Plastics account for the largest share (38.9%); Human faeces comprise a significant portion (25.0%); Papers make up nearly one-fifth (19.4%); Organic waste constitutes a smaller fraction (11.1%); and Metals represent the smallest proportion (5.6%). School sanitation levels, indicating: (41.7%) Mixed improved/unimproved toilets; 33.3% Improved toilets; 5.0% Open defecation; and 22.2% Exclusive improved toilets. This shows concerns about waste management at schools, with a potential tendency to affect the health of children and staff, and consequently deteriorate learning activities and outcomes. All stakeholders should put hands on deck to minimize effects of waste mismanagement at schools in order to save children, staff, and learning.

Keywords: *Open defecation, waste disposal, burning, schools, management, learning, children*

Introduction

Management is the process of planning, organizing, leading, and controlling resources to achieve specific goals and objectives efficiently and effectively. School management refers to the planning, organization, leadership, and control of educational institutions to ensure effective teaching, learning, and student development (Karhsima, 2016). A school is an educational institution designed to provide learning spaces and resources for students, teachers, and staff. Its primary purpose is to facilitate teaching, learning, and personal development (Kansyochukwu et al., 2020).

Waste is produced from human activities, and is in form of refuse, sludge, garbage, etc. Activities such as commercial, agricultural, etc. are producing waste to the environment. Waste may be in solid form such as papers, plastics, metals, glass, biodegradable items or non-biodegradable items

(Karshima, 2016; Kaoje et al., 2020). Waste Management is a practice of great concern to public health, environment, and learning environments, because, any failure may lead to devastating consequences. In the course of waste management key steps consisting of waste generation, collection, transportation of waste, waste processing, disposal, and monitoring of waste materials are involved (Magami et al., 2017; Nasir & Ibrahim, 2022). There is indeed need for sustainable waste or proper waste management practices at any place including the learning environment in order to contribute greatly in achieving sustainable development goals (SDGs) (Mbue et al., 2015 ; Ngeno et al., 2022). Due to poor management and increased course of human activities waste management is becoming a daunting thing. Improper waste management elicited great effects upon humanity such as spread of diseases, production of greenhouse gases at high levels (such as methane, carbon monoxide, etc), air pollution, land pollution, food chain pollution or poisoning (Kaoje et al., 2018). Poor waste management have been causing migration of toxic substances such as heavy metals, persistent organic pollutants, into soils, thereby encouraging their uptake by plants and animals ultimately along the food chain. These chemicals when consumed by humans can cause serious harms to the body such as toxicity to tissues, organs, systems, and in turn leading to serous health effects such as diabetes, oxidative stress, mutation, birth defects, etc (Obebe & Adamu, 2020).

Open defecation (OD), a form of human waste mismanagement is importantly a concern, that spread diseases affecting children, and as well adults (teachers and other school actors). Open defecation spread diseases such as trachoma, polio, diarrhea, and elicit anemia, and other forms of malnutrition that ultimately affect learning and it's outcomes (Rada et al., 2016; Shamaki & Shehu, 2017).

At school, other waste materials could be items such as anatomical items (from laboratory practical), chemicals from laboratory or other purposes, food remnants, glass wares (such as broken glass, cover slips, slides, bottles, etc), drugs, human waste, etc (Shehu et al., 2020). Improper waste disposal leads to effects such as bad smell, enhanced microbes' growth in the settlements, enhanced infections prevalence (such as in the case of polio, hepatitis, anthrax, Ebola, diarrhea, etc) (Sarkar & Bhuyan, 2018; Sabo et al., 2022). People present in the school or nearby such as children, teachers, administrators, healthcare givers, and other actors are easily affected by poor waste management. Teachers or school staff affected by waste mismanagement can easily fall sick and abstain from duty or deliver duty poorly (Jiya et al., 2020; Abubakar & Raji, 2021). Likewise, students or pupils easily fall sick due to poor waste management leading to hospitalizations and absenteeism, and in turn affecting the overall learning or it's outcomes. Children due to open defecation or chemicals poisoning can suffer malnutrition and in turn leading to ill health and poor performance as well (Sripada et al., 2022). Therefore, poor waste mismanagement most be investigated thoroughly and routinely in order to fish out some causes of poor learning, and poor performance in our schools, with a view to suggest solutions and call the attention of managers for taking drastic measures (Winter et al., 2021; Yarima et al., 2021). Indeed, the school environment most only be healthy and supportive to learning if objectives are to be attained. The objective of this study was to assess waste management among schools in Illela Local Government Area, Sokoto State, Nigeria.

Research questions

The following research questions are meant to guide the study:

What are the methods used in disposing plastics at schools in Illela Local Government Area,



Sokoto State, Nigeria?

What are the types of waste materials found at schools in Illela Local Government Area, Sokoto State, Nigeria?

What are the methods of disposing human waste (faeces) at schools in Illela Local Government Area, Sokoto State, Nigeria?

Methods

Study Area

This study was conducted in Illela Local Government Area, Sokoto State, Nigeria among schools in the area. Sokoto State is found in the Northwest part of Nigeria, mostly populated with Hausa and Fulani tribes, and other relations. They mostly adhere to Islam as religion.

Study Design

Study design refers to the overall plan and structure of a research study, outlining how data will be collected, analyzed, and interpreted to answer research questions or test hypotheses. The study design applied in conducting this work was descriptive survey type to collect data in a given time and among given samples.

Population and Sample Size of the Study

The population involved in this study consists of 36 schools in Illela Local Government Area, Sokoto State, Nigeria. The sample size was used for convenience, using the tenets of convenience sampling strategy to effectively use the avalanche resources.

Research Instruments

The research instrument employed in this study was a questionnaire checklist that was formulated through careful adaptation of WHO guidelines for assessment and investigation of water, sanitation, and hygiene (WASH) at schools. The instrument contains an introduction section, section A that carries data on method of waste management, section B queries on types of waste, and section C that ask about type of sanitation at schools.

Data Collection and Analysis

The data collected from the survey was obtained through the use of "visual observation and inspection" methods. Then, the collected data was managed by using descriptive statistics presenting the results in tables (consisting of frequency, percentage, and chi square at $p < 0.05$). Visual observation and inspection involve systematically watching and examining people, processes, environments, or objects to gather information, identify patterns or issues, and make informed decisions.

Results and Discussion

The results for this study were revealed in Tables 1-3.

What are the methods used in disposing plastics at schools in Illela Local Government Area, Sokoto State, Nigeria?

Table 1

Methods of waste disposal at schools in Illela Local Government, Sokoto State, Nigeria

Method	Frequency	Percentage	Chi-square	Remark
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Open dumping	18	50.0	21.23	Significant
Landfilling	6	16.7		
Open burning	12	33.3		
Total	36	120		

Table 1 shows the methods of waste disposal among private and public schools in Illela local Government Area Sokoto State, Nigeria. The Table 1 related that, the methods with highest prevalence (50.0%) was "open dumping," then "open burning" (33.3%); and lastly "landfilling" (16.7%). Amadi et al. (2020) assessed sanitation services in primary schools in Abuja, Nigeria, and found that, there are unsatisfactory levels of sanitation practices among the population of the study. The major ways of disposing waste were open burning, open dumping, and others (landfilling and recycling). The study finding indicates that, open dumping, and open burning are dominant. The study is line with the finding from Bauchi State, Nigeria among some primary healthcare workers (Sarkingobir et al., 2022). Likewise, Sarkingobir et al. (2023) reports from Sokoto, that open burning is widely used method in developing countries. However, open burning has the potential to expose children at school to dangerous chemicals such as metals, dioxins, furans, volatile compounds, particulates, and dust. This lead to reduced visibility, escalation of respiratory diseases, poor attention in classes, poor concentration, allergy, mental problems, etc. Open waste dumping encourages leaching of chemicals into soils and water bodies in turn taken up plants and ultimately to the man at the end of the food chain or food web (Amadi et al., 2020).

What are the types of waste materials found at schools in Illela Local Government Area, Sokoto State, Nigeria?

Table 2

Types of waste been disposed at schools in Illela Local Government, Sokoto State, Nigeria

Method	Frequency	Percentage	Ch1-square	Remark
Biomedical	0	0.0	12.23	Significant
Human faeces	9	25.0		
Plastics	14	38.9		
Papers	7	19.4		
Metals	2	5.6		
Others (Organic)	4	11.1		
Total	36	100		

Table 2 shows the types of waste been generated by schools in Illela Local Government Area Sokoto State, Nigeria. The most dominant type of waste was plastics (38.9%), followed by human faeces (25.0%), then papers (19.4%). Others are: Organic (11.1%), and lastly metals (5.6%). All



the components of waste produced by schools are of great tendency to lead to inconveniences. Plastics are among the major pollutants of the nowadays. It is ubiquitous, non-biodegradable, leach harmful chemicals even when burnt, adamant (persistently live for hundreds of millions of years), papers too when burnt cause central nervous system effects, allergy, etc. Metals are capable of eliciting injury and poisoning as well, organic waste may decompose and cause foul smell, removing the beauty of the school environment, and spread infections through various ways (Jambeck et al., 2015). School is meant to encourage children to learn (Inuwa & Yosof, 2014; Bello et al., 2017). Children spend much of their time at school, therefore, any insalubrious event in the encouragement can endanger their lives, cause an inability to learn (Abubakar & Raji, 2021; Ibrahim et al., 2021). Contrary to finding of this study, another study in India reported the presence of largely compostable type of waste at schools. However, the study still complained about insufficiency of waste management plans at schools (Ramamoorthy et al., 2019).

What are the methods of disposing human waste (faeces) at schools in Illela Local Government Area, Sokoto State, Nigeria?

Table 3
Sanitation levels at schools in Illela Local Government, Sokoto State, Nigeria

Sanitation level	Frequency	Percentage	Chi-square	Remark
Open defecation	9	25.0	11.7	Significant
Improved sanitation (toilet)	12	33.3		
Unimproved sanitation (toilet)	8	22.2		
Mixture (improved and unimproved sanitation/ toilet)	15	41.7		
Total		120		

In Table 3, the sanitation level (nature of human waste or faeces management) was shown. The result indicates that, most (41.7%) of the schools used improved and unimproved toilets or sanitation, 33.3% used improved sanitation methods (toilets), 25.0% used "open defecation" as

method of sanitation, and 22.2% used only "improved sanitation (toilet)." Good waste management at schools help to protect the health of children (learners) and staff, thereby encouraging learning. It also helps to facilitate behavior change (Rada et al., 2016; Shamaki & Shehu, 2017; Obebe & Adamu, 2020). There is considerably unsatisfactory level of sanitation (improved toilets are unavailable) among the schools visited. This was in agreement with other works, such as Amadi et al. (2020). Amadi et al (2020) in a study in Abuja primary schools, stated, open defecation as the dominant practice in developing countries, encouraged by poor sanitation facilities accessibility, as of 2012 about 38 million people in Nigeria engaged in open defecation. An activity that precipitates flies, vermis, animals, water pollution, hospitalizations, school absenteeism, soil pollution, cholera, typhoid fever, dysentery, food poisoning, malnutrition, etc (Amadi et al., 2020; Charles, 2021).

Certainly, waste mismanagement at schools poses significant environmental, health, and educational risks. Improper disposal of waste lead to pollution, disease transmission, and unpleasant learning environments. Therewith, there are environmental effects such as: Pollution (contamination of soil, water, and air); climate Change (methane from decomposing waste contributes to greenhouse gas emissions); habitat destruction (litter harms wildlife and ecosystem); and health effects disease spread) (GESAMP, 2015; Prakash, 2017; Abubakar et al. 2018; Alabi et al., 2019; Sabo et al., 2022; Sidi & Yahaya, 2022). Poor waste management facilitates the spread of infectious diseases (e.g., cholera, typhoid); vector-borne illnesses; waste attracts disease-carrying pests (e.g., rodents, mosquitoes) (Reza & Yousuf, 2016; Singh et al., 2018; Soumiya et al., 2018). Waste cause respiratory Issues (burning waste releases toxic fumes); educational effects such as the followings: Distractions (poor waste management creates unpleasant learning environments); lost instructional time due to health issues related to waste management lead to absenteeism; missed opportunities such as Inadequate waste education neglects essential life skills (Ibrahim et al., 2019; Irianti & Prasetyoputra, 2019). Solutions to Waste Mismanagement at Schools include: Develop and Implement effective waste management policies; provide education and awareness programs; establish recycling and composting Initiatives; improve infrastructure (e.g., waste segregation facilities); engage students, teachers, and community in waste management efforts; and perform regular monitoring and evaluation (Dahal et al., 2014; Inuwa & Yusof, 2014; Hamid & Asghar, 2017; Tait et al., 2020).

Conclusion

Management is great aspect of every organization, including the schools. School authority (staff) and related managers should use every way possible to ensure that schools are safe, so that learning can occur effectively with endangering health of students nada staff and inurn affecting learning. It is on this note, that this work assessed levels of waste management at schools in Illela Local Government, Sokoto State, Nigeria. The study found that there is significant concern about the ways waste are handled at the schools involved. There is plain use of poor management methods such as open dumping and burning that in turn may affect health of students and teachers. Unhealthy staff and students cannot be involved in attaining objectives of learning. Thus, stakeholders should take not by coming to rescue the situation.

References

Abubakar, A., Barnabas, M.H., & Tanko, B.M. (2018). The physico-chemical composition and

- energy recovery potentials of municipal solid waste generated in Numan Town, North-Eastern Nigeria. *Energy and Power Engineering*, 10, 475-485.
- Abubakar, A.U., & Raji, I.A. (2021). Status of public primary schools: Safety, health service provision and environmental health facilities in Sokoto Metropolis, Northwestern Nigeria. *Asian Journal of Medicine and Health*, 19 (11): 22-31.
- Alabi, O.A., Ologbunjaye, K.I., Awosolu, O., & Alalade, O.E. (2019). Public and Environmental health effects of plastic wastes disposal: A review. *Journal of Toxicology and Risk Assessment*, 5(2), 1-13.
- Amadi, C.O.A., Yakubu, M.B., Azuamah, Y.C., Amadi, A.N., & Ukah, A. (2020). Assessment of sanitation practices of primary school pupils in Abuja, Nigeria. *International Journal of Research and Review*, 7(4),413-417.
- Anyarayer B.K., Alhassan, A., & Faisal, A.M. (2019). Access to improved sanitation facilities and female school attendance: a study of Savelugu Municipality of Ghana. *Journal of Arts and Humanities*, 8(1), 56-67.
- Bello, M.B., Daramola, D.S., Yusuf, A., & Amali, I.O., (2017). An evaluation of access to universal basic education in Sokoto state, Nigeria. *Asia Pacific Journal of educators and Education*, 32:61-72.
- Charles, O. (2021). The menace of open defecation practice among communities in Nigeria: a call for public health education. *International Journal of innovative Research and Advanced Studies*, 8(3), 1-4.
- Dahal, K.R., Adhikari, B.Y., & Tamang, J. (2014). Sanitation coverage and impact of open defecation free (ODF) zone with special reference to Nepal: A review. *International Journal of Engineering and Applications*, 4(8), 118-128.
- GESAMP (2015). "Sources, fate and effects of macroplastics in the marine environment: a global assessment" (Kershaw, P. J., ed.). (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). Rep. Stud. GESAMP No. 90, 96 p.
- Hamid, A., & Asghar, S. (2017). Determination of present household solid waste generation rate, physical composition, and existing SWM practices in selected areas of Lahore. *Nature Environment and Pollution Technology*, 17(1),315-321.
- Ibrahim, M., Barau, L., Alhassan, M., Gidadawa, Z.S., & Dan Galadima, H. (2019). Assessment of environmental impact of solid waste generation and disposal in Sokoto metropolis. *International Journal of Scientific and Research Publications*, 9(5), 377-383.<http://dx.doi.org/10.29322/IJSRP.9.05.2019.p.8945>.
- Ibrahim, M.F., Hod, R., Toha, H.R., Nawi, M.A., Idris, I.B., Yusoff, M., & Sahani, M. (2021). The impacts of illegal toxic waste dumping on childrens health: A review and case study from Pasir Gudang, Malaysia. *International Journal of Environmental Research in Public Health*, 18(221), 1-18. <Http://doi.org/10.3390/ijerph18052221>.
- Inuwa, A.A. & Yusof, N. M. (2014). Review of parental and school climate factors instrument for secondary schools in Nigeria. *Journal of Education and Practice*, 5(21):147-157.

- Irianti, S. & Prasetyoputra, P. (2019). Open burning of household solid waste and child respiratory health: Evidence from Indonesia. *Jurnal Teknologi Kesehatan*, 17(3), 123-134.
- Jambeck, J.R., Geyer, R., Wilcox, C., Sisegler, T.R., Perryman, M., Andrady, A., Narayan, R., & Law, K.L. (2015). Plastic waste inputs from land into the ocean. *Marine Pollution*, 347(6223),768-771.
- Jiya, F.B., Jiya, N.M., Ibitoye, P.K., Umar, K. A., Adamu, A., & Isezuo, K.O. (2020). School health services in Sokoto town, Nigeria. *IOSR Journal of Dental and Medical Sciences*, 19(4):44-50.
- Kajoe, A.U., Sabir, A.A., Yusuf, S., Jimoh, A.O., & Raji, M.O. (2017). Residents perception of solid waste disposal practices in Sokoto, Northwest Nigeria. *African Journal of Environmental Science and Technology*, 11(2), 94-102. <http://doi.10.5897/AJEST2014.1791>.
- Kanayochukwu, E., Dogo, B., Akinmumi, O.O., Oluwafemi, A.T., Ajibuah, J., Mwanret, D., & Queen, S., (2020). Assessment of the conditions of educational facilities in selected local government areas in Kaduna state, Nigeria. *Researches Reviews of the Department of Geography, Tourism and Hotel Management*, 49(1):81-98.
- Kaoje, U. Garba, J., Christiana, O.N., Olayinka, R.M., Mohammed, Y., Mohammed, A.U. (2018). Biomedical waste handling and knowledge of its health hazards among waste handlers in a tertiary hospital in Sokoto, Nigeria. *Public Health Review International Journal of Public Health Review*, 5, (1)26-32.
- Karhsima, S.N. (2016). Public health implications of poor municipal waste management in Nigeria. *Vom Journal of Veterinary Science*, 11(2016), 142-148.
- Magami, I.M., Maishanu, H. M., & Danbare, B.M. (2017). Survey of waste disposal and its perception among residents of Sokoto Metropolis, north-Western Nigeria. *International Journal of Pure and Applied Biosciences*, 5(2), 9-13. <http://dx.doi.org/10.18782/2320-7051.2456>.
- Mbue, I. N., Bitondo, D., & Azibo, B.R. (2015). Municipal solid waste generation, composition, and management in the Douala municipality, Cameroon. *Journal of Environment and Waste Management*, 2(4), 91-101.
- Nasir, Z.M., & Ibrahim, A.G., (2022). Appraisal of people perception on waste disposal and management in Sokoto metropolis. *International Journal of Innovative Environmental Studies Research*,10(4), 1-8.
- Ngeno, E.C., Mbuci, K.E., Necibi, M.C., Shikuku, V.O., Olisah, C., Ongulu, R., Matovu, H., Ssebugere, P., Abushaban, A., & Sillanpaa, M. (2022). Sustainable re-utilization of waste materials as adsorbents for water and wastewater treatment in Africa: Recent studies, research gaps, and way forward for emerging economies. *Environmental Advances*, 9(100282),1-14.
- Obebe, S.B. & Adamu, A.A.(2020). Plastic pollution: Causes, effects and preventions. *International Journal of Engineering, Applied Science and Technology*,4(12),85-95.
- Prakash, S.(2017). Impact of plastic pollution on environment and human health: An overview. *Iconic Research and Engineering Journals*, 1(5), 53-59.
- Rada, E.C., Beescianni, C., Girelli E., Ragazzi, M., Schiavon, M., Toretta V. (2016). Analysis and measures to improve waste management in schools. *Sustainability*, 8(840), 1-12.
- Ramamoorthy R., Poyyamoli, G. & Kumar S. (2019). Assessment of waste generation and

-
- management in Puducherry Region, India. *Environmental Engineering and Management Journal*, 18(2), 499-512.
- Reza, A., & Yousuf, T.B. (2016). Impacts of waste dumping on water quality in the Burigangan River, Bangladesh and possible mitigation measures. *Journal of the Environment*, 11(1), 35-40.
- Sabo, G., Zayyanu, A., Abdullahi, K.M., Malami, Z., Aliyu, A., Muhammad, S., Bello, A. (2022). Assessment of biomedical waste management among primary healthcare workers in Gwadabawa local government of Sokoto state, Nigeria,” *Transaction on Biomedical Engineering Applications and Healthcare*, 2 (1)1-9.
- Sarkar, M.S.I., & Bhuyan, S. (2018). Analysis of physical and chemical composition of the solid waste in Chittagong City. *Journal of Industrial Pollution Control*, 34(1), 1984-1990.
- Sarkingobir, Y., Umar, A. I., Miya, Y.Y., Hamza, A., Tambari, U., Sule, I.F., & Magori, D.Z. (2022). Determination of Selected Essential (Copper, Zinc) And Non-Essential (Lead, Chromium, Cadmium) Heavy Metals in Some Single-Use Plastics from Sokoto Metropolis, Nigeria
- Sarkingobir, Y., Umar, A.I., & Shagari, K.A. (2020). Nanoplastics: Small science with bigger consequence. *Proceedings of Virtual International Conference on Advancements in Nanotechnology (VICAN) & association of Indian Biologists (AIB)*.
- Sarkingobir, Y., Waheed, S.A., Abubakar, M., & Gilani, N. (2023). Plastic waste materials in a classroom environment: An assessment of nursery classes in Sokoto state, Nigeria. *Pakistan Journal of Social Science*, 43(2), 217-226.
- Shamaki, S.B. & Shehu, A.A. (2017). Assessment of solid waste management in Sokoto metropolis. *Journal of Agriculture and Environment*, 13(2), 159-167.
- Shehu, A.A., Maiyaki, F.U., Yahaya, M.H., & Aliyu, S. (2020). Stakeholders views on ways to reduce the use of plastic bags and its environmental and public health impacts in Sokoto metropolis, Sokoto state, Nigeria. *International Journal of Research and Scientific Innovation*, vii(iv),196-200.
- Sidi, A.S., & Yahaya, U.F. (2022). Chemical additives of concern in electronic plastics: Theoretical view. *ISSRA Journal of Applied Medical Sciences*, 1(3), 12-19.
- Singh, A., & Raj, P. (2018). Segregation of waste at source reduces environmental hazards of municipal solid waste in Patna, India. *Archives of Environmental Protection*, 44 (4), 96-110.
- Singh, J., Saxena, R., Bharti, V., & Singh, A. (2018). The importance of waste management to environmental sanitation: A review. *Advances in Bioresearch*, 9(2), 202-207.
- Soumiya, M., Balakrishnan, & Shanthi, K. (2018). Composition of municipal solid waste accumulated in Vellalore dump yard from Coimbatore City. *Research Journal of life Sciences, Bioinformatics, Pharmaceutical and Chemical sciences*, 4(40), 156-164.



- Sripada, K., Wierzbicka, A., Abass, K., Grimalt, J.O., Erbe, A., Rollin, H.B., Weihe, P. et al (2022). A children's health perspective on nano-and microplastics. *Environmental Health Perspectives*, 130(1), 1-15.
- Tait, P.W., Brew, J., Che, A., Costanzo, A., Danyluk, A., Davis, M., Khalaf, A., McMahon, K., Watson, A., Rowcliff, K., & Bowles, D. (2020). The health impacts of waste incineration: A systematic review. *Australian and New Zealand Journal of Public Health*, 44 (1), 40-8.
- Winter, J.C., Damstadt, G.L., Lee, S.J., & Davis, J. (2021). The potential of school-based WASH programming to support children as agents of change in rural Zambian households. *BMC Public Health*, 21(1812):1-13.
- Yarima, S.A., Maishanu, S.Z., Yarima, U.A. (2021). Knowledge, attitude and practice of users towards water usage in IUIU Main Campus, Mbale. *International Journal of Health and Pharmaceutical Research*, 6(2):44-51.