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THE DISPOSAL PRACTICES OF UNUSED AND EXPIRED PHARMACEUTICAL PRODUCTS AMONG NON-GOVERNMENTAL HEALTHCARE PROVIDERS IN NORTH EASTERN NIGERIA

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ABSTRACT

The disposal practices of unused and expired medicines have become a worldwide challenge. Due to the state of insecurity in the North Eastern Nigeria, Non-Governmental Healthcare providers provide healthcare services and medication to populations in distress and are also positioned to possess unused and expired health products. The objective of the study was to evaluate the knowledge, attitude, and practices of Non-Governmental Healthcare providers working in Borno State Nigeria towards handling unused and expired pharmaceuticals. A cross-sectional research design using questionnaires was employed among all Non-Governmental Healthcare providers registered under the Borno State Agency for Coordination of Sustainable Development and Humanitarian Response (BACSDAHR) and all donor agencies implementing health programmes within the state. A total of 43 respondents participated in the study. About 86.0% showed good knowledge of the environmental impact of improper disposal, 95.5% showed a good attitude on disposal of unused and expired medicine, 62.8% exhibited good practices in the handling of unused and expired medicines. A significant association was found between the profession and the disposal practices of unused and expired medicines. Between 80% to 93% of respondents do not know of the availability of any medicine disposal guideline document in their organization. The staff of Non-Governmental Healthcare providers show good knowledge, good attitude as well as good practices on the disposal of unused and expired medicines. The profession of respondents significantly influenced their disposal practices.

Keywords: *Knowledge of drug disposal, drug disposal practices, unused and expired medicines, Non-Governmental Healthcare providers*

INTRODUCTION

Health products are defined as any substance, preparation, or device intended for use by humans principally or entirely for a health-related purpose. They include pharmaceutical products, complementary health products, cosmetic products and medical devices (Xu *et al.*, 2018)

Pharmaceutical products are essential in maintaining human health and are a key factor in all healthcare systems. Global medicine consumption is increasing daily with more emphasis on rational use but the proportion of medicines left unused is still high. This has been attributed to various reasons such as poor quantification, over prescribing, discontinuation or change of treatment, side effects or adverse drug reaction, medication non-adherence, expiration of medicines e.t.c (Sangeetha *et al.*, 2018. Auta *et al.*, 2011)

Medicine wastage refers to unwanted medication which includes expired, unused, split, and contaminated drugs, vaccines, and sera that are no longer required and need to be discarded appropriately. It is estimated that countries spend an average of 25% of their total health disbursement on medicines (Gebremariam *et al.*, 2019) It has been found that about 70 % of the total funds invested in medicines are wasted in normal supply chain (Kagashe *et al.*, 2014)

Medicines though essential in maintaining human health contain chemicals that can contaminate the environment if not properly handled. Inappropriate disposal of medicines is associated with environmental pollution and health hazards. Inappropriate disposal of unused and expired medicines has become a worldwide challenge for policymakers, healthcare professionals, drug manufacturing companies, and the general public (Ayele and Mamu, 2018). Pharmaceuticals have become an emerging, ubiquitous contaminant found in the natural environment. Frequently used medications such as antibiotics, anti-inflammatories, anti-hypertensives, anti-diabetics, hormonal drugs e.t.c have been detected in water, the environment, and the food chain (Yu *et al.*, 2019) Several studies have found knowledge of the disposal of unused medicines to be inappropriate due to a lack of guidance from health professionals, unclear disposal instructions, and public awareness of disposal methods (Angi'enda and Bukachi, 2016) A study conducted in Nigeria in pharmaceutical industries showed poor management of pharmaceutical waste and little or no modern knowledge of health and safety personnel on pharmaceutical waste management (Ngwuluka *et al.*, 2011). It also revealed lack of adherence to regulatory requirement despite awareness

Non-Governmental Healthcare providers constitute a heterogeneous group of organization with varying activities, capacities, responsibilities, and roles. They provide healthcare and various types of humanitarian assistance to populations in distress. They often offer access to life saving medications (such as that for tuberculosis, HIV/AIDS, malaria, sleeping sickness e.t.c) that are sometimes too expensive for the population in distress. They effectively compliment the role of the countries and the international governmental organizations (such as WHO) in healthcare delivery. They are usually not a business but are voluntary and non-bureaucratic in nature. Examples are AIDS Prevention Initiative in Nigeria, Society for Family Health, International Medical Corps, Save the children International e.t.c (Rostrup, 2001).

Non-Governmental Healthcare providers play an important role in improving health in low- and middle-income countries. In North Daffur state Western Sudan where the conflict started in 2003, a study showed that international Non -Governmental Healthcare providers has been providing 70% of curative health services and established 24 health centers in Internally Displaced Persons IDP camps (Yagub and Mt Stall,

2015). Studies in Nigeria have also shown that Non-Governmental Healthcare providers promote healthcare services through collaboration with the government and other non-state actors (Muhibbu-Din 2019). Since Non-Governmental healthcare providers render healthcare services and access to medication to categories of people, they are also in the position to possess unused and expired health products. The knowledge, attitude, and practices of their personnel towards unused and expired products go a long way to define the disposal practices of the Non-Governmental Healthcare providers. There is a dearth of information on the disposal practices of unused and expired health products among Non-Governmental Healthcare providers in Borno State Nigeria.
The objective of the study was to evaluate the knowledge, attitude and practices of Non-Governmental Healthcare providers working in Borno state Nigeria towards handling expired and unused pharmaceuticals.

MATERIALS AND METHODS

Study site

The study site is the Borno State located in North Eastern Nigeria with a land mass of 61,435sqkm. The current population estimation is over 5 million people distributed across 27 local government areas. Due to the state of insecurity in the region, there is a high number of internally displaced persons, and the state also has one of the worst mortality indices in the country. There is also a high epidemiology of bacterial and viral infections such as cholera, meningitis, and measles (Lawal and Iman 2019). Non-Governmental Healthcare providers have stationed themselves to provide lifesaving interventions in terms of employment creation, food subsidy, provision of health and educational services. They also complement the government's effort to other members of the state through the provision of vaccines, drugs, and health personnel (Lawal and Iman, 2019).

Study design

The study design is cross-sectional with a quantitative method of data collection. Information that is relevant in the assessment of the knowledge, attitude, and practices of healthcare providers towards the handling of expired and unused medicines within the supply chain was collected using pre-tested questionnaires.

Study population

The study population were Non Govermental Healthcare providers registered under Borno State Agency for Coordination of Sustainable Development and Humanitarian Response (BACSDAHR) and donor agencies implementing health programmes within the state.

Inclusion criteria

International or local Non-Governmental Healthcare providers registered with the Borno State Agency for Coordination of Sustainable Development and Humanitarian Response (BACSDAHR).

UN Agency or Donor Agency

Non-Governmental Healthcare providers that manange health or pharmaceutical products in their supply chain, Non-Governmental Healthcare providers who agree and consent to participate in the study

Exclusion criteria

Non-Governmental Healthcare providers not handling any health or pharmaceutical product, Non-Governmental Healthcare providers not registered with BACSDAHR, Non-Governmental Healthcare providers who refuse to participate in the study

Sample size

A sample size of 50 registered NGOs and donor agency that managed health commodities in Borno State Agency for Coordination of Sustainable Development and Humanitarian Response (BACSDAHR) were utilized. This is in line with the opinion in a study which showed that when the sample size is manageable, there is no need for sampling (Isreal, 1992; Micheal *et al.*, 2019)

Ethical approval

The study was approved by the state ethical approval committee of the Borno State Ministry of Health with approved relevance number MOH/GEN/6679/1.

Data collection tools

Questionnaire was developed by the authors and validated by testing using healthcare providers working in Non-Governmental Organizations but not representing the organization in this study. The questionnaire was then adjusted after testing before utilizing it for data collection

Data collection

Quantitative data collection method involving the use of Google forms (self-administered questionnaires) hosted on Google with an access link generated and shared to all participants using various networks such as logistics cluster, International NGO forum, logistics and supply chain fora, pharmacy co-ordination group, and health coordination department. The questionnaire was divided into 5 sections A-E with each section focused on questions on bio-demographic/organizational profile, knowledge, attitude, practices and questions on policies and governance. Data collection was from April 2021 to July 2021

Informed consent

Informed consent was obtained from all participants involved in the study by phone call to the healthcare provider in charge of handling pharmaceutical products in the organization obtained through BACSDAHR.

Statistical analysis

Demographic variables such as gender, age, marital status, religion, profession, educational level, years of practice, organization type, and years of operation in the state were summarized using descriptive statistics of frequencies and percentages. Knowledge and practices were measured in this study using nominal(categorization) and ratio level of measurement. Nominal included sorting data into mutually exclusive categories such as male/female, Medical Doctors/Pharmacists/Nurses/Others. Ratio assign numeric value measured by the number of respondents that give a particular response compared to the overall figure. For

unused medicines, donation to other areas where needed is considered good practice and for expired products, handing over to NAFDAC is good practice. A 5-point Likert scale questionnaire was used to measure attitude towards disposal of pharmaceutical products. Ratio is then converted to percent and percentage above 60 is considered good overall.

Data analysis was done using SPSS version 23 statistical package (chi-square test). A p-value of ≤0.05 was considered significant.

RESULTS AND DISCUSSION

Out of a total of 50 questionnaires administered across the state, 43 responses were filled and returned giving a response rate of 86%.

Respondents' demographic characteristics

A greater percentage of the respondents were male (76.79%), 65.1% were between the ages 30-39 years and 55.8% of the respondents were married as seen in Table 1

A high number of the respondents 23(63.5%) were not healthcare professionals (neither Pharmacists, Nurses, or Medical Doctors). However, a majority had a minimum of a bachelor degree (95.3%). About 48.8% of respondents had a minimum of 7 years of work experience. 65.1% of the respondents were currently working with an International NGO (Table 1)

Knowledge of disposal of unused and expired medicines

About 74.4%of the study population had a good knowledge of composition of medical waste while 86.0% had good knowledge of environmental impact of improper disposal practices (Table 2).

Attitude on disposal practices of unused/expired medicines and their impact on the environment

A high number of providers (74.9%) consider it important to minimize the entrance of pharmaceuticals into the environment while 85.7% confirm that medicines could enter the environment through the method of disposal of unwanted medication. About 91.1% of the respondents affirm that residues of pharmaceuticals in the environment could cause adverse effects on the environment, animals, and humans while 95.5% consider it necessary to properly dispose of unused/expired medicine.

Disposal practices of unused/expired medicine

Out of the 43 respondents, 19(44.2%) confirm the availability of unused medicines in their facilities. Handling of unused medicine, 62.8% of the respondents showed good practices (donations to areas where they are needed) in the handling of unused medicines as well as good practices in the handling of expired medicines (handing over to NAFDAC) (Table 2, Table 4 and Table 5). On the handling of expired medicine, 100% of the pharmacist respondents exhibited good knowledge of handling expired medicine. There is a significant association $P<0.001$ between the profession and the handling of expired medicines (Table 3)

Table 1: Participants' social-demographic characteristics and organizational profile (N = 43)

Variable	Frequency (n)	Percentage (%)
Gender (Sex)		
Male	33	76.7
Female	10	23.3
Age (Years)		
21-29	7	16.3
30- 39	28	65.1
40-49	8	18.6
Marital Status		
Married	24	55.8
Single	19	44.2
Religion		
Christianity	28	65.1
Islam	13	30.2
Other religion	1	2.3
Profession		
Medical Doctor	2	4.7
Nurse	2	4.7
Pharmacist	16	37.2
Other profession	23	53.5
Highest level of Education		
Bachelor's Degree	23	53.5
Master's Degree	17	39.5
PhD	1	2.3
Other degrees	2	4.7
Length of practice (Years)		
1-3	7	16.3
4-6	15	34.9
7-10	9	20.9
>10	12	27.9
Type of organization		
Community-Based Organizations	2	4.7
International Non-Government Organization	28	65.1
Non-Government Organization	10	23.3
UN Agency	3	7.0
Duration of operation in Borno State(Years)		
1-3	17	39.5
4-6	21	48.8
7-10	3	7.0
>10	2	4.7

Footnote : Other profession refers to lab oratory officers, logisticians and other focal personnel working as Non-Governmental Healthcare providers. Other degree refers to holders of Higher National Diplomas, Ordinary National Diplomas e.t.c

Table 2: Knowledge and practices on disposal of unused and expired medicines

Variable N=43	Good knowledge of environmental impact of improper disposal (86.0%)	Good practice in handling unused medicines (62.8%)	Good practice on the handling of expired medicines (62.8%)
Gender			
Male	62.8	48.8	44.2
Female	23.2	14.0	18.6
Marital status			
Single	39.5	30.2	25.6
Married	46.5	32.6	37.2
Profession			
Doctors/Nurses	9.3	7.0	4.7
Pharmacists	37.2	27.9	37.2
Other professions (Logisticians etc)	39.5	27.9	20.9
Educational level			
Bachelor	41.7	32.6	27.9
Masters	37.2	23.2	30.3
Doctorate	2.3	2.3	2.3
Other Degree	4.7	4.7	2.3

Availability of Disposal policy guidelines document within the organization

About 86% of respondents do not know of the availability of an organizational-based disposal policy document while 90.7% do not know of the availability of WHO guidelines for safe disposals of unwanted pharmaceuticals in and after emergencies within their organizations. A similarly high percentage of respondents (81.4%) confirm no knowledge of the availability of NAFDAC guidelines for handling and disposal of unwholesome medicine and NAFDAC regulated products within their organizations. In the same line, 93% of respondents do not know a non-specific guideline on the discarding of unused/ expired medications. There was a significant association between profession and the knowledge of the availability of NAFDAC guidelines on handling and disposal of unwholesome medicine and regulated products ($P<0.031$) (Table 3). There was also a significant association between profession and the need for increased research focus and government attention in this area($P<0.034$) (Table 3).

About three-quarter of the study population had a good knowledge of the composition of unused and expired medicines and a higher percentage had a good knowledge of the environmental impact of improper disposal of unused and expired medicines. This is in contrast to the findings of a study among healthcare professionals, in India where more than 80% of Medical Doctors and Nurses, 65% of patients and 58% of Pharmacists are unaware of safe drug disposal practices (Nipa *et al.*, 2017).

Table 3: Test of association in the study

Variable N=43	**Knowledge on availability of guidelines for disposal of unused and expired medicines within respondent's organization**	**Awareness of availability of unused medicines**	**Handling of expired medicines**	**The need for increased research focus and government attention in this area**
Gender	No Yes	No Yes	Good Poor	No Yes
Male	28 5	19 14	19 14	16 17
Female	7 3	5 5	8 2	5 5
	Chi Square X^2=1.117a P<0.290	Chi square X^2 = 0.394a P<0.530	Chi square X^2 = 1.412a P<0.235	Chi square X^2 = 0.007a P< 0.933
Marital status	No Yes	No Yes	Good Poor	No Yes
Single	17 2	15 4	11 8	7 12
Married	18 6 Chi square X^2=1.467a P<0.226	9 16 Chi Square X^2= 7.507a P<0.041	16 8 Chi Square X^2= 0.138a P<0.710	14 10 Chi square X^2= 1.960a P<0.161
Profession	No Yes	No Yes	Good Poor	No Yes
Doctors/Nurses	3 1	0 4	2 2	3 1
Pharmacists	10 6	5 11	16 0	11 5
Other Profession	22 1 Chi square **X^2=6.967a P<0.031**	18 5 **Chi Square X^2=12.057a P<0.002**	9 14 **Chi square X^2 = 14.481a P< 0.001**	7 16 **Chi square X^2 = 6.752a P<0.034**
Educational level	No Yes	No Yes	Good Poor	No Yes
Bachelor degree	18 5	12 11	12 11	13 10
Master degree				
Doctorate	15 2	10 7	13 4	6 11
Others	1 0	0 1	1 0	0 1
	1 1 Chi square X^2= 2.205a P<0.531	2 0 Chi quareX^2 =2.047a P<0.384	1 1 Chi square X^2 = 2.242a P<0.433	1 1 Chi square X^2 = 2.840a P<0.417

In this study, about two-thirds of the subjects demonstrated good practices in the handling of expired medicines by handing them over to the National Agency for Food and Drugs Administration and Control NAFDAC and State Ministries of Health. All of the Pharmacists involved in the study demonstrated good handling practices of expired medicines (handling over to NAFDAC). This is in line with the findings of a study in Anambra State Nigeria among Community Pharmacists where the most common disposal method for solid and semisolid

dosage forms was via NAFDAC (Micheal *et al.*, 2019). It is however surprising that majority of the respondents are not aware of the availability of any medicine disposal guideline document within their organization.

The demonstration of good disposal handling practices in this study may be attributed to several reasons such as professional training, educational level and length of practice. There is a need to make medicine disposal guideline documents available in the organizations to further improve disposal practices.

For unused medicines, government agencies can design a programme for drug exchange/donation to areas where they might be of need after ascertaining the quality of the medicines (Pinheiro,2008). More attention should be placed on proper supply chain management and re-distribution before expiration among different agencies.

Table 4: Disposal practices of Non-Governmental healthcare providers in handling unused medicines

Variable N=43	**Throw in Garbage**	**Donate to places where needed**	**Burn**	**Keep till expiry**	**Distribute to colleagues and friends**
Gender					
Male	4	21	4	4	0
Female	2	6	2	2	0
Marital status					
Single	2	13	2	2	0
Married	3	14	3	4	0
Profession					
Doctors/Nurses	0	3	1	0	0
Pharmacists	0	12	4	0	0
Other Profession	3	12	4	4	0
Educational level					
Bachelor degree	3	14	3	3	0
Master degree	3	10	4	0	0
Doctorate	0	1	0	0	0
Others	0	2	0	0	0

Table 5: Disposal practices of Non-Governmental healthcare providers in handling expired medicines

Variable N=43	Flush in toilet	Throw in garbage bin	Hand over to NAFDAC	Burn	Keep them	Bury	Don't know what to do
Gender							
Male	5	3	19	6	0	0	0
Female	2	0	8	0	0	0	0
Marital status							
Single	4	2	11	1	0	1	0
Married	4	1	16	2	0	1	0
Profession							
Doctors/Nurses	1	0	2	1	0	0	0
Pharmacists	0	0	16	0	0	0	0
Other Profession	4	2	9	4	0	4	0
Educational level							
Bachelor degree	4	3	12	2	2	0	0
Master degree							
Doctorate	2	0	13	2	0	0	0
Others	0	0	1	0	0	0	0
	0	0	1	0	0	1	0

Medicine disposal habits are known to be influenced by environmental consciousness, availability of guidelines, dosage form and social and cultural attitudes (Swaroop et al, 2015). In this study, association was also found between profession and knowledge of medicine disposal guideline document in their organization. Other studies have however shown that knowledge of medicine disposal guidelines may not translate to actual practice as only 23.4% of Pharmacists in the study by Micheal *et al.* (2019). complied fully with the National guidelines on disposal of expired drugs, 22.1% complied partially and over half did not comply. Gaps have also been shown to exist between awareness of the consequence of improper disposal and actual disposal practices (Azmi and Shakeel, 2020). There is the need therefore to further investigate the association between profession and disposal practices of unused and expired medicines. It is necessary to create public awareness on the consequences of improper management of expired medicines as well as improve research focus and government attention in this area.

Limitations of the study

Non-Governmental healthcare providers filling the questionnaire for the organization may not adequately present the practices of all the officers in the organization although effort was made to ensure that the focal officers in charge of pharmaceutical products and health commodities were the ones that filled the questionnaire. Access to location due to insecurity.

CONCLUSION

The staff of Non-Governmental Healthcare providers show good knowledge, good attitude as well as good practices on the disposal of unused and expired medicines. The profession of respondents significantly influenced their disposal practices. There is a need to make medicine disposal guideline documents available within each organization to further improve disposal practices. More studies are needed to investigate the influence of factors such as finance, culture, and profession in the disposal practices of unused and expired medicines

COMPETING INTERESTS

The authors declare that they have no competing interests

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