

Personnel and Safety Practices in Medical Laboratories, Sudan: the challenges to achieving goals

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Abstract: **Background:** Implementing safety and personnel management procedures in medical laboratories reduces the risks expected during work **Objectives:** The current study aimed to evaluate safety and personnel practices in medical laboratories in Wad Medani City, Sudan **Methods:** A cross-sectional analytical design based on the participation of medical laboratories during the period from 2019 to 2020 was followed, the included population was seven government medical laboratories and nine private medical laboratories. Research data was collected using a detailed questionnaire designed to be answered by study participants. Computerized analysis program SPSS (version 20) used for percentage calculation **Results:** the percentage of safety requirements was between 12.5% and 56.5%, and the average rate was 34.68% while for personnel management was between 25% and 68.75% with average of 43.75%. The level of workers' awareness of the safety guidelines provided by the World Health Organization reached only 43.7%. The greatest deficiency in personnel management was associated with continuous training and performance assessment for personnel at an interval time, at a weak rate of 25% **Conclusion:** The safety and personnel management procedures in the medical laboratories studied are not sufficient to provide the necessary protection and thus may affect work performance.

Keywords: Medical Laboratories, Biosafety, Personnel management, Sudan

Introduction

Based on the World Health Organization (WHO) guidelines, biosafety in medical laboratories focused on the safety of personnel and the environment by having an effective safety program to deal with risks and disease outbreaks [1]. The above-mentioned guidelines are the cornerstone of medical laboratory safety and must be applied during daily activities, so it is important to ensure that medical laboratories adhere to them.

Standard operating procedures (SOPs) as a safety component are constructions that must be followed to complete different tasks to ensure safety, failure of medical laboratories to adhere to written instructions for SOPs constitutes a safety deficiency [2]. Inside the medical laboratories, where chemical and biological tests are performed, worker safety requires that the workplace be free of food and drink items, and this is to prevent the transmission of infectious agents or toxic chemicals through the digestive system [3]. Improper storage of medical laboratory items may also affects safety [4, 5]. The most important example that can be mentioned here is keeping clinical samples and laboratory reagents in one place, and the main reason is the inability to provide sufficient and advanced devices for storage.

Washing of hands in a healthy way using medical soaps, is absolutely one of the most important safety measures that must be followed to limit the transmission of diseases and chemical pollutants [6]. As part of safety, hand hygiene facilities should be available in medical laboratories [7].

Despite the safety procedures followed in medical laboratories, the possibility of exposure to pathogens from various samples remains, however one of the safety measures that can prevent diseases from progressing in case of exposure is immunization [8]. Vaccination coverage rates of medical laboratory personnel against common and serious diseases such as hepatitis B, tuberculosis and measles must be satisfactory [9]. The published data explained many of the reasons facing immunization programs in low-income countries, such as the lack of statistics and logistical services, in addition to the educational level of the targeted people [10]. Medical laboratory personnel management includes qualification and licensing resources, effective job descriptions, and continuing professional education. Lack of skilled personnel and international training standards are important performance challenges in medical laboratories in Sudan and other low-income countries [11, 12]. Whether now or in the future, poor safety and personnel management in medical laboratories has harmful consequences, such as disease transmission, environmental pollution, and wasted capabilities, so this study aimed to evaluate safety and personnel practices in medical laboratories in Wad Medani City, Sudan.

Methods

Design and settings

This study followed a cross-sectional analytical design based on the participation of medical laboratories during the period 2019-2020. The included population was seven government medical laboratories and nine private medical laboratories in the city of Wad Medani, the capital of Gezira State. Research data was collected using a detailed questionnaire designed to be answered by study

participants. Questions were directed to assess medical laboratories safety in the following aspects: staff awareness of WHO safety guidelines, establishment of standard operating procedures, abstinence from eating and drinking, proper storage of samples, providing of hand hygiene supplies, and hepatitis immunization, while the issue of personnel management concerns qualification, authorization and continuing educational training. Computerized analysis program SPSS (version 20) used for percentage calculation.

Ethical approval

This study was approved by Ministry of Health of Gezira State and Faculty of Medical Laboratory Sciences at University of Gezira. Permission was also taken from each medical laboratory director.

Results:

The laboratory director of each participating medical laboratory filled out the questionnaire questions. All questionnaire questions were answered, the percentage of safety requirements was between 12.5% and 56.5%, and the average rate was 34.68%. The level of workers' awareness of the safety guidelines provided by the World Health Organization reached only 43.7%. Only 12.5% of medical laboratories examined properly store clinical specimens, while 25% do not have safety-related work instructions, written SOPs and/or staff training. Immunization against hepatitis B virus for working personnel was achieved at a rate of 37.5%. Maintaining the cleanliness of the workplace and providing hand-washing supplies was relatively better, with a rate of 56.5% and 56.25% respectively. The overall coverage for assessed safety guidelines was 34.68% (Table 1).

The greatest deficiency in personnel management was associated with continuous training and performance assessment for personnel at an interval time, at a weak rate of 25%. The availability of qualified persons for the laboratory section or laboratory supervisor recorded a frequency of 43.75% and 37.5, respectively. The overall coverage for personnel management in target laboratories was 43.75% (Table 2).

Table 1. Frequency of safety practices in medical laboratories, Wad Medani, Sudan

Task	Percentage (%)
Staff awareness of the WHO Laboratory biosafety manual	43.75%
Availability of work instructions at the workbench	25%
Availability of SOPs at all workstations for safe handling of all samples for ensuring safety handling	25%
Work and storage areas of the laboratory being free of staff food items	37.5%
Samples stored separately from reagents and blood products in the laboratory refrigerators and freezers	12.5%
Availability of adequate storage to ensure that all supplies are held at the correct environmental conditions	43.75%
Appropriately disposal of hazardous wastes	43.75%
keeping the work area clean and tidy for efficient operation, including cleaning and disinfecting of workbench areas on a daily basis	56.5%
Availability of sufficient waste disposal facilities and is separated into infectious and non-infectious waste,	43.75%
Availability of adequate hand washing facilities in the laboratory, including soap and towels	56.25
Staff having appropriate vaccinations such as for hepatitis B	37.5%
The total average	34.68

Table 2. Assessed personnel practices in medical laboratories, Wad Medani, Sudan

Task	Percentage (%)
Laboratory head person with appropriate qualifications and training for the position as per the job description	68.75%
Laboratory manager authorizes personnel to perform particular tasks	62.5%
Section of the laboratory led by a person who is adequately qualified, trained and competent in that discipline	43.75%
Training and continuing education program need for personnel	25%

Qualifications and responsibilities for laboratory supervisor	37.5%
Performance assessment for personnel at an interval time	25%
The total average	43.75

Discussion

The need for appropriate laboratory diagnosis is increasing because of the spread of diseases throughout the world, especially in poor countries [13]. Performance in clinical laboratories depends on essential components, including biosafety and personnel management. Inadequate safety results in laboratory accidents, diseases transmission and chemical contaminations [14, 15], while deficiencies in personnel management lead to poor laboratory performance [16]. As a developing country, Sudan suffers from poor health facilities. The reasons for this situation are due to the economic situation, lack of adequate training and conflicts.

The current study aimed to evaluate safety and personnel requirements in medical laboratories and determine the extent of their impact. The study showed insufficient knowledge of medical laboratory workers about the World Health Organization's guidelines for biological safety, which may reduce their abilities to properly deal with biological, chemical, and other precautions during daily work. The findings also revealed weaknesses in written work instructions and standard operating procedures, which affect the consistency and accuracy of safety procedures followed [17].

The study found that the lack of capabilities and resources are two important reasons for weak safety and personnel management in medical laboratories in the study area, which represents a considered part of Sudan. Therefore, adequate and optimal methods for storing samples were not followed in most medical laboratories, as well as the lack of a correct method for disposing of hazardous wastes.

In the present study, vaccination against hepatitis B virus was documented at 37.5%, meaning that the majority of medical laboratory workers were not protected against hepatitis B virus. Knowing that, hepatitis B infection in medical personnel has been documented at a rate of 6.7% in African countries and 4.9% in Sudan [18, 19], in line, during 2009, the frequency of vaccination against hepatitis B among workers in medical laboratories in Khartoum was 16% [20]. Here, it is necessary to raise health awareness about the importance of immunization and monitoring the immune response, in addition to providing vaccines by the responsible authorities in the country.

Hand hygiene is considered reliable in preventing the transmission of about 70% of infections [21], and the risk increases by removing gloves while working. However, hand hygiene cannot be achieved without the availability of appropriate facilities, such as providing a sufficient number of wash basins and medical supplies. It was noted in this study that there is a loss of hand hygiene facilities in a significant proportion of participated medical laboratories, similarly, a lack of hand washing facilities was found in survey in Nigeria during 2018 [22].

In general, the study recorded a noticeable shortage of qualified personnel required for the various tasks as head of the laboratory department and laboratory supervisor. This deficiency limits the ability of medical laboratories to carry out their duties and satisfy patients. As The Lancet published in 2018 [23], one of the gaps in medical laboratories is inadequate training of laboratory personnel, especially in low-resources countries. The need for continuous training in medical laboratories increases with the rapid development of methods for diagnosing diseases. Possible reasons for lack of training among medical laboratory personnel low-resources countries relate to funding, lack of government commitment, and personal perception of responsibility [24, 25].

Very recently in Sudan, armed conflicts expanded in 2023, stopping services from most hospitals and advanced laboratories in the capital, Khartoum. Therefore, it is expected that medical laboratory services in Wad Medani - the second city - will increase. The spread of diseases and epidemics also requires medical laboratories to play their role in accurate and early diagnosis, in addition to taking the necessary measures to prevent the transmission of diseases and contaminants.

Conclusion

The medical laboratories studied are far from achieving the desired goals in terms of biosafety and personnel management, as most of them do not have the necessary tools.

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