Science Article

Drug Storage Practices in Secondary Care Hospitals in Nigeria: A Pilot Study

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ABSTRACT

Background: Existing guidelines specify the optimal conditions for the storage of pharmaceuticals and health commodities. However, this is often a challenge in resource limited settings due to inadequate storage infrastructure and severe shortages of appropriately trained personnel. This pilot study sought to evaluate drug storage conditions in general hospitals in Akwa Ibom State, Nigeria.

Method: This was a questionnaire guided face-to-face interview survey and practice observation of a purposive sample of store managers in the sixteen general hospitals in Akwa Ibom State. Data was analysed descriptively using frequencies and mean while t-test was used to compare storage quality and the availability of a pharmacist as the store manager.

Results: About 63% of the hospitals surveyed showed total drug storage quality score of 8–10 that indicated acceptable quality with only a third of the stores showing scores of >10 that indicated good quality storage. Up t0 70% of the drug stores lacked electricity on day of visitation while 50% lacked a poisons and controlled drug management system. Although the mean storage quality score was slightly higher for hospitals with a pharmacist as the store manager (mean quality score = 9.8, SD: 2.04 ± 0.83) compared to those with non-pharmacists (mean quality score = 9.3, SD: 1.25 ± 0.39); this was not statistically significant (t (14) = -0.578, p=0.581).

Conclusion: Overall, our study findings indicate that more needs to be done in terms of availability of pharmacists in the hospital drug stores as well as overall storage practices especially in relation to the handling of controlled drugs and the provision of alternative sources of electricity. This is important given the implication of our findings on the maintenance of the cold chain and the overall quality of pharmaceuticals stored in these facilities.

Keywords: Degradation, pharmaceuticals, drug storage, health commodities.

INTRODUCTION

Drug storage conditions affect the post-manufacture quality of pharmaceuticals and health commodities. Reports show that availability of adequate drug storage infrastructure that prevent degradation, contamination and damage to pharmaceuticals is a key challenge in many countries in Sub-Sahara Africa. –– Poorly stored medicines deteriorate, become less efficacious and ultimately result in treatment failures. There is clear evidence that environmental factors such as high temperature and humidity common in tropical climates promote drug degradation. For example, medicines on the WHO Essential Drug List (EDL) such as acetyl salicylic acid, amoxicillin, paracetamol, adrenaline and reconstituted antibiotics have been shown to have stability problems under tropical climate conditions. Creams, ointments and similar drug formulations deteriorate and become unusable on exposure to excessive environmental heat. while biologics and related products including insulin and vaccines degrade rapidly when stored or transported inappropriately in tropical climates.

Contamination from pest infestation, wastage due to loss, theft and pilferage, poor inventory control and stock management are other storage-related issues shown to limit equitable access to essential medicines in SSA countries.–"– This is particularly dire in countries in Africa with severe health workers shortages and appropriately trained pharmaceutical personnel. Reports of medication errors due to poorly organised storage areas in hospital drug stores have also been reported in the literature from other parts of the world. The World Health Organization (WHO) and similar institutions have published guidelines for the supply, and management of essential medicines. These include the WHO Guidelines for the Storage of Essential Medicines and the USAID Guidelines for Warehousing Health Commodities which provide guidance on the supply, management and storage of pharmaceuticals and health commodities in African countries. The WHO guidelines also detail the appropriate design for a medical store and provide recommendations for storage of medicines that are at risk of theft, abuse or have potential for addiction. However, it remains unclear whether these guidelines are adhered to in public sector hospitals in Nigeria.

In Nigeria, the healthcare system is split broadly into the public (government) and private sector. Government funded health facilities in Nigeria provide up to 71% of the orthodox health services in the country and are broadly divided into tertiary, secondary and primary care centres. In general, although primary care centres make up 87% of the total number of hospitals in the country, reports show that perceived lower quality of health services, limited funding, unavailability of drugs and basic infrastructure as well as physician shortages in these facilities limit their use.– – Consequently, the tertiary and secondary care hospitals in the country are the preferred choice in the health seeking behavior of the general populace.

This research aimed to assess drug storage conditions in public sector health facilities in Nigeria.

METHOD

This was a questionnaire guided face-to-face interview survey and practice observation of a purposive sample of store managers in the sixteen general hospitals in Akwa Ibom State. The list of all the general hospitals in the State was obtained from the State's Hospital Management Board. The study was conducted from September to December 2016. Store managers were approached via an invitation to participate letter. Consent to participate was obtained from each store manager with opportunity given for them to ask questions prior to study enrollment. The questionnaire in this study was adapted from the WHO Checklist for Storage Areas in Pharmacy and Warehouses questionnaire used in previous research.

The pilot of this research was conducted in Akwa Ibom State, Nigeria and the study location was chosen based on access to contact persons and available resources. Akwa Ibom State is one of the thirty-six States in Nigeria and is situated in the South-South region of the Country. The State has a population of approximately 5.5million people, representing about 3% of the total country

population.30 The State has one government funded tertiary care hospital, 16 secondary care hospitals and approximately 500 primary health care centres. Given that most of the populace primarily utilize tertiary and secondary care hospitals in Nigeria; this study surveyed all the general hospitals in the State.

The adapted questionnaire consisted of two sections: Section A collected demographic information while section B comprised 14 questions that were related to storage conditions in the pharmacy store of the respective general hospitals in the state. Five of the items related to the environmental conditions of the drug store including cleanliness on day of visit, incidence of pest infestation, adequate ventilation, moisture retention and direct sunlight penetration. Five others related to store security and stock management and included availability of stock record system, lockable cupboards and doors, poison and controlled drug management system, practice of first-in-first-out (FIFO) principle and physical conditions of the stored medicines. Four of the questionnaire items related to available infrastructure that included availability of refrigerator and cold chain boxes, power source and electricity, fire extinguisher and the physical floor space.

The survey interview and practice observation lasted for approximately 30 minutes. The data obtained from the study were coded and transferred to the IBM Statistical Package for Social Sciences (SPSS) version 22. Each drug store visited allowed full access to their facility for practice observation and received a score of one for each of the 14 items in the study questionnaire. The overall quality of the drug store was assessed based on the total sum score as described in previous research. Scores of 1-3 = poor quality; 4-7 = doubtful quality; 8-10 = acceptable quality; 11 and above = good quality. Descriptive statistics including frequency and percentages was used to summarise the data. Independent sample t-test was also conducted to assess whether there was a statistically significant difference in overall drug store quality score between hospitals that had pharmacists or non-pharmacists as the store manager.

RESULTS

Majority of the store managers surveyed were male and two-thirds were pharmacists with most of the participants reporting length of experience of 5 years or more (Table 1). About 56% of the store managers had at least a first degree while about a third had only the equivalent of a high school diploma as their highest qualification (Table 1). The latter group did not possess any formal qualification relating to pharmacy. The shelves in the store rooms were clean with no dust or litter observed in the 16 sites surveyed, however, only 60% of the store managers reported that the drug stores were cleaned daily with 30% reporting only a weekly cleaning schedule. About a third of the store managers reported direct sunlight penetration, moisture retention and incidence of pest and/or insect infestation in their store rooms (Figure 1).

Table 1: Sample Demography

Demography	N (%)
Male	12 (75)
Female	4 (25)
= 5years	5 (31)
6 - 10	5 (31)
> 10	6 (38)
At least a first degree (BPharm or equivalent)	9 (56)
Postgraduate diploma	1 (6)
Other (high school qualification)	6 (38)
Pharmacist	10 (62)
Non-Pharmacist	6 (38)
N Total	16

Total drug store quality scores ranged from 7-12 in the study sample. Only five (31%) of the hospital drug stores surveyed had a total quality score greater than 10 that indicated good quality storage. The total quality score was 8–10 for the majority (63%) of the hospital stores, indicating that drug storage in these facilities were of acceptable quality. A score of 7 observed in one of the drug stores suggested that drug storage at the affected hospital was of doubtful quality. Although the mean score was slightly higher for hospitals with a pharmacist as the store managers (mean quality score = 9.8, SD: 2.04 ± 0.83) compared to non-pharmacists (mean quality score = 9.3, SD: 1.25 ± 0.39); this was not statistically significant (t (14) = -0.578, p=0.581).

DISCUSSION

As custodians of medicines, pharmacists are responsible for the drug life cycle from manufacture, procurement, storage, distribution and dispensing to patients. In countries with severe pharmacy workforce shortages such as Nigeria; pharmacists and other support staff provide services in drug stores. This was observed in our study where about a fourth of the hospital pharmacy store managers were non-pharmacists. This feature is a source of concern given the lack of formal qualifications to carry out the tasks associated with being a hospital pharmacy store manager. To prevent unlawful access to habituating drugs with high risk of misuse and abuse, guidelines mandate the use of poisons and controlled drug management system. The lack of poisons and controlled drug management system observed in about half of the hospital drug stores surveyed imply unrestricted access to drugs such as opioids in these facilities. Even though the findings of this study showed that there was no statistically significant difference in the overall quality score of the drug stores with store manager as a pharmacist or non-pharmacist; our study findings suggest the need for training on the principles of drug storage particularly in relation to poisons and access to controlled drugs.

Moisture retention and direct sunlight penetration observed in most of the stores visited is also a key concern. Direct penetration of sunlight leads to instability and degradation of drugs that are photosensitive. Extreme heat and exposure to sunlight degrades and shortens the half-life of essential drugs such as contraceptives, vitamins, syrups, steroids, adrenaline and reconstituted antibiotics. Such pharmaceuticals are likely to lose their potency with a high risk of treatment failure when used. Furthermore, moisture retention can lead to microbial contamination, de-sterilisation of drug products as well as degradation for hygroscopic drugs such as artemisinine containing antimalarial; 8 our findings therefore highlight the need for the implementation of appropriate measures to prevent moisture retention and sunlight penetration in these facilities. Existing studies evaluating the post-manufacture quality of essential drugs sold in drug markets in Africa demonstrate in vitro stability problems due to poor storage practices in tropical conditions. Although this study did not assess the pharmaceutical quality of the drugs already stored in the facilities visited; our study findings demonstrate the need for appropriate temperature and humidity control in the hospital drug stores visited.

Infrequent and/or poorly cleaned drug store promote rodents and insect infestation. Existing guidelines recommend that drugs store should be cleaned daily. While most of the hospital drug stores surveyed in this study were cleaned as required, up to a third were only cleaned weekly. This carries a high risk of pest infestation and cross contamination from litter, dusts and mites. Further, vaccines and other biological products are effective and therapeutic only when stored under controlled temperature conditions. Therefore, the presence in the store room of cold boxes and refrigerators are highly essential. While most of the hospital drug stores visited had refrigerators for drug storage; the majority of these were not functional due to lack of electricity at time of visit. Our findings are similar to those from other developing countries and demonstrate the need for appropriate cold chain storage practices. The lack of electricity and inability to maintain the cold chain has far reaching implications for vaccines and biologicals in these facilities, given that these products are likely to be ineffective when administered to

patients. Our findings therefore show the urgent need for alternative power sources to provide electric supply to hospital drug stores.

Our study has some limitations. This study was a cross sectional survey and provides only a snapshot of the storage practices on the day of visitation. Nevertheless, our methodology is an established and pragmatic research approach used in similar studies in other countries. Our study findings also provide key insights and evidence that can inform and strengthen hospital drug storage policies in Akwa Ibom state.

CONCLUSION

This study has described the state of Public Secondary healthcare facility drug stores in Akwa-Ibom state, Nigeria. The lack of electricity and controlled drug management system observed in most of the drug stores visited is a key concern with respect to the quality of medicines stored in the facilities surveyed. Our study findings indicate that more needs to be done in terms of the storage of pharmaceuticals in healthcare facilities in Akwa Ibom State, especially in relation to the handling of controlled drugs as well as the provision of an alternative source of electricity given the implication of this on the maintenance of the cold chain. This is also important given that poorly stored drugs degrade and carry a high risk of treatment failure when used.

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