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Research Article

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Assessment of laboratory waste management and laboratory staff awareness in Khartoum state

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Abstract

Background

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.

Materials and Methods

A cross-sectional study was carried out on a group included 36 laboratories in Khartoum state from February to march 2021. Approvals have taken from each laboratory and participants voluntary informed consent and the data were collected using administered questionnaire and the data were analyzed by SPSS .

Result

Majority of the laboratories have sharp 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 in Khartoum medical laboratories.

More than two thirds of laboratory personal did not get training in waste management. greater portion of laboratories have specialized company approved by authorities to collect the medical waste and treat it. similar percentage of laboratories have dustman for this job and in few laboratories the collection and treatment of the waste done by laboratory staff.

Majority of laboratories staff are 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. Majority of laboratory staff they don't know how to manage chemical waste.

Conclusion

Laboratories wastes are harmful to the environment, human, and animals. 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 .

Keywords

Waste, management, laboratory, Sudan, Khartoum

Introduction

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⁽¹⁾. 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⁽²⁾ .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 .

Materials and Methods

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 (provided in supplementary files) from random samples under COVID 19 regulations and the data was analyzed by SPSS version(22) and presented as frequencies.

Result

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 have 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 are 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 (3,4).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 table (3,4).

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

| Waste types | Number | Frequency |
|------------------------------|--------|-----------|
| Needles and sharps | 33 | 91.7% |
| Biological(patients samples) | 34 | 94.4% |
| Bacteria culture media | 8 | 22.2% |
| Chemicals | 12 | 33.3% |
| Radioactive | 3 | 8.3% |
| house | 33 | 91.7% |

Table(2): laboratory waste Disposal protocols awareness among laboratory staff

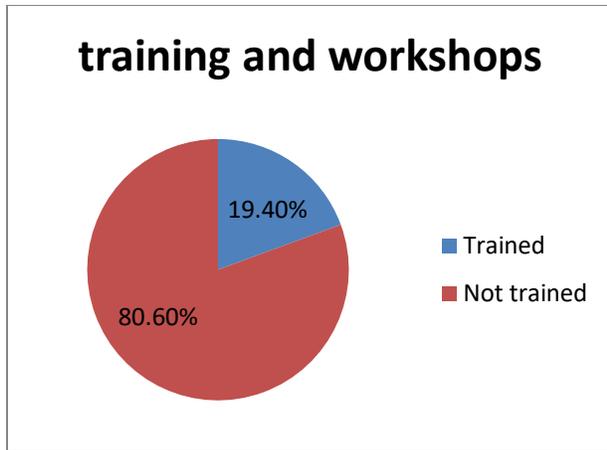
| waste | Frequency of staff don't know laboratory waste Disposal protocols |
|---------------|---|
| chemicals | 55.6% |
| biological | 19.4% |
| Culture media | 8.3% |
| radioactive | 11.1% |

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

| protocol | Frequency |
|---------------------------------|-----------|
| sewage | 27.8% |
| Pour it in street | 2.8% |
| Pour it far away from buildings | 5.6% |
| Pour it in a well | 8.3% |

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

| protocol | Frequency |
|--------------------------------|-----------|
| Medical waste company protocol | 8.4% |
| Ordinary waste company | 55.6% |
| Landfill | 2.8 |
| burn | 13.9 |



Figure(1): frequency of laboratory staff training in waste management

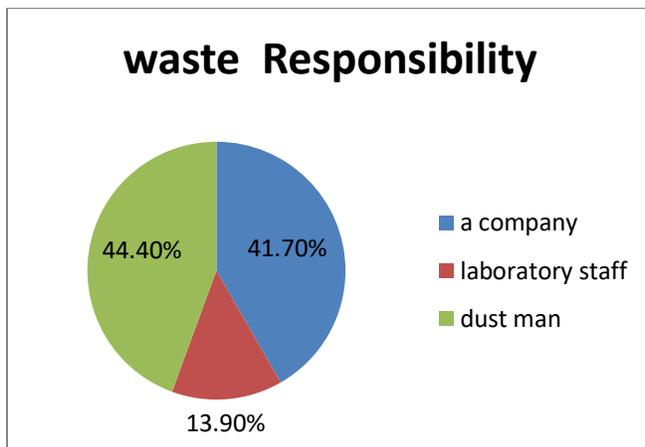
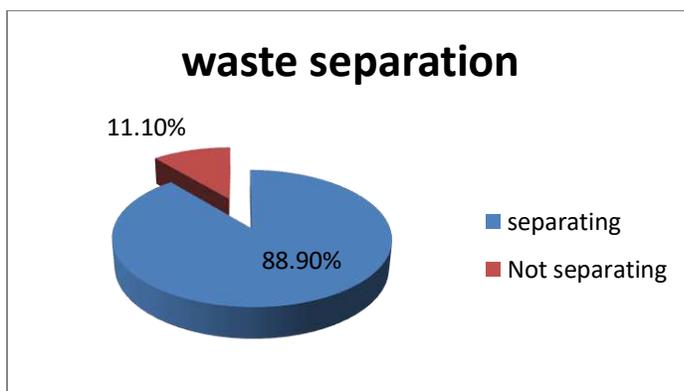


Figure (2): waste management responsibility



Figure(3) laboratory waste separation in medical laboratories

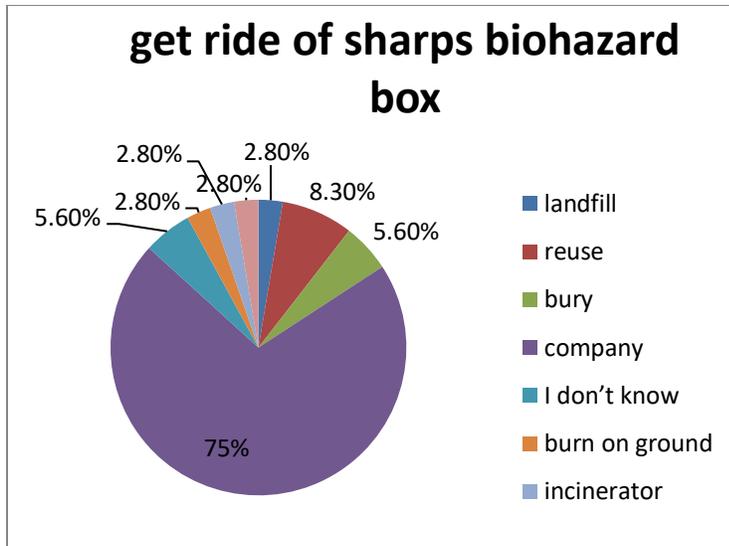


Figure (4): different protocols of biohazards box disposal

Discussion

The results showed there is no unique protocol followed in Khartoum state clinical labs for laboratory waste management specially 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 of. 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⁽³⁾.

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⁽⁴⁾.

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⁽⁵⁾.

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⁽⁶⁾.

Conclusion

Laboratories wastes are harmful to the environment, human, and animals because it contain 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 were 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.

Consent for publication

Not applicable

availability of Data and Materials

All data generated or analyzed during this study are available from the corresponding author on reasonable request.

Competing interests

I declare that I have no competing of interests

Funding

no funding was received

Author's contributions

Not applicable

Acknowledgment

I Acknowledge all laboratories that participate in this study

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training and workshops

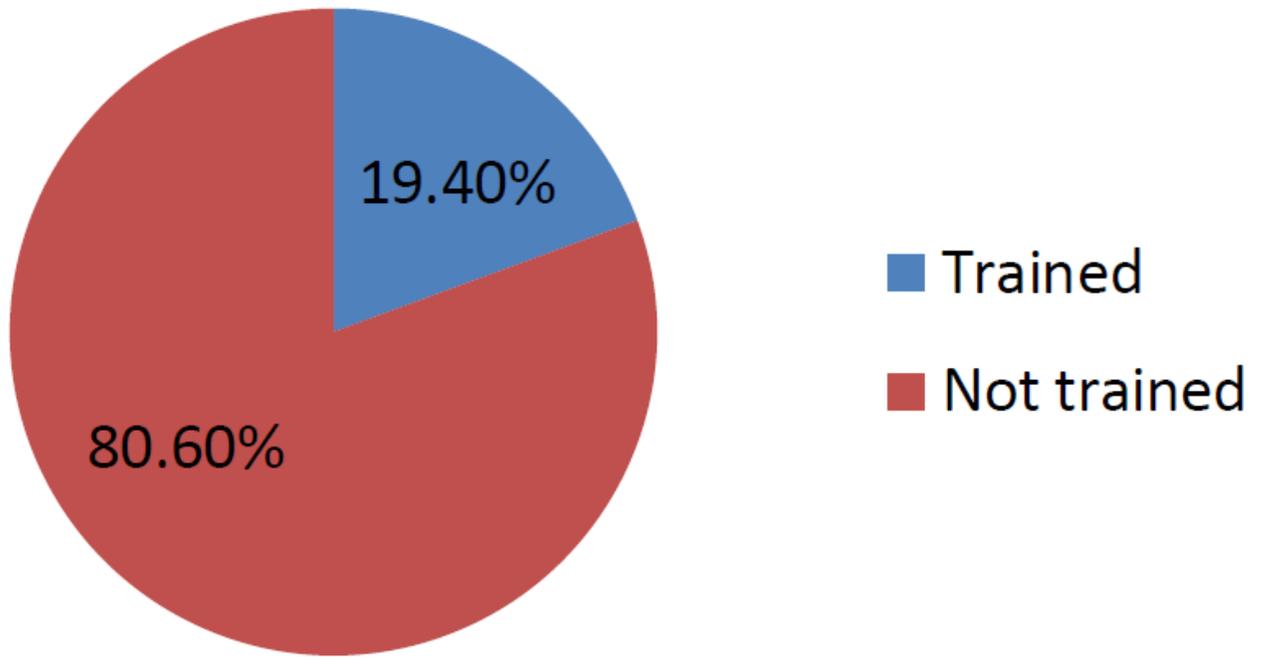


Figure 1

frequency of laboratory staff training in waste management

waste Responsibility

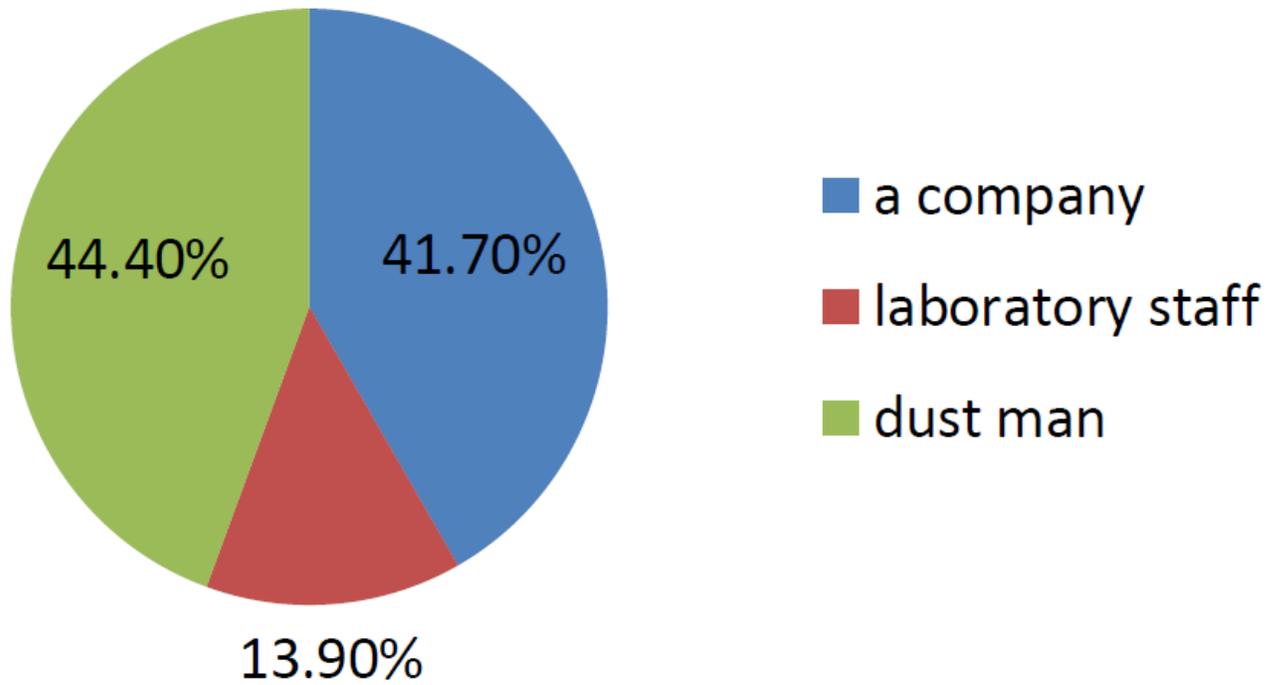


Figure 2

waste management responsibility

waste separation

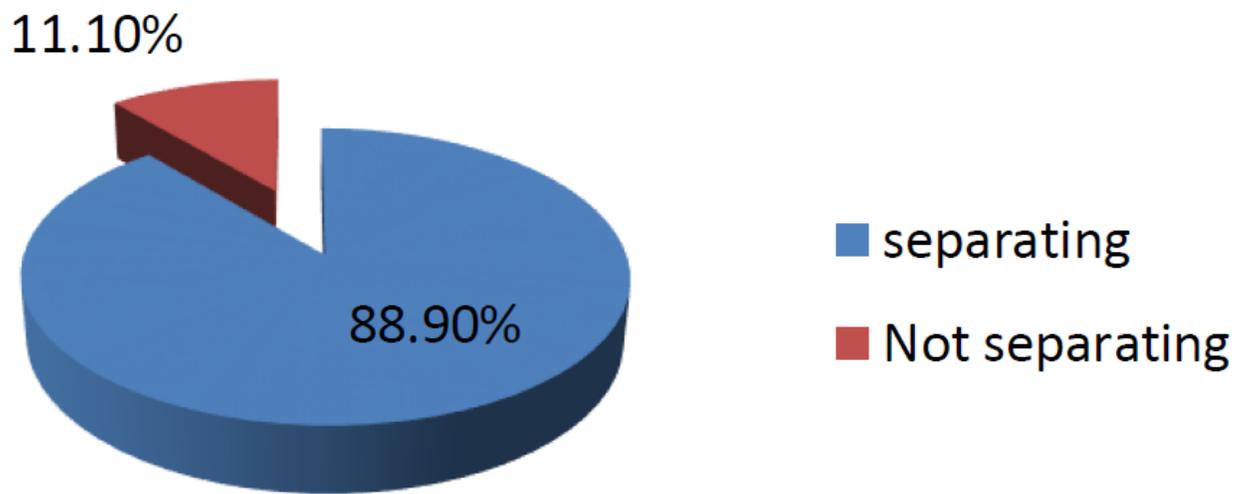


Figure 3

laboratory waste separation in medical laboratories

get ride of sharps biohazard box

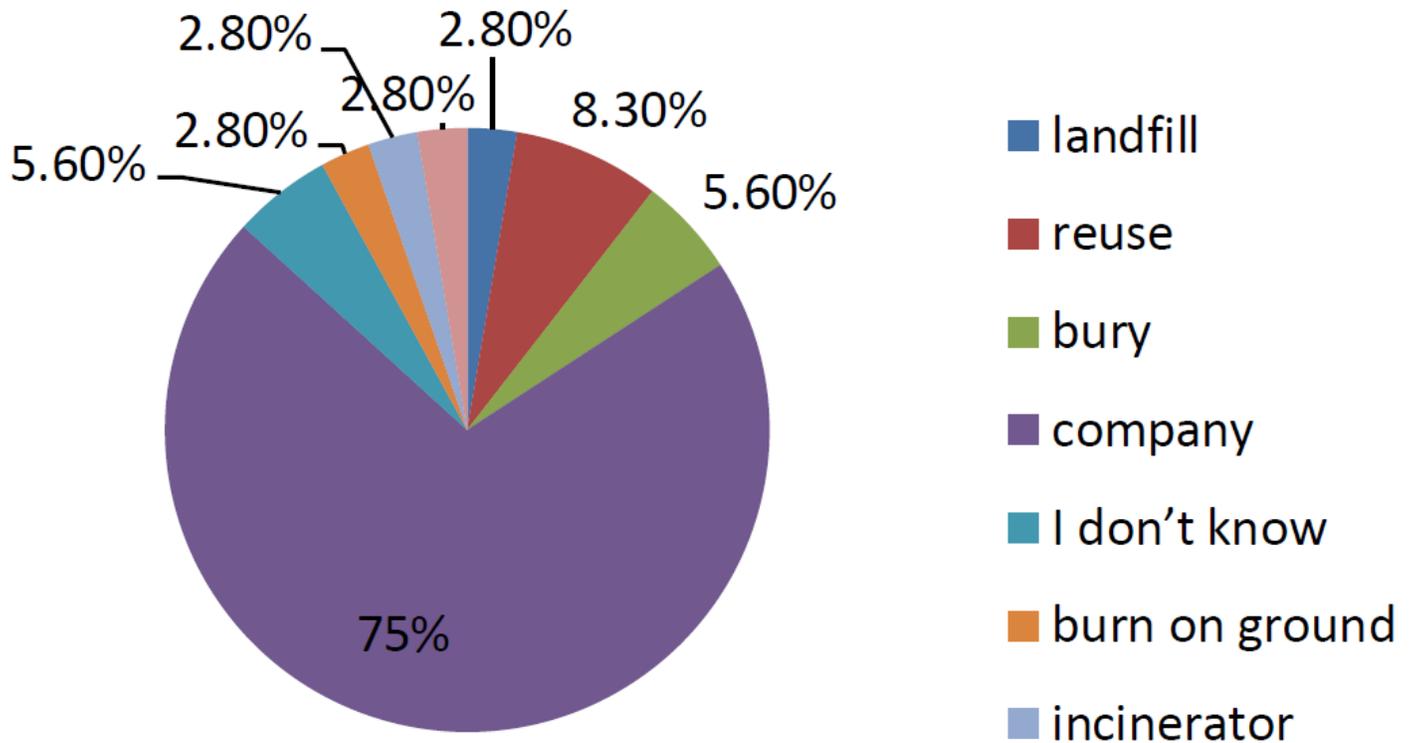


Figure 4

different protocols of biohazards box disposal

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [questionareconverted.pdf](#)