

Health Impacts and Risks Related to the Management of Solid Biomedical Waste in Health Facilities

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Abstract

Biomedical waste (BMW) is a health and environmental problem. Also, a study was conducted to develop a biomedical waste management system whose implementation will improve public health, while respecting environmental, technical and socio-cultural concerns. This is a descriptive cross-sectional study which took place from January 16 to 31, 2021. Biomedical waste, in the same way as household or other type waste, is experiencing an ever-increasing production in all countries and their dangers increase in proportion to the quantity produced. Proper management of this type of waste, with a view to disposal that minimizes the risks to health and the environment, represents a high cost, which accentuates the problems in developing countries. However, the lack of means should not be used as an excuse for inaction and the health situation relating to biomedical waste could progress positively with a better awareness of local stakeholders and an improvement in their management. Indeed, hospital staff, patients and their families are likely to contract nosocomial diseases, while the general population is exposed to the dangers of DBM when consuming contaminated food, by inhalation, ingestion or through any type of direct or indirect contact with DBMs; this means that legal complaints about it are likely to increase over time.

Keywords: Biomedical Waste; Management; Pollution; Risks; FOSA

Introduction

The hospital plays an important role in the protection and promotion of health. It is a real pole in every city. It is for this reason that the hospital is not a major producer of waste like other institutions [1]. Today, the issue of waste in hospitals is becoming more and more acute, as it poses risks to human health as well as to its environment, on which its impact is becoming more and more widespread and generates different forms of pollution (soil, air, water). Various publications and surveys have shown that the current conditions for the disposal of medical and pharmaceutical waste are not always satisfactory [2].

Thus, the rational removal of pollutants is one of the essential conditions for compliance with hygiene rules, not only inside establishments, but also in the general environment. Among these pollutions, that attributable to medical and pharmaceutical solid waste, undoubtedly one of the most complex to solve [3].

The 2002 WHO survey of 22 developing countries found that the proportion of health facilities that did not apply appropriate methods of disposal of care waste ranged from 18 to 64 per cent. Faced with this worrying situation, in 2005 WHO launched the Global Challenge for the Safety of Care and proposed, as its main strategy, the management of DBMs to prevent the various risks generated [4].

Thus, the Support for Investments in the Health Sector (PAISS) project was set up to have as its primary objective to contribute to the improvement of the general state of health of populations through a greater performance of health services, improve the quality of maternal and child health, and reducing the impact of communicable diseases.

Biomedical waste (DBM), or medical care waste (DSM), includes all waste from diagnostic, monitoring, preventive, curative and palliative treatment activities in the field of human and veterinary medicine. They are produced by human health, veterinary hygiene, medical research and education institutions, testing or clinical research laboratories, and vaccine production or testing establishments. The risks associated with DBM are psychosocial, traumatic, infectious, toxic, radioactive and environmental.

DBM management is described as the process of ensuring the hygiene of healthcare facilities, the safety of health personnel and the community. It includes the planning, supply, training and behaviour of health personnel, the correct use of tools, equipment and pharmaceuticals, appropriate treatment methods inside or outside healthcare facilities and assessment [5].

The study conducted in 2008 by MINSANTE/DPS at the level of health facilities showed a defective management of DBMs and a total absence of corrective strategies [6].

It is in this context that we felt it was necessary to carry out a study on the management of DBMs within PBF (Performance-Based Health Training) and non-PBF (Performance-Based Health Training) health facilities in certain regions of Cameroon with a view to reducing the risks associated with them and improving conditions for 'health and safety in the working environment. The evaluation of the improvement of the impact of diseases in health centers requires better management of biomedical waste.

Material and Methodology

The impacts and risks related to the management of DBMs in health facilities (FOSA) were essentially based on the exploitation of the various project formulation and implementation documents on the one hand, and on the consultation of the various project stakeholders and the visit of the FOSA on the other hand in the North-West and East regions, of Adamawa and the North.

The study was carried out in three main phases as follows:

The identification of the impacts was made thanks to the Leopold matrix from the surveys carried out in the FOSA, from the interview with the FOSA managers, direct observations on the site. This matrix correlates the activities of FOSA on the one hand and the components of the environment on the other.

The impact assessment was made using the Fecteau matrix based on surveys carried out in hospitals, the interview with FOSA managers, direct observations on the site. This matrix correlates the activities of the farm on the one hand and the components of the environment on the other.

The potential impacts likely to emerge from different health facilities were described and then evaluated using the Fecteau grid, which takes into account three criteria: intensity, duration and extent.

Semi-structured interviews were conducted with certain stakeholders in the management of DSMS and their risks, as well as through the use of the risk matrix: health professionals, municipal officials and their agents, to explain certain points that remain dark, collect the problems experienced and the points of view of the various stakeholders.

The compulsion of certain documents such as documents that are related to the actions carried out by the various stakeholders concerning the process of DBMS management and health risks in health facilities, also seek the existence of ministerial circulars, guides

and procedures for the management of DBM.

The collected data was entered using Excel 2013 software.

Results

The lack of specific premises for the storage of DBMS in the various FOSA causes traffic congestion. It contributes to the obstruction of stormwater and wastewater drainage routes (Photo.1.).



Photo 1: Traffic congestion.

The piling up of waste from the various care units causes the degradation of the aesthetic appearance and beauty of the environment and DBMS by the staff of health facilities or the populations causes the release of certain gases (Photo.2.) such as NO, NO₂, CO, CO₂, ... which are destructive of the ozone layer.

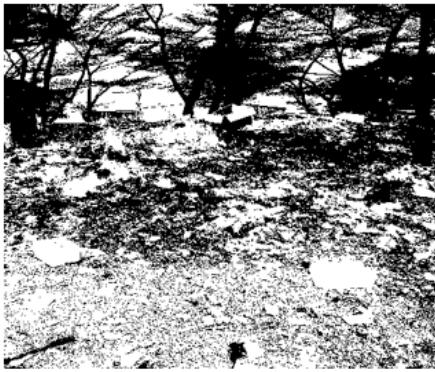
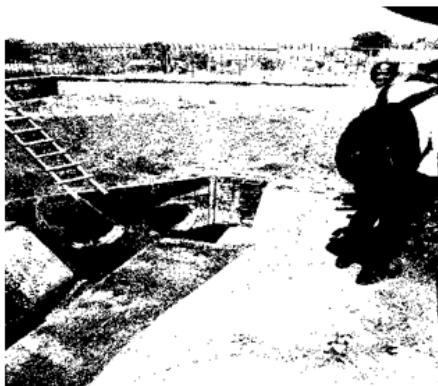


Photo 2: Release of gases into the atmosphere by open air incineration.

The runoff that washes the piles of hospital waste is usually loaded with pollutants (solid glass particles, heavy metals, etc.) to infiltrate the water table or to flow into streams. At each destination, these pollutants (Table 1) attack the fauna and flora found there (Photo.3).

**Photo 3:** Water and soil pollution.

<i>Environmental component</i>			<i>Characterization parameters and evaluation</i>	
Components of the environment	Activities and sources of impacts	Impact	Nature	Evaluation
ground	Release of incineration residues into nature	Loss of vegetation cover	-	Avg
Air	Incineration of DBMS	Rejection of toxic fumes	-	Avg
	Exhibition of garbage cans	Emanation of foul odors,	-	Avg
Water	Runoff that washes off DBMS piles	Groundwater pollution	-	May
Socio-economic environment	Anarchic rejection in the hospital compound	Deterioration of the hospital environment and proliferation of vectors	-	May
	Poor conditioning	Unsanitary care services	-	Min

Table 1: Assessment of the environmental and social impacts of DBMS in FOSA.

	<i>Exposed person</i>	<i>Explanation</i>	<i>Risks of HIV/AIDS infection</i>	<i>Risk Category</i>
Production	Medical staff Paramedical Nurse	Lack of attention Ignorance of risks Mixtures with garbage	Injuries with sharp objects	Major
Sorting at Source	Paramedical Medical Personnel Nurse	Lack of categorization	Accident contamination of all cutting/cutting waste	Major
Collection and storage	Collection officers	Unprotected waste	Injuries by sharp object	Major
transport and evacuation	Personnel of private companies	Mixtures with garbage Recovery Adequate means of collection	Injuries by sharp object	Major
Elimination	Maintenance staff	No protection	Injury	Major

Table 2: Risk of HIV/AIDS infection by stage of waste generation.

The incineration of hospital waste piles in the open air causes the release of certain gases such as HCl (hydrochloric gas), SO₂ (sulphur dioxide), H₂S (hydrogen sulphide) and phosphagen which are very harmful to humans (Table 1).

The piling up of waste from the two hospitals without overturning causes the release of foul odors, which attract flies and mosquitoes, vectors of multiple diseases (Photo.4.).

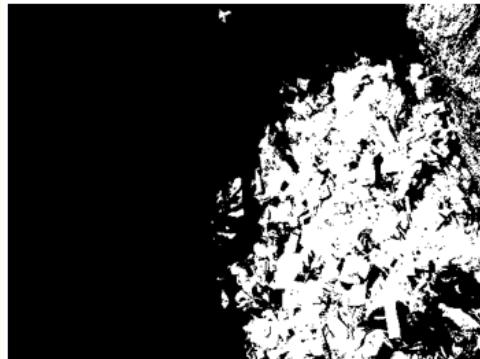


Photo 4: Crowding of solid waste causing vector proliferation.

The direct discharge of waste from service units into nature (Photo.5), on the ground or in garbage bins, very often mixed with household waste, is a widespread practice that constitutes a great danger.

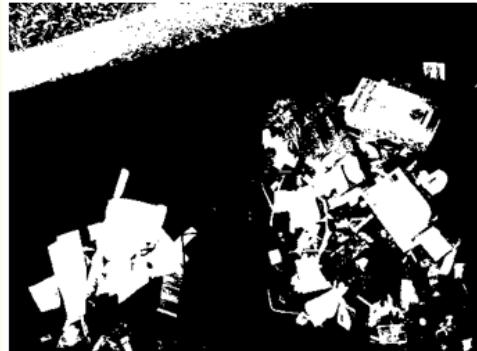


Photo 5: Dangerous objects present in the different care units.

Surveys of administrative staff, doctors, paramedics, support staff and agents of private companies were able to obtain the following results.

Of the 131 respondents on the issue: 20 people or 15.27% had no idea of the risks; 30 people or 22.90% had cited three risks; 10 people or 7.63% had cited two risks; 71 people or 54.20% had cited a risk. On this issue, it is also noted that 7 of the 19 agents of the private companies surveyed or 36.84% were unaware of the risks associated with the bad DBMS. On the other hand, 5 of the 24 boys/girls in the wards, or 20.83%, were unaware of the risks associated with bad DBMS.

The health and environmental risks frequently cited by respondents can be summarized in the following figures:

The likelihood of HIV infection after exposure to contaminated blood is relatively high, but once the blood is contaminated, the victim will be placed on ARVs for one month and triple therapy blocks any cellular activity of the virus.

After the field investigations, it emerged that the mismanagement of DBMS has a major risk to the environment. Here we note soil pollution at 22%, air pollution at 45%, water pollution at 27%, damage to the water table at 4% and a contribution to climate change at 2% (Fig.2).

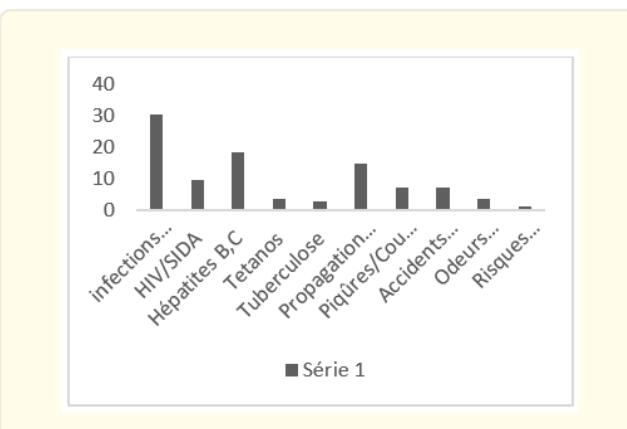


Figure 1: Perceptions of health risks in the different FOSA.

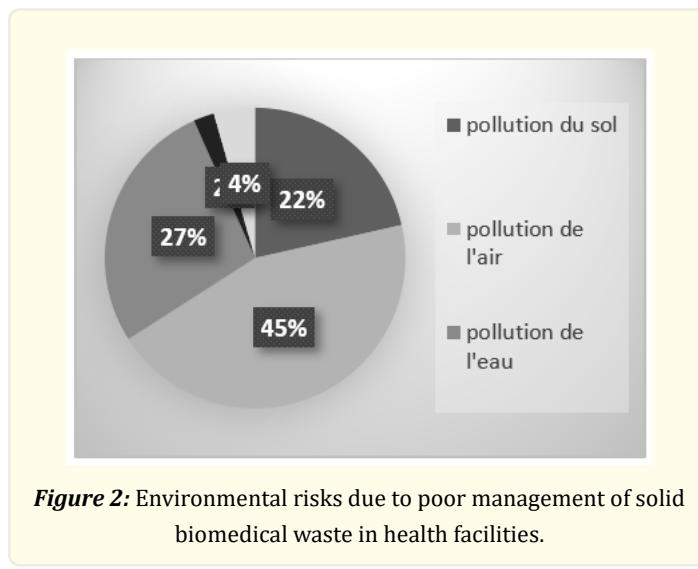


Figure 2: Environmental risks due to poor management of solid biomedical waste in health facilities.

Discussion

Biomedical waste is a reservoir of potentially hazardous microorganisms that can infect hospitalized patients, health workers and the general public. Other potential infectious risks include: the external spread of sometimes resistant microorganisms present in health facilities, the management of DBMs, in particular, the inappropriate handling of equipment (especially those infected with HIV/AIDS) poses serious threats to the health of several categories of actors and the handling of this waste is a factor in aggravating the environmental and health risk [7].

The problems posed by poor management of DBMs are acute. The main persons exposed in the DBM management process are patients and health professionals (medical and paramedical staff) in care establishments; nursing assistants, servants, cleaners, cremation workers, etc.; outside the hospital perimeter, agents of private companies or NGOs responsible for collection, transport and landfill of household waste mixed with DBM [8].

Informal waste pickers who permanently or occasionally search garbage, including women and children.

Populations that use recovered hospital objects for domestic use [9].

The risks associated with poor waste management in FOSA generally relate to :d accidental injuries: risks of accidents for health personnel; children who play (or defecate) on garbage dumps as well as unsuspecting waste pickers and acute poisonings, nosocomial infections and nuisances for health and collection personnel (odors, exposure, lack of protective equipment, lack of medical follow-up, etc.) [10].

With regard to infections, the following categories are identified: viral diseases such as HIV/AIDS, Viral Hepatitis B (HVB) and Viral Hepatitis A. Health personnel, accompanying persons, maintenance personnel and populations living near landfills (children, waste pickers, etc.) are mainly exposed to these pathologies; microbial or bacterial diseases, such as tuberculosis, streptococci, typhoid fever, etc [11].

Risk are several such as: pollution of the water table (HD of Abong-Mbang, HR of Bertoua), Risk of eutrophication, Bioaccumulation and bioaccumulation of heavy elements in the courses affecting wildlife (HR of Bertoua), Risk of infections, burns, intoxication, Risk of pollution of the water table (HD of Abong-Mbang, HR of Bertoua), Bioaccumulation and bioaccumulation of heavy elements in the courtyards and Risk of infections, burns, poisoning affecting wildlife (BERTOUA HR)[12].

It should be noted that local populations are very sensitive to certain types of waste, particularly anatomical (amputations, placentalas, etc.). They are most often very demanding as to the modalities of their elimination. It would be unacceptable to dump these types of waste in garbage dumps [13].

In most of the FOSA surveyed, this waste is given to patients or family members.

Consideration could be given to the development of septic tanks into which these types of waste are discharged. However, it is imperative that any decision in this direction be submitted to the approval of the persons concerned or their families [14].

From this point of view, socio-cultural and religious beliefs will have to be truly taken into account in the management plan of the DBM in order to guarantee respect for the representations and customs of the populations concerned.

Conflict of interest

Authors declare that they have no conflict of interest.

References

1. Anonymous. DPS/MINSANTE report. Inventory of hospital waste in Cameroon (2007): 11.
2. Bidias J. Evaluation of solid waste management at Jamot Hospital in Yaoundé and Biyem Assi District Hospital: Environmental and social impacts (2013).
3. Daoudi. Evaluation of the management of medical and pharmaceutical solid waste at Hassan II Hospital in Agadir (2013): 10-25.
4. Abdelsadok N. "Accompanying study for the management of medical waste in Morocco". End of Studies Thesis for obtaining the Specialized Master in Waste Management, Treatment and Recovery, Casablanca (2010): 34-46.
5. Aroga AS. "Contribution to the improvement of the management of solid biomedical waste at the main hospital in Dakar". Dissertation End of Studies for obtaining the DESS Specialized in Health Service Management, Hospital Management, Higher Institute of Health (2012): 14-146.
6. Bidias J. Evaluation of hospital solid waste management at Biyem-Assi District Hospital and Jamot Hospital in Yaoundé: Environmental and Social Impacts (2013).
7. Billau P. "Estimation of the health and environmental hazards of biomedical waste in Benin with a view to their management". End-of-training essay, Sherbrooke University Environmental Training Centre (Canada) (2018): 28-86.
8. Djogoue PF. Study report on the national biomedical waste management plan in the framework of the health sector investment support project (2016): 1-60.
9. Mbayé MF. Study report on the biomedia waste management plan in Chad (2014): 24-56.
10. Magda S. Hospital waste management in El-Beira Journal of Environmental Management, Governorate, Egypt 91.3 (2013): 618-629.
11. Mbouna N. Study of the biomedical waste management system in the matam health district (Senegal) in 2017: technical aspects, costs and financing (2018): 10-26.
12. Mbog Mbog S. "Evaluation of the management of hospital liquid waste: case of wastewater from Yaoundé University Hospital". Thesis presented with a view to obtaining a Professional Master in Environmental Sciences, Sanitation and Environmental Restoration, University of Yaoundé I, Cameroon (2013): 25-62.
13. Ndiayé M. Biomedical waste management in five hospitals in Dakar, Senegal (2012): 1-9.
14. Ngankem II AF. "Evaluation of the management of liquid biomedical waste in the university hospitals of point g and Gabriel Touré". Thesis presented for the degree of Doctor of Medicine, University of Bamako (2014): 0-40.

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