

# Assessment of Laboratory Waste Management and Laboratory Staff Awareness in Khartoum State

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## ABSTRACT

A good environmental health conditions is a challenge worldwide. However, Majority of Laboratory wastes extremely dangerous to the environment, animals, and human because of increasing numbers of laboratories and health facilities especially on big cities in Africa like Khartoum state Capital of Sudan. A cross-sectional study was carried out on a group included 36 laboratories in Khartoum state from February to march 2021. There is no unique protocol for

waste management and disposal followed by laboratories in Khartoum state so jeopardize laboratorian and community.

**Keywords:** Waste, Management, Laboratory, Health facilities

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## ABOUT THE STUDY

Medical laboratories are the main producer of the infectious waste, including microbiological materials, infectious sharps, and blood specimens and other types of samples. However, an improper management of the contaminated waste could leads to diseases transmission (Askarian M, *et al.*, 2012). The best strategy for managing a laboratory waste aims to maximize safety and minimize environmental impact, and considers these objectives from the time of purchase (National Research Council, 2011). However, whether the laboratories in Khartoum are following standard waste management protocol or and their staff have sufficient training in the waste management, the environmental impact of lab waste is hot question to answer in this study. The aim of this study was to assess the waste management procedures used at clinical laboratories in Khartoum, Sudan and assessment of laboratory staff training.

A cross-sectional study was carried out on group included 36 laboratories (hospital, clinic, and health center laboratories) in Khartoum state capital of Sudan from February to march 2021, laboratories from outside Khartoum state were excluded. Approvals have been taken from each laboratory and participants' voluntary informed consent and the data were collected using administered

questionnaire from random samples under COVID-19 regulations and the data was analyzed by SPSS version (22) and presented as frequencies.

Majority of medical laboratories in Khartoum state have sharps and needles waste, biological waste of human samples mainly (urine, stool, blood) and regular waste. Followed by chemical waste, culture media respectively, and radioactive waste which is the least frequent waste which is presented in *Table 1*. More than two thirds of laboratory staff did not get training and workshops in waste management as shown in *Figure 1*. Greater portion of laboratories have specialized company approved by authorities to collect the medical waste and treat it. Similar percentage of laboratories has dustman for this job and in few laboratories the collection and treatment of the waste done by laboratory staff which is illustrated in *Figure 2*.

Majority of laboratories staff is separating the medical sharps from other types of wastes in safety boxes and get rid of it by specialized company in medical waste. Few laboratories throw the safety box in landfill and reuse the safety box again and others burring or burning it as shown in *Figure 3* and *4*. Majority of laboratory staff they don't know how to manage chemical waste as presented in *Table 2*. Regarding chemical and biological waste there is variation in disposal methods as shown in *Tables 3* and *4*.

Table 1: Frequencies of laboratory waste in medical laboratories in Khartoum state

Frequency	Number	Waste types
91.70%	33	Needles and sharps
94.40%	34	Biological(patients samples)
22.20%	8	Bacteria culture media
33.30%	12	Chemicals
8.30%	3	Radioactive
91.70%	33	House

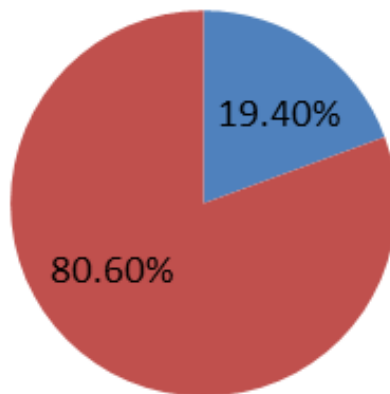


Figure 1: Frequency of laboratory staff training in waste management. Note: (■) Trained; (■) Not trained

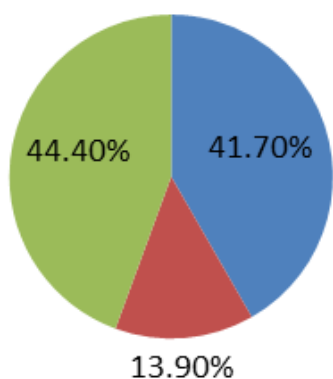


Figure 2: Waste management responsibility. Note: (■) A company; (■) Laboratory staff; (■) Dust man

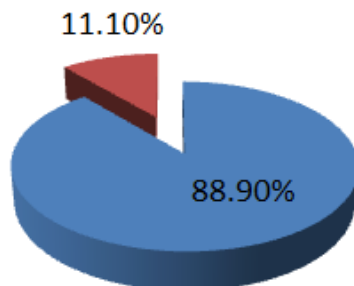


Figure 3: Laboratory waste separation in medical laboratories. Note: (■) Separating; (■) Not separating

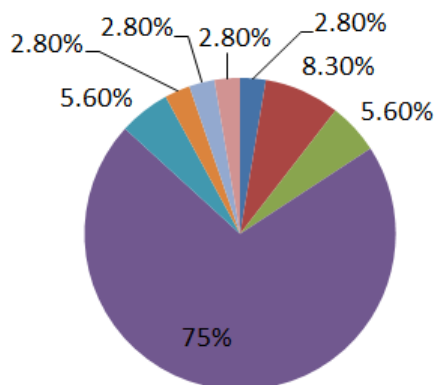


Figure 4: Different protocols of biohazards box disposal. Note: (■) Landfill; (■) Reuse; (■) Bury; (■) Company; (■) I don't know; (■) Burn on ground; (■) Incinerator

**Table 2: Laboratory waste disposal protocols awareness among laboratory staff**

Waste	Frequency of staff don't know laboratory waste disposal protocols
Chemicals	55.60%
Biological	19.40%
Culture media	8.30%
Radioactive	11.10%

**Table 3: Disposal of chemical waste protocols followed by laboratory staff**

Protocol	Frequency
Sewage	27.80%
Pour it in street	2.80%
Pour it far away from buildings	5.60%
Pour it in a well	8.30%

**Table 4: Disposal of biological waste protocols followed by laboratory staff**

Protocol	Frequency
Medical waste company protocol	8.40%
Ordinary waste company	55.60%
Landfill	2.8%
Burn	13.9%

The results showed there is no unique protocol followed in Khartoum state clinical labs for laboratory waste management especially infectious waste as well as inadequate training for laboratories staff. Neglecting guideline of lab waste management and disposal jeopardize lab staff, dustman, and others life with infectious diseases. These results were supported by many published studies.

Saad SA found in his study that most of waste, office, general, food, construction debris, and hazardous chemical materials were all mixed together as they are produced in hospitals, collected, and finally disposed out. A small part of infectious, and sharps waste in some health facilities are gathered separately and handled in a central incinerator. In Khartoum state no guideline for hospital waste, or even hazardous waste only some general environmental guideline. At the hospital level, no policies or rules were existed, except in the radiotherapy center, where they treat radioactive wastes by the laws of the Sudanese Atomic Agency. Urgent actions are required for the treatment and prevention of hazards related with this type of waste (Saad SA, 2013).

Hassan AA, *et al.* found that Sharps management is inefficient in Khartoum hospitals. As all wastes are gathered without separation and disposed improperly, especially needles (Hassan AA, *et al.*, 2018).

Mukhtar CM found that waste management guidelines, waste collection

program, radioactive waste container and hazards chemical waste management are not available in National Public Health Laboratory (Mukhtar CM, 2016).

Elnour AM, *et al.* reported that the nursing and sanitation staff at the main hospitals of the White Nile State in Sudan recorded significant improvement in their knowledge and practice with regard to hospital waste management immediately after the educational intervention program and three months later (Elnour AM, *et al.*, 2015).

**CONCLUSION**

Laboratories wastes are harmful to the environment, human, and animals because it contains infectious material, sharp materials, chemical reagents, and radioactive reagents. Laboratories staff have inadequate training in waste management and disposable. There is no unique protocol for waste management and disposal followed by laboratories in Khartoum state so jeopardize laboratorian and community. Thus laboratories should give their staff training in waste management and disposable and get rid of their waste only through specialized medical waste company. Government should develop our national waste management and disposable guideline based on the international guideline and implement it with follow up in order to have clean environment from laboratories waste in Sudan.

## DECLARATIONS

### ***Ethical approval***

Collection of data was approved by of Khartoum State Ministry of Health Research Department ethical committee.

### ***Informed consent***

Informed consent was obtained from all individual participants included in the study.

### ***Ethical guidelines***

All procedures performed in studies involving human participants were in accordance with the ethical standards of Khartoum State Ministry of Health Research Department ethical committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

### ***Acknowledgment***

I acknowledge all laboratories that participated in this study.

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